Polysomnography at a sleep disorders unit in Melbourne

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Objective: **To outline the procedure of polysomnography as carried out in a sleep disorders unit in Melbourne and to describe the patients undergoing polysomnography in terms of their age and sex and the sleep disorder diagnosed.**

Design: **A retrospective survey of consecutive patients who required diagnostic polysomnography.**

Setting: **The Sleep Disorders Unit at Epworth Hospital, a large private hospital in Melbourne.**

Patients: **Two hundred consecutive patients who underwent polysomnography over a seven-month period. Their ages ranged from 19 to 77 years.**

Interventions: **All patients had diagnostic polysomnography for one night in the sleep laboratory. This involved 12 to 14 physiological variables being monitored continuously overnight by means of a new digital recording and sleep analysis system.**

Main outcome measures: **Patients were categorised according to their main sleep disorder or primary diagnosis. Additional sleep disorders in some patients were categorised as secondary diagnoses.**

Results: **The commonest age group among both male and female patients was 40–49 years. Overall, men outnumbered women three to one. Almost two-thirds of all patients had as their primary diagnosis some degree of obstructive sleep apnoea syndrome or simple snoring. The next most common diagnosis was periodic limb movement disorder. The remaining diagnoses included a variety of sleep disorders, from narcolepsy to sleep terrors.**

Conclusions: **Despite its complexity and time-consuming nature, polysomnography is an essential procedure for the diagnosis and treatment of a wide range of sleep disorders. More sleep laboratories and a greater emphasis on the multidisciplinary teaching of sleep disorders medicine will be required in Australia.**

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Knowledge of sleep and its disorders has increased considerably over the past decade. This is particularly so for sleep-related respiratory disorders such as obstructive sleep apnoea syndrome, movement disorders such as periodic limb movement disorder and those sleep disorders involving disturbances of circadian rhythms, such as delayed sleep phase syndrome.[1] A new international classification of sleep disorders has recently been published[2] and the new nomenclature is used throughout this report. The advances in sleep disorders medicine have depended, among other things, upon polysomnography, the multichannel physiological recording procedure used in the study of sleep. Polysomnography used to be the domain solely of sleep researchers in academic institutions. In Australia this began in the 1960s but was given a great impetus after 1981 by the development in Sydney of nasal continuous positive airway pressure (CPAP) treatment for obstructive sleep apnoea.[3]

Polysomnography is one of the most intensive and time-consuming investigations. Nevertheless, it is now required as a routine clinical service, at least in the major population centres, for making a diagnosis, quantifying disorders and evaluating therapies for increasing numbers of patients with a variety of sleep disorders. This is not because the prevalence of sleep disorders has suddenly increased. It is because sleep disorders that were previ-

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ısly unrecognised, but which are now ıown to be associated with significant ɔrbidity and mortality, can now be diag- ısed and treated successfully.

The purpose of this report is to describe ›lysomnography as performed in one ıstralian sleep laboratory — the Sleep sorders Unit at Epworth Hospital, a large ivate hospital in Melbourne. How and ıy the many physiological variables are onitored all night are explained. The nge of sleep disorders encountered in is specialised unit is illustrated by the agnoses of 200 consecutive patients who ıderwent polysomnography. There is a 'ief discussion to explain some of the sser-known disorders and the indications r polysomnography in general.

ethods

ıe basic methods used at Epworth Hospital for ɔnitoring sleep and for scoring sleep stages ə based on long-established standards.[4] The ditional methods for cardiopulmonary moni- 'ing during sleep were devised to meet, and some respects to exceed, the standards commended by the American Thoracic ›ciety,[5] the American College of Chest Physi- ıns and the Association of Sleep Disorders ›nters.[6] These standards require an overnight sessment of sleep stages, respiratory air- w and effort, arterial oxygen saturation, ›ctrocardiogram, body position and leg ›vements.

