

ACHIEVING COMPLIANCE

Setting the patient up for success: An interview with **Dianne Richards**



Dianne Richards has degrees in Nursing and Psychology. She began studying Psychology in 2000 while Manager of the Sleep Investigation Laboratory at Royal North Shore Hospital, Sydney, Australia. She worked with Sleep Psychologist Delwyn Bartlett and her Psychology team at the Woolcock Institute for Medical Research for two years with their Insomnia program. She

now has a private practice in Sydney as a Consultant Psychologist—Sleep Disorders.

Please tell us about yourself and your background in sleep.

I began my career as a nurse. In 1988, I saw an advertisement in a newspaper for Sleep Technologists to staff the Camperdown Sleep Disorders Unit, which was just opening. At that time the only sleep labs in Sydney were at Royal Prince Alfred Hospital (RPAH) and the Hornsby private sleep lab. I was interviewed by the late Helen Bearpark who was a great mentor to sleep technologists in the early days and she made it sound like the most interesting job in the world. A sleep technologist named Barbara Rose was brought over from the United States to train us as there was no one qualified in Australia. We learned our craft on the old pens to paper Grass machines. Barb Rose brought her father with her and we practised set-ups on him. I initially worked nights and evenings until the Annandale private lab was opened and I eventually became Assistant Manager, Education Officer and CPAP Therapist. That was the start of my passion for facilitating CPAP acceptance and adherence.

I was the manager of the Sleep Investigation Laboratory at Royal North Shore Hospital when I began studying Psychology. In the Honours year of my degree, I approached my friend, Sleep Psychologist Dr Delwyn Bartlett, to help me with a research project that would use a Cognitive Behavioral Therapy approach to improve CPAP acceptance. Our research, which was supported by the Woolcock Institute of Medical Research produced some positive results, and was eventually published in the journal *Sleep*.¹

Earlier this year I began a private practice as a Psychologist specialising in sleep disorders and I maintain my activities with the Woolcock Institute.

What types of patients do you see in your practice?

I see patients who are having difficulty getting their heads around accepting CPAP as a medically prescribed treatment

NEWS UPDATE

The International Diabetes Federation (IDF) has issued an urgent call to action with the release of recent research confirming that type 2 diabetes and obstructive sleep apnea (OSA) are closely related. They recommend that all type 2 diabetic patients be screened for OSA, indicating their serious concern for the longer term health risks associated with this correlation between the two chronic disease states. For more information visit www.idf.org. The website www.healthysleepanddiabetes.com may also be of interest to patients wanting more information on either disease state.

FOR MORE INFORMATION SEE PAGE 15

for sleep apnea. These may be individuals who have initially rejected CPAP and have never started treatment or those who have briefly tried CPAP but failed to continue.

I also see individuals with insomnia who have difficulty getting to sleep and/or staying asleep. Chronic insomnias can also be associated with circadian rhythm disorders such as delayed sleep phase syndrome. This is a persistent inability to fall asleep and arise at conventional clock times and often occurs in adolescents who sleep during the daytime and stay up all night. Other individuals, particularly the elderly, sometimes advance their sleep phase by going to sleep too early in the evening and therefore waking in the very early hours of the morning. Shift work is another cause of difficulty with sleep adjustment. These insomnias may be an acute problem resulting from stress or anxiety, or may be a more chronic problem present over many years. However, depression, worry and anxiety contribute to or are caused by insomnia due to sleep fragmentation and deprivation.

SETTING THE PATIENT UP FOR SUCCESS: AN INTERVIEW WITH DIANNE RICHARDS CONTINUED >

How do you define compliance?

Acceptance and adherence are much better words than compliance. They reflect a collaborative approach to patient care rather than an authoritarian approach. The patient is very much a part of the team and treatment uptake is shared.

Published articles are inconsistent regarding a definition for adherence and the range varies from 3.2 hours to 4.9 hours. However, four hours of CPAP use seems to be the most favored. A study by Campos-Rodriguez et al² indicated that regular, consistent CPAP use reduces mortality. Individuals who used CPAP for more than six hours per night, or even from one to six hours each night, had significantly higher survival rates after five years than those who only used CPAP for less than one hour per night.

Do you consider how the patient feels in determining adherence and does this play a part in their management?

Of course, the patient's subjective view of their CPAP use is important. If the individual is using CPAP, is happy to do so and is feeling well and awake during the daytime, then that has to be considered a positive outcome.

“Self efficacy reflects your belief in your own ability to accomplish some future behavior.”

How do you measure adherence?

Firstly, I ask the patient about a typical night's CPAP use. Over the years, I have developed a line of questioning that I always use to uncover the information I need. I do this in a conversational manner rather than using a formal questionnaire.

What are the key pieces of information you are looking for in this line of questioning?

By teasing out the patient's nightly routine from the time he/she gets into bed to getting up the next morning, I can find out if the treatment is effective. If it isn't, I can narrow down the cause. The narrative will tell me if ineffective treatment has something to do with the interface or if the settings, like pressure or humidification, need adjusting. It may be that

the patient is mouth-breathing or there may be mask issues. There may be physiological or environmental reasons for the patient not continuing with treatment all night or failing to be satisfied. The narrative is important because if there is a problem, usually the patient cannot isolate problems or causes. All they know is that the treatment is not yielding the promised results.

Do you use any data downloads to assist in determining adherence?

I do use the data download facility. It enhances the information I have uncovered from the patient, and it can often be encouraging for the patient to see the hard copy of graphs and data.

What graphs/data do you find patients respond to most?

Time in bed with the mask on the face is always of interest to the patient. I find evidence of leak to be most beneficial. It draws the patient's attention back to the importance of checking the mask and equipment before going off to bed. Sometimes it's as simple as failure to put the mask on properly that is a causal factor of poor results.

From your experience, is one patient group more at risk of being non-adherent?

Probably women are more at risk of not continuing to use CPAP. Also those individuals whose disease is severe enough to be treated but who have minimal daytime deficits.

From your experience, what are the main contributors to non-adherence?

There are many contributors to non-adherence. Mask discomfort, machine noise, monetary cost, problems with nasal side-effects, difficulty using the technology, portability issues etc. However, negative self image, social stigma, lack of social support from important 'others', high personal cost/low benefit, poor self efficacy are all important contributors.

What methods have you found successful in managing non-adherent patients?

One of many reasons for individuals rejecting CPAP is poor self efficacy. Self efficacy reflects your belief in your own ability to accomplish some future behavior. This belief can be changed, most commonly through Cognitive Behavioral Therapy (CBT). This is a psycho-educational intervention that has the most evidence of effectiveness. CBT enlists clients' strengths and weaknesses, desire to change, conscientiousness and social support system to change covert behavior (what we think) and overt behavior (what we do).



In our research, we gave the patient a series of two CBT sessions at weekly intervals prior to the CPAP titration night in the sleep lab and before they had any experience of CPAP. What we wanted to do was to set them up for success. An important part of the intervention was the inclusion of a bed partner/family member in the process. This important 'other' in the patient's life was considered part of the sleep team and played a role in helping with ongoing encouragement, equipment assistance and monitoring subjective outcomes.

Once the patient begins using CPAP, practical help is vital. When I was a CPAP therapist, I found that contacting the patient by phone a few weeks after starting CPAP was a good practice to resolve ongoing issues and offer encouragement. The patient needs close attention during the first month of treatment with at least one visit to the CPAP clinic. After that time it is important for ongoing adherence for the patient to continue to feel the benefit of the treatment. As you know, sometimes things change over time. Weight gain or loss may occur. Perhaps the mask may deteriorate and begin to leak causing loss of pressure. Sometimes a mouth leak may develop, again causing loss of pressure. If these things result in the patient feeling less daytime benefit, they may stop using their treatment. It needs to be clear to the patient that 'someone' is on the other end of the phone to call should there be any problems with equipment or lingering symptoms.