Strangely, these recommended standards ıke little or no mention of methods for tecting and counting snoring noises, or for ntinuously monitoring the sleeper's position bed. Nor do they place much emphasis on ıtinely recording the movements of each leg. e Epworth methods include the latter variables using specially developed transducers. ıother unusual feature at the Epworth Sleep sorders Unit is the use of digital rather than alogue techniques for recording, displaying d analysing the results (see below).

Patients are admitted to the Epworth Sleep sorders Unit in the evening, at least one hour fore their usual bedtime. They are not rmitted to drink alcohol that day. Electrodes d other transducers are attached to the tients and they are allowed to sleep all night, ch in a single room, without purposeful distur- nce. Recordings are made continuously for o 10 hours. Similar recordings are sometimes ›o made during the day for shorter periods, a multiple sleep latency test (see below). One ıht's polysomnography, in conjunction with a tailed history of the patient's sleep habits, is en sufficient to make a diagnosis.

The Epworth Sleep Disorders Unit currently ›ords sleep data from two patients simultane- sly, seven nights a week. The Unit is staffed night by graduate nurses who are specially trained in polysomnographic methods. Most of the equipment was specially made to my specifications, by Compumedics Pty Ltd, a highly innovative manufacturing company in Melbourne.

Variables measured

All patients undergoing polysomnography at Epworth Hospital have the following variables recorded simultaneously and continuously overnight.

Electroencephalogram. The EEG, usually recorded from electrode positions C_4 and A_1, is essential in distinguishing wakefulness and the stages of sleep — stages 1, 2, 3 and 4 and rapid eye movement (REM) sleep.[4]

Electrooculogram. The EOG, recorded separately from each eye, detects the conjugate, saccadic eye movements of wakefulness, the slow non-conjugate movements of stage 1 sleep, and the rapid eye movements of REM sleep.[4]

Submental electromyogram. The EMG is recorded from electrodes under the chin (submental muscles). Tonic activity in these muscles is lowest during REM sleep which is thereby distinguished from stage 1 sleep and from wakefulness.[4]

Respiratory airflow. Thermistors are used to detect the combined nasal and oral airflow by cooling during inspiration and heating during expiration. Airflow is reduced during hypopnoeas and absent during apnoeas.[5]

Respiratory movements. Thoracic and abdominal respiratory movements are monitored separately with strain gauges or respiratory inductive plethysmography (Respitrace; Respitrace Corporation, Andsley, New York). With upper airway obstruction, as in obstructive sleep apnoea, respiratory movements become paradoxical, that is, the abdomen contracts on inspiration as the thorax expands. With central sleep apnoea both the thoracic and abdominal movements cease. Mixed apnoeas begin as central apnoeas and then become obstructive. Partial upper airway obstruction or reduced respiratory effort produces hypopnoea rather than apnoea.[5]

Arterial oxygen saturation (Sao_2). A pulse oximeter gives continuous measurements of arterial oxygen saturation from a probe on the ear-lobe or finger. The Sao_2 falls temporarily during apnoeas and hypopnoeas.[5]

Electrocardiogram. Chest leads are used to monitor the ECG, particularly for tachyarrhythmias which are common with obstructive sleep apnoea.[5]

Leg movements. The movements of each leg are detected separately by a ceramic strain gauge placed over each tibialis anterior muscle. Leg movements occur intermittently, as part of more general body movements with change of posture during a normal night's sleep. However, periodic limb movement disorder (PLMD) involves repetitive, stereotyped leg movements which occur in bursts during sleep. These movements may occur predominantly in one or other or both legs in different people and at different times of the night. If the movements of both legs are not monitored, cases of PLMD can be completely missed.[7] The ceramic strain gauges give a voltage out only when distorted by movement beneath them. They are very sensitive, and I have found them preferable to the more usual method of detecting leg movements from the amplitude of the EMG recorded from each tibialis anterior muscle.