Intervention by a psychologist can be helpful not only before CPAP treatment begins but also if the individual finds that there are psychological issues making it difficult to continue to use CPAP.

What is the main focus of the CBT sessions that occur prior to CPAP initiation?

CBT is about correcting faulty beliefs that affect the way we think and behave. The client is given a psycho-educational program that provides a lot of information about sleep and about CPAP. Initially the equipment is not discussed at all, the focus is on sleeping safely. I used a home-made video which provided modelling of the desired behavior. It showed two obviously real patients (not actors) talking about successfully using CPAP. I also gave the patients a resource booklet and made it clear that help was available and would be provided by an individual who was introduced to the group, once they started using CPAP. Partners were recruited as part of the team and were invited to come along. The actual equipment was not introduced until the end of the program, when the patient could look at it but not yet experience the mask or feel the machine pressure. This was done deliberately to maintain feelings of self efficacy. A trial of the mask and machine was left to the sleep lab staff.

How do you determine which patients require CBT?

The referring physician nominates the patients.

Do you think CBT would be suitable for most sleep apneic patients?

I think CBT would be suitable for all patients with sleep apnea who have had CPAP recommended as a treatment.

Our study created a group situation but it was not one where group members were expected to share experiences. Participants were not expected to say anything at all but were encouraged to ask questions. Most people who are too shy to ask often appreciate listening to the questions and answers initiated by others. People often feel isolated if they have a medical condition and it is comforting to know you are not alone.

Patients with severe OSA were advantaged because they could bring their partner along. That person was there to provide social support and could remember what the person with a memory deficit may not. It's the old saying, 'two heads are better than one'.

1. Richards D, Bartlett DJ, Wong K, Malouff J, Grunstein RR. Increased adherence to CPAP with a group cognitive behavioral treatment intervention: a randomized trial. *Sleep* 2007;30(5):635-40.

2. Campos-Rodriguez F, Pena-Grinan N, Reyes-Nunez N et al. Mortality in obstructive sleep apnea-hypopnea treated with positive airway pressure. *Chest* 2005; 128:624-33.

Symptoms of OSA

- Excessive daytime sleepiness
- Snoring
- Witnessed apneas
- Mood swings
- Poor cognitive function
- Memory loss
- Feeling unrefreshed on waking

Consequences of OSA

- Hypertension
- Cardiovascular disease
- Cerebrovascular disease
- Sexual dysfunction
- Depression
- Motor vehicle accidents
- Poor work performance

From **the editor**



Current research¹ shows that there is an independent association between moderate-severe sleep apnea and all-cause mortality, reinforcing the importance of diagnosing and treating sleep apnea. As CPAP is the primary treatment for obstructive sleep apnea, this finding also highlights the critical need for patients using CPAP to achieve compliance.

In this edition of ResMedica we have taken a global approach to review patient compliance to PAP. We look at how it is defined, how non-compliance is best managed and how it affects different patient groups.

Our interview with Australian Sleep Psychologist, Dianne Richards, shows how the use of Cognitive Behavioral Therapy improves compliance in OSA patients using CPAP.

Neurologist and Sleep Physician, Dr P Terrence Moore, discusses the compliance program he runs at his sleep laboratory in Dallas, USA.

We interview French Physiologist Physician, Dr Carole Philippe, regarding compliance in OSA patients as well as patients with CHF. Dr Philippe also gives us an insight into the services available for CPAP patients in France.

UK Respiratory Physician, Dr Anita Simonds, tells us about compliance issues for patients using NIV therapy.

We also hear the user's perspective in our interview with Heloise and Laurie Cree from Australia. They talk about their experiences of using CPAP and the importance of supporting each other in this endeavor.

We have a snapshot of published research pertaining to compliance for those who would like to read further, as well as a listing of conferences relating to sleep.

In a follow-up to an earlier edition of ResMedica, on page 1 we note the IDF consensus statement on sleep apnea and type 2 diabetes, with website links to more information about the important relationship between these two conditions.

On behalf of the ResMedica Global Editorial Committee, I would like to sincerely thank everyone who contributed to this issue of ResMedica for so willingly giving their valuable time and sharing their expertise with us.

Sleep well.

Alison Hansford, Global Editor

"In this edition of ResMedica we have taken a global approach to review patient compliance to PAP. We look at how it is defined, how non-compliance is best managed and how it affects different patient groups."

1. Marshall et al. Sleep apnea is an independent risk factor for all cause mortality: The Busselton health study. *Sleep* 2008;Vol 31, Abstract Supplement.

Achieving compliance through education: An interview with Dr P Terrence Moore



Dr Moore received his MD from the Tulane University medical school in 1984. He did his residency in neurology at the University of Southern California from 1984 until 1988, and received his board certification in Neurology in 1991 and in Sleep Medicine in 1995. He has published in the journal Sleep¹

on the occurrence of periodic limb movements of sleep in patients with spinal cord disorders.

Please tell us about your practice '4 Better Sleep'.

My practice currently consists of both adult neurology and sleep medicine probably in a ratio of 35%:65%. I see hundreds of patients with obstructive sleep apnea each year and many others with other types of sleep disorders including parasomnias and sleep-related epilepsy. I also see many patients with complaints of insomnia of various types, most of whom require no specific testing.

Last year my lab performed over 700 polysomnograms. My Sleep Center focuses on high-quality effective care. I believe that we are unsurpassed in the Dallas area in turnaround time with respect to getting results to referring physicians and patients, as well as follow-up care. All patients either see me prior to testing and/or in their follow-up very shortly thereafter to discuss the results of the polysomnogram and actually review portions of the study. During this time I point out what happens with breathing and the disruption of sleep architecture as a result of obstructive sleep apnea (OSA). Further, we have very efficient staff who are able to provide whatever ongoing care patients with OSA may need, whether it be durable medical equipment or clinical expertise.

Most of the patients I see with OSA have comorbid conditions such as hypertension, but the vast majority are otherwise functionally healthy. Some patients with conditions such as severe CHF require specialized positive airway pressure therapy such as servo-ventilation, something we are also able to provide. I also work with patients who have neuromuscular weakness, meaning weakness of the muscles of respiration, including patients with amyotrophic lateral sclerosis (ALS).

How do you define compliance?

Compliance is currently defined as using positive airway pressure for an average of at least four hours nightly or during the sleep period. This can now be monitored fairly accurately with compliance data capability in most currently available units. Information from the CPAP unit can be downloaded

via flash cards and then uploaded to a computer, and a report can be generated from the data. It typically contains a raster of information including dates and time of day in a configuration that is easy to view and gives the physician a quick idea of how well the patient has been able to follow through with treatment. It also gives insights into the patient's bed schedule, which may help us understand complaints of persistent daytime fatigue. The data reports are made part of the patient's chart.

Patients at our clinic receive quarterly phone follow-ups from technicians who ask about problems with the device or difficulty with nasal congestion, pain and so on. They also ask if the patient is using the device nightly. This information is recorded in a standard manner in the patient's chart.

Do you show the downloaded data to patients, and if so, what data do they respond to most in relation to subsequent improvements in compliance?

I typically review this data with the patient individually much as I review their sleep study results. I will show them the graphical data that is displayed in a raster format indicating the dates and times of usage represented by the time the machine is on versus the time it is off. This data also provides important insights into the patient's bed habits, which have a great effect on sleep quality and thereby compliance. It is not infrequent for a patient to be surprised to see their pattern of usage as it may not correlate well with their recollection. Other patients seem to be very adept at estimating overall usage.