Body position. The sleeper's position is monitored continuously by a small electrical position sensor placed over the sternum. This transducer consists of mercury switches and resistors arranged so that when a constant current is passed through the circuit the voltage out varies predictably with the transducer's position and hence the sleeper's position, whether supine, prone or left or right lateral. Obstructive sleep apnoea and snoring are worse when the sleeper is lying supine.[8]

Snoring noises. A small microphone attached to the bedhead, just above the sleeper's head, readily detects snoring noises. The output from this microphone is recorded directly onto the sound track of a video recorder running at half-speed which records for eight hours on a standard four-hour VHS tape. The microphone output is also integrated electronically so that snoring noises of greater than a fixed threshold intensity can be counted automatically. Snoring is one of the most common disorders presenting to a practitioner of sleep disorders medicine, whether as part of the obstructive sleep apnoea syndrome or not.

Infrared video recordings. Black and white pictures are obtained in the dark by using invisible infrared light and a special video camera. This provides an eight-hour visual record with the associated sound track on the video recorder. The polysomnographer has an excellent view on a video monitor of the patient's posture, movements, snoring and other noises, and general condition throughout the night.

Other recordings. For some disorders it may be desirable or essential to include additional channels of information which are not required routinely for polysomnography. For example, body temperature is sometimes monitored at Epworth Hospital by rectal thermistor, to provide information about circadian rhythm disorders. Other sleep laboratories sometimes use transcutaneous carbon dioxide electrodes to indicate carbon dioxide retention during sleep apnoea and alveolar hypoventilation. Oesophageal balloon pressure or diaphragmatic EMG are sometimes used to measure breathing effort.[5] Nocturnal penile tumescence studies involve circumferential strain gauges applied to the penis overnight to detect erection or its failure during REM sleep.[9] This is used to help diagnose the cause of male impotence. Such studies are currently not done at Epworth Hospital.

Nasal CPAP treatment

Patients requiring nasal CPAP treatment for sleep apnoea are readmitted to the Sleep ers Unit for the first night of treatment. ndergo polysomnography while wearing P mask, the pressure in which is meas- nd controlled from the recording room. essure is progressively increased from vels until the apnoeas and snoring are led. Apnoeas are worst for most patients lying supine and in REM sleep. By st, snoring is worst in non-REM sleep ying supine.

ıle sleep latency test

a test done during the day as an objec- asurement of sleepiness and to measure ency before the onset of REM sleep.[10] In people, REM sleep does not appear until t least 60 minutes of non-REM sleep. of less than 15 minutes are an essential stic feature of narcolepsy, while delays › 60 minutes are common in, but are not nselves diagnostic of, depressive illness. nultiple sleep latency test the patient has EOG and EMG recordings for about 20 s on four or five separate occasions, two apart. Patients suffering from excessive e sleepiness usually fall asleep in less) minutes.

ding equipment and the analysis ults

gle channel of information from polysom- hy can be easily interpreted without cross ce to the others. In the past this has been y trained polysomnographers, visually every page of the voluminous paper s, which is very time consuming. Some roblems of data handling and the subjec- oring of results have been overcome by velopment of digital polygraphs and ter-aided analysis.

w computerised system, Sleepwatch™, veloped initially for the Sleep Disorders Epworth Hospital by Compumedics Pty mputer-controlled preamplifiers for each transducer are at the patient's bedside. plified analogue signals are fed via multi- ıbles to a nearby recording room. There e digitised, displayed and recorded on sc. The display is on a digital polygraph e upper and lower halves of the 20-inch r displaying waveforms on two different ses. The upper half displays 20 seconds involving higher frequencies (EEG, EOG, etc.) while the lower half displays 2 s of data involving slower changes respiratory airflow, etc.). Up to 20 input els can be used for each patient.