In my opinion, this data is useful to provide the patient with some objective analysis of the therapy. Hopefully this will either provide positive feedback, encouraging them to continue to be compliant, or demonstrate ways in which they can improve compliance and thereby benefit from the treatment. I always discuss the data in the context of the potential long-term consequences of untreated sleep apnea such as hypertension and cardiovascular disease. I stress the importance of viewing this treatment as a long-term situation much as one would approach the treatment of diabetes. In this case it is the consistency of the approach in developing good habits that will result in long-term dividends.

How else do you measure compliance?

In addition to objective compliance data I also assess the patient clinically. I look at their overall sense of well-being, the presence or absence of snoring while on therapy and rating scales such as the Epworth Sleepiness Scale, particularly if these were greater than 10 prior to therapy.

ACHIEVING COMPLIANCE THROUGH EDUCATION: AN INTERVIEW WITH DR P TERRENCE MOORE CONTINUED >

Information from the spouse or bed partner is also very important in this regard, especially if problems arise. I encourage patients to bring the spouse/bed partner to follow-up visits. Face-to-face interaction with the patient, in my opinion, is the cornerstone of clinical medicine.

During office visits I have a chance to explain a great many things regarding the patient's condition, how comorbidities may affect their therapy and what they can expect from the therapy itself. I can also help to anticipate problems they may have and troubleshoot them before they begin.

In my experience, the patient who has a better understanding of their diagnosis is better able to comply with therapy and is more likely to ask questions when problems arise rather than abandoning treatment. I have also found email to be a valuable adjunct to this form of communication.

Overall, what compliance rates have you achieved with your patients?

From a sample of 143 patients, our compliance rate is 68%. We obtain this number by putting pencil to paper and calculating the number of patients who are compliant based on a benchmark of four hours nightly use. We calculate this number by totalling the entire number of days the patient has had the device and dividing that into the cumulative hours of usage.

From your experience, what are the main contributors to non-compliance in OSA patients?

I'm not sure if there is a single main factor for non-compliance. There are a number of categories, including misapprehension on the part of the patient, which may be driven by disinformation from others or from the mainstream media; a psychological distaste for the therapy itself; or various aspects of discomfort including dryness and nasal congestion. In general, I think the patients who are most severely afflicted actually tend to respond best to therapy. Again, thorough education regarding the disorder and its potential effects on the patient's health and functioning are an important aspect of long-term compliance.

I also believe that thorough education regarding the CPAP device itself and the interface and accessories leads to improved functioning of the device, increased comfort and generally improved compliance. When our patients are set up with the CPAP unit they have a separate appointment with a qualified technician who covers all aspects of the device and accessories including compliance data capability. This information is also included in the patient's chart.

From your experience, is one patient group more at risk of being non-compliant?

I am not sure that there is a specific demographic which is at higher risk for non-compliance. I think in general younger patients, especially single ones, are less enthusiastic about CPAP therapy because of the perception that it probably has among members of their cohort. Another group may be people who perceive that they have no problem to begin with. A significant number of patients with sleep apnea, even severe sleep apnea, may have no symptoms of daytime sleepiness and therefore feel that no treatment is necessary. These patients are probably more frequently men, especially older men. I am not aware of any data that would confirm these impressions.

What methods have you found successful in managing non-compliant OSA patients?

Clinical follow-up is important for compliance. Some patients require more time than others to become inured to the therapy itself. I use what I have referred to as habituation therapy to assist these patients in desensitizing themselves to the treatment. Specifically, I encourage them to spend time with the mask/nasal pillows and the device itself while they are awake and more in control compared to when they

“I stress the importance of viewing this treatment as a long-term situation much as one would approach the treatment of diabetes.”

are sleeping. They are to adjust the interface optimally based on how it feels, looks and any leaking that may occur when they attach it to the CPAP unit. I also encourage them to lie in bed with it and to turn from side to side to see how leaks may develop. This may improve their ability to adjust it quickly and to adjust the interface more optimally. Also, judicious use of hypnotic agents may help patients comply with therapy as it reduces the perceived intrusiveness of positive airway pressure therapy.