e analysis is done by the system automat- t the end of every 20 seconds. For e, the EEG is analysed in terms of its ncy and amplitude by measuring the and amplitude of each wave. In addition, te rapid eye movements are counted; the MG amplitude is calculated; left and right vements are indicated; the mean and minimum SaO_2 are calculated; snores are counted; and the sleeper's position is recorded.[11] Ongoing summaries of these results are displayed on a monitor which is separate from that displaying the raw data. Condensed graphical summaries of these results are also printed automatically, in colour, every 90 minutes during recording. Further analysis of the data, such as the number of hypopnoeas and apnoeas per hour of sleep (respiratory disturbance index), proceeds at the end of recording after artefacts have been edited from the data and after each 20-second period has been assigned to a stage of sleep or wakefulness by the scorer.

These computerised methods have greatly reduced the running costs of the sleep laboratory, particularly the costs of recording paper. They have made the scoring process quicker and more objective, but have not eliminated the need either for visually checking the raw data or for personal interpretation of the final results. Polysomnography cannot be fully automated, at least with our present knowledge and methods.

Indications for polysomnography

With an investigation as time-consuming and expensive as polysomnography, it is appropriate to ask why any particular patient should have it. Sleep disorders medicine crosses the boundaries of many disparate disciplines such as thoracic medicine, neurology, ear, nose and throat surgery, psychiatry, urology, paediatrics, general practice and clinical psychology. The skills and knowledge of sleep disorders medicine are not derived from any one of these disciplines alone. It is a multidisciplinary subspeciality. However, some disciplines have, quite appropriately, set out detailed indications for polysomnography from their own viewpoint.[5,6] The Thoracic Society of Australia and New Zealand has recently published a position statement on the treatment of sleep-disordered breathing, including the relevant indications for polysomnography.[12] In more general terms, polysomnography is performed for the following reasons:[13]

1. Sleep involves unique states (non-REM and REM sleep) in which regulatory physiology differs from that during wakefulness. Some pathological events such as sleep apnoeas or periodic limb movements are state-specific. They cannot be reliably diagnosed or quantified without polysomnography.
2. Sleep may modify body functions which are also abnormal during wakefulness. Chronic obstructive pulmonary disease, neuromuscular disorders and various forms of epilepsy are examples here. It may be essential or advisable in the management of such disorders to know how much they are affected by sleep.
3. Abnormalities of sleep architecture (duration and distribution of sleep stages and their associated EEG patterns) can be seen which are diagnostic of some disorders, such as narcolepsy and alpha-EEG sleep.

There are some sleep disorders that do not usually require polysomnography. These include insomnia associated with anxiety or with mood disorders, and parasomnias such as sleep bruxism. Polysomnography is necessary in such cases only if the primary diagnosis is in doubt, perhaps because of the failure of previous treatments, or if another undiagnosed, secondary sleep disorder is also suspected.

Results

Data have been collated from 200 consecutive patients undergoing diagnostic polysomnography at Epworth Hospital over a seven-month period in 1989. Their diagnoses give some indication of the broad range of sleep disorders presenting to a Sleep Disorders Unit. Men outnumbered women three to one (Table 1). The ages ranged from 19 to 77 years, the commonest age group being 40–49 years. The frequencies of various primary diag-

TABLE 1: Ages of the patients undergoing polysomnography

	No. of patients		
Age (years)	Male	Female	Total
19	1	1	2
20–29	13	4	17
30–39	26	9	35
40–49	42	15	57
50–59	42	5	47
60–69	23	7	30
70–79	8	4	12
Total	155	45	200

TABLE 2: Primary sleep disorders among the 200 patients

Primary diagnosis	Proportion of patients
Mild obstructive sleep apnoea/simple snoring	36.5%
Moderate to severe obstructive sleep apnoea	28.0%
Central alveolar hypoventilation syndrome	2.0%
Periodic limb movement disorder	5.0%
Restless legs syndrome	5.0%
Alpha-EEG sleep	5.0%
Narcolepsy	2.5%
Idiopathic hypersomnia	3.0%
Insomnia with anxiety/depression	3.0%
Drug/alcohol dependent sleep disorder	1.5%
Psychophysiological insomnia	2.0%
Subjective insomnia, normal polysomnography	0.5%
Delayed sleep phase syndrome	2.0%
Rhythmic movement disorder (adult)	1.0%
Sleep bruxism	0.5%
Sleep terrors (adult)	0.5%
Total	100.0%