Addressing issues such as nasal congestion, from whatever cause, may also be important. Some patients with fixed restriction of airflow through the nose might benefit from appropriate surgery allowing them to use CPAP more effectively.

Approximately, what percentage of your patients require hypnotics?

Unfortunately, I have not reviewed this in detail and cannot provide specific percentages. I would say it is a small percentage of patients who require hypnotics that is related to CPAP itself, probably fewer than 10%. In my experience most patients who are on hypnotics and CPAP are probably on the hypnotics for reasons related to one form of insomnia or another.

Approximately what percentage of your patients have fixed nasal airflow restriction which requires surgical intervention?

This also is a small number although I have not researched it quantitatively. I think the published data indicates that nasal surgery may render CPAP more effective in cases where it renders it more tolerable for the patient. There is no data that indicates nasal surgery in and of itself has a great likelihood of curing obstructive apnea. That being said, it is probably in the range of 10–20% although this is a rough guess.

Clinically when I see a patient who has a history of chronic nasal obstruction or a complaint of frequent difficulty breathing through the nose or if there is physical evidence of chronic nasal obstruction I generally recommend a referral to an ENT surgeon for an opinion.

How long have you found it takes for non-compliant OSA patients to become compliant?

I do not think that there is a standard answer for this question. Each patient is unique and has different factors that may affect compliance. Further, compliance from a given patient is not always uniform and may change with time. These are things that must be anticipated and sought out primarily through clinical follow-up whether it be in the office setting or electronically. As such, I make every effort to see all of my patients at least annually to discuss their diagnosis and treatment and to address any problems or questions that they may have.

1. Dickel MJ, Renfrow SD, Moore PT, Berry RB. Rapid eye movement sleep periodic leg movements in patients with spinal cord injury. *Sleep* 1994;17(8):733-8.

Epworth Sleepiness Scale

The Epworth sleepiness scale is a questionnaire intended to measure daytime sleepiness. It was introduced in 1991 by Dr Murray Johns of Epworth Hospital in Melbourne, Australia.¹

The questionnaire is very simple. Using a scale from 0-3, the questioner chooses the number that corresponds to their likelihood of dozing or sleeping in each of nine situations, ranging from 'Sitting and reading' to 'In a car, while stopped for a few minutes in traffic'.

Once they have rated all of the situations, their total score is analyzed. The scale can be found at http://www.resmed.com/en-au/patients/about_sleep_and_breathing/do-i-have-osa.html?menu=patients

Situation	Chance of Dozing or Sleeping
Sitting and reading	_____
Watching TV	_____
Sitting inactive in a public place (eg, a theater or a meeting)	_____
As a passenger in a car for an hour without a break	_____
Lying down to rest in the afternoon when circumstances permit	_____
Sitting and talking to someone	_____
Sitting quietly after a lunch without alcohol	_____
In a car, while stopped for a few minutes in traffic	_____
Total score (add the scores up)	_____
This is your Epworth score	_____

1. Johns MW. A new method for measuring daytime sleepiness: the Epworth sleepiness scale. *Sleep* 1991;14(6): 540–5.

An interview with Heloise and Laurie Cree



Recently published research shows that people with sleep-disordered breathing are more likely to stay on their treatment if they have a supportive partner.¹ It's no wonder, then, that Heloise and Laurie Cree have been able to use their therapy for over 15 years – they both use flow generators, and they have both put a

lot of effort into getting the most out

of their treatment.

Heloise's extreme fatigue had been a problem for many years before she was diagnosed. She describes it very vividly. "On weekends I might get up and have some breakfast, do some washing and go back to bed. I'd just fall asleep. The kids would come in and say, are we having any lunch? I'd get up and make the lunch, then go back to sleep. They'd come in again – are we having dinner? And this just went on and on."