'ABLE 3: Secondary sleep disorders among the 200 patients

›condary diagnosis	Proportion of patients
›riodic limb novement disorder	15.0%
pha-EEG sleep	6.0%
ild obstructive sleep ıpnoea/snoring	2.5%
somnia with ınxiety/depression	2.0%
›stless legs syndrome	2.0%
rug/alcohol depen- ıent sleep disorder	2.5%
›tal	30.0%

›ses are shown in Table 2. Thirty per cent : patients also had a secondary sleep isorder (Table 3). In some cases it was a ıatter of clinical judgement which was the rimary diagnosis and which the secon- ary, e.g. PLMD associated with alpha- EG sleep, restless legs syndrome, or mild bstructive sleep apnoea and snoring.

leep apnoea and snoring

learly two-thirds of all patients had as their rimary diagnosis some degree of sleep pnoea and snoring. For the purposes of ıis investigation, patients with mild sleep pnoea were those with 5 to 15 apnoeas er hour of sleep, each involving temporary rterial oxygen desaturation of more than %. In moderate to severe cases, apnoeas ccurred 16 to 60 or more times per hour f sleep. Patients whose diagnosis was imple snoring had less than 5 apnoeas per our, which was considered not to be of linical significance. Nevertheless, these atients who simply snored had all been ›ported to "stop breathing" sometimes uring sleep at home, so that obstructive leep apnoea could reasonably be uspected. Patients with clinically signifi- ant sleep apnoea mostly suffered from aytime sleepiness which increased with ıe severity of the disorder. A few also omplained of insomnia. Central alveolar ıypoventilation syndrome was much less ommon than sleep apnoea.

Simple snoring was treated by conser- ative measures (weight loss, reduced ılcohol intake, nasal decongestion, and not leeping supine) and by surgery on the ıose and/or soft palate.[14] This involved 'arious combinations of operations such as ıvulopalatopharyngoplasty, tonsillectomy, ıasal septoplasty, and turbinate lateralisa- ion, as determined for each patient by the ›ar, nose and throat surgeon. Patients with ıoderate or severe obstructive sleep ıpnoea syndrome were mostly treated by nasal CPAP. Of the 56 patients in these categories, 44 had nasal CPAP, 7 had surgery as above, and 5 had only conser- vative treatment.

Periodic limb movement disorder

This disorder, previously called nocturnal myoclonus, was the second most commonly diagnosed. It occurred in 5% of patients as a primary diagnosis and in another 15% as a secondary diagnosis, mostly in association with obstructive sleep apnoea (18 patients) or restless legs syndrome (8 patients). A diagnosis of PLMD was not made unless there were at least 90 leg movements during the night's sleep. Each movement lasts for 0.5 to 4 seconds occurring at intervals of 5 to 120 seconds, mostly 20 to 40 seconds.[7] Some are associated with a brief arousal which fragments sleep. Patients complain of insomnia or daytime fatigue and sleepi- ness. PLMD cannot be diagnosed without polysomnography.

Restless legs syndrome

This was the primary diagnosis in 5% of patients and a secondary diagnosis in another 2%, in association with narco- lepsy, drug abuse or rhythmic movement disorder (see below). The diagnosis of rest- less legs syndrome is based mainly on the history of "funny feelings", a dysaesthesia unlike other sensations, usually in the lower limbs, coming on in a relaxed state and associated with a compulsion to move the legs.[7] Movement relieves the feeling temporarily but prevents sleep onset until the symptom abates. In many cases sleep is then fragmented by periodic limb move- ments which begin after sleep onset. Tricyclic antidepressants in the usual doses exacerbate these disorders. The treatment of first choice for both restless legs syndrome and PLMD is clonazepam taken before bedtime, but levodopa is also effective.

Alpha-EEG sleep

This is a little-known disorder diagnosed on the basis of changes in the sleep EEG. Its cause is unknown, but it is evidently not simply due to anxiety or depression. In patients with alpha-EEG sleep, waves of 6–12 Hz continue and often increase in amplitude after sleep onset, rather than decrease as is normal. These waves coexist with the higher amplitude and lower frequency delta waves of non-REM sleep. This disorder is associated with daytime fatigue and sleepiness. If the patient happens to snore, his or her symptoms can be wrongly attributed to sleep apnoea. The daytime fatigue does not improve with nasal CPAP treatment. Alpha-EEG sleep is not easy to treat, although low-dose imipramine (10–50 mg at night) helps some patients. Moldofsky et al. claim that alpha- EEG sleep is a frequent accompaniment of fibrositis and rheumatoid arthritis.[15] This was not the experience of the majority of patients with alpha-EEG sleep at Epworth Hospital.

Narcolepsy and idiopathic hypersomnia

Together these disorders made up 5.5% of primary diagnoses in the present series, although they are probably more common in the community than this figure suggests. Overnight polysomnography and a multiple sleep latency test are essential in making these diagnoses. Narcolepsy is an inherited disorder, typically with daytime sleep attacks, cataplexy, sleep paralysis and hypnagogic hallucinations.[16] Some patients also have obstructive sleep apnoea or PLMD causing additional daytime sleepiness which does not respond to amphetamines — unlike the sleepiness of narcolepsy which does. Cataplexy is caused by abnormal REM sleep intrusions into wakefulness and requires different medication, such as imipramine or clomipramine, to control it. The presence of obstructive sleep apnoea or PLMD may justify the addition of a third kind of treatment to control the narcoleptic patient's symptoms.

Idiopathic hypersomnia presents some- what like narcolepsy, with sleep attacks but without cataplexy and the associated REM sleep intrusions into wakefulness.[17] Subjec- tively, these patients are often more sleepy at night and when they wake in the morning than are narcoleptic patients, whose sleep is often fitful. The daytime sleepiness of idiopathic hypersomnia can be very dis- abling and does not usually respond to amphetamines but, in my experience, it does sometimes respond to methysergide.

Chronic anxiety and depression

These disorders are commonly associated with insomnia, but polysomnography was carried out in these cases only because other diagnoses were suspected.

Delayed sleep phase syndrome

This is a circadian rhythm sleep disorder which must be distinguished from insomnia.[18] These patients can sleep, but not until much later than they desire, for example, 4.00 a.m. to 11.00 a.m. The circadian rhythm of alertness/sleepiness is delayed in its phase, as reflected in the delayed secretion of melatonin from the pineal gland and by the delayed phase in the circadian rhythm of core temperature. Hypnotic drugs do not control this severely disruptive disorder, even in high doses. Bright light therapy offers some hope in treating delayed sleep phase syndrome, but it is still experimental. The patient is exposed to artificial bright light for one or two hours early in the morning.[19]

Other disorders

Of the remaining primary diagnoses in Table 2, rhythmic movement disorder, or sleep-related head-rolling, needs some explanation. This is a neurological disorder involving spontaneous rolling or rocking movements of the head and sometimes of the trunk and legs when the subject is drowsy, or after sleep onset.[20] It needs to be distinguished from sleep-related epilepsy; hence the need for polysomnography with video monitoring. It is considered to be a rare disorder in adults, but is relatively common in infants and young children.

Sleep terrors occur on partial arousal from delta-wave sleep (sleep stages 3 and 4) and are seldom remembered next day, unlike nightmares which occur mainly in REM sleep and are remembered.