It was Heloise and Laurie's son who first suggested the cause. He was doing an assignment on sleep apnea for his social work degree, and working late into the night at the computer in the corner of the bedroom. He heard her snoring and gasping for breath, and told her about it in the morning.

She told her ENT specialist who sent her to a sleep clinic – they sent her home with a CPAP machine and she's never spent a night without it since. That was in 1990.

"The difference was astonishing," Heloise recalls. "I did the sleep study on a weeknight – the weekend came and I went out into the garden and said, look at all the weeds! I had more energy overnight."

Another bonus was that the horrific nightmares that she had had since childhood disappeared.

Laurie has a background in science and physiology, was a lecturer in science education at the University of Technology Sydney and is the co-author of a standard textbook on nursing. He was naturally interested in Heloise's new therapy and read everything he could. Soon he was travelling all over the region, giving talks on OSA and explaining the available treatment. He started attending Colin Sullivan's lunchtime meetings at Royal Prince Alfred Hospital (Sydney) and Australasian Sleep Association conferences.

In 1993 Laurie had a short stay in hospital in a four-bed ward. He was talking to his room-mate about how loudly the 82-year-old man in one of the other beds snored when the man replied, "He snores loudly, but you're number one!"

"We're not aware of our own snoring," Laurie comments, and Heloise adds, "Why didn't I know he snored? Because I was snoring so much myself."

Laurie had been tired, but not as tired as Heloise. "It sneaks up on you," he says. "It's gradual – you don't realise you should have more energy. I felt so much better after starting on the CPAP machine – so much more energy. I was very busy, studying at night and so on, so it wasn't difficult to find reasons for my tiredness – but they weren't the right reasons."

Laurie and Heloise have travelled extensively, with both CPAP machines, spending three months on a world tour in 2000, as well as going camping and taking a number of long-distance train journeys throughout Australia. Their expertise on the availability of powerpoints and the energy requirements of their CPAPs is unsurpassed!

Laurie continues to benefit from CPAP and has used the same machine for many years. Heloise's set of health issues is quite complex, so she has tried a number of different machines over the years. She is now very happy using an AutoSet™ Spirit, with an integrated humidifier. She doesn't use the automatic start but starts it herself with the pressure set to 13 H₂O – a gradual build up of pressure is not adequate for her needs.

Heloise acknowledges that it was hard to get used to the therapy, but found it helpful when starting out to take deep, slow breaths. As well as her humidifier, she uses nose oil to stop her nose from drying out. She is an extremely motivated user, and says, "I never think I won't put it on – I wouldn't get any sleep. I can't imagine not using it. My father had two strokes that killed him, and I don't want the same thing to happen to me."

Laurie is also very comfortable with his therapy. "For me, it's just natural to put on the mask when I go to bed," he says. He suggests that people who are new to the therapy get used to having the mask on their face while watching television – once they're happy with that, attach the machine and turn it on.

They both suggest that people become involved in their treatment and educate themselves about it. They also say that it is essential that patients maintain contact with their doctor or specialist to make sure that everything works properly and is changed with their changing needs.

As people who've got 33 years of flow generator experience between them, they're well worth listening to.

1. Cartwright, R. Sleeping together: A pilot study of the effects of shared sleeping on adherence to CPAP treatment in obstructive sleep apnea. *Journal of Clinical Sleep Medicine* 2008;4(2):123–127.

Comprehensive support for compliance: An interview with **Dr Carole Philippe**



Dr Carole Philippe has been the Physiologist Physician in Charge, since 1992, of the Service D'Explorations Fonctionnelles du Sommeil (Sleep Functional Explorations Service) at Hôpital Tenon, in Paris, where she works with patients with obstructive, mixed and central sleep apnea, complex sleep

apnea syndrome, obesity hypoventilation syndrome and respiratory failure. Since 2001 she has also worked with Professor Marie-Pia d'Ortho at Hôpital Henri Mondor, Créteil, seeing patients with heart failure and Cheyne-Stokes respiration (CSR). She