There are two main groups of patients who are not represented in the present series because they are currently investigated elsewhere in Melbourne, not at Epworth Hospital. The first is of men undergoing nocturnal penile tumescence studies for impotence. The second is of children with sleep apnoea who may require tonsilloadenoidectomy or, in some cases, nasal CPAP treatment.

Discussion

Among the many sleep disorders outlined here, none is new, but several are being newly diagnosed by polysomnography. Most can be treated once an accurate diagnosis has been made. The majority of patients requiring polysomnography complain not of insomnia but of excessive daytime sleepiness. It may come as a surprise that there are so many sleepy patients in the community — about 2% of the adult population.[21] There is a general lack of awareness in Australia of sleep disorders as common causes of morbidity and mortality. Sleep apnoea has been associated with hypertension and cerebrovascular accidents.[22] The noise of snoring is still widely considered to be of trivial consequence by all except those whose domestic lives are made miserable by it or whose marriages have ended because of it. Excessive daytime sleepiness, of whatever cause, is associated with impaired intellectual, social and occupational performance and may be an important factor contributing to traffic and industrial accidents.[23]

The commonest sleep disorder in this series of 200 consecutive patients undergoing polysomnography at Epworth Hospital was obstructive sleep apnoea associated with snoring and excessive daytime sleepiness. This is similar to the experience in most sleep disorder centres in the United States. The choice of treatments for these patients depends on several factors, including the severity of their apnoea and sleepiness, their use or abuse of alcohol and drugs (making the symptoms worse), their obesity, the structural features and the collapsibility of their upper airway during sleep, and the presence or absence of other sleep disorders.[12,14] Lifestyle changes directed at reducing body weight and limiting alcohol consumption are important in most cases and are the main treatment in some. When snoring is a major social problem, without clinically significant sleep apnoea, surgery often helps by improving the nasal and pharyngeal airway.[13] This has a 70%–80% chance of controlling snoring but is much less effective for sleep apnoea.[14]

With severe obstructive sleep apnoea syndrome (defined here as more than 30 apnoeas and hypopnoeas per hour of sleep), a trial of nasal CPAP is almost mandatory.[12] Most patients feel so much better within a day or two that they need little convincing to continue the treatment at home. However, some require surgery on their nose and perhaps their soft palate to use nasal CPAP satisfactorily.[12]

By contrast, the choice of treatment is less clear cut for milder forms of obstructive sleep apnoea, in which daytime sleepiness and related symptoms are much less evident. Clinical judgements about how to treat each patient can be made only after overnight polysomnography and in some cases a multiple sleep latency test, an ear, nose and throat assessment and treatment of coexisting disorders. Both the patient's and the bed-partner's history are important, but can be quite misleading. The results from the present series show that about 30% of patients have more than one sleep disorder. This particularly involves PLMD which is a relatively common disorder, rarely diagnosed without polysomnography.

At least some facilities for polysomnography are available in most capital cities in Australia. Some sleep laboratories offer "limited" sleep studies for the diagnosis of sleep apnoea. An oximeter simply records the arterial oxygen saturation overnight, or sometimes only during a daytime nap, without the patient's sleep stages and other variables being monitored. Such studies do not provide adequate information about sleep apnoea in relation to sleep stages or sleeping posture, which are important because sleep apnoea is usually worst in REM sleep and when lying supine. Nor do "limited" studies address the problem of secondary sleep disorders which coexist with sleep apnoea and may require separate treatment. A clear role for such studies is yet to be defined.

The Australasian Sleep Association provides a forum for everyone interested in sleep and its disorders, no matter from which discipline their interest arises. Sleep disorders medicine will play an increasing role in the health care of Australians. More sleep laboratories, equipped to diagnose and treat the whole range of sleep disorders, are needed in public hospitals to provide a much needed service and to teach medical students and graduates about sleep disorders.

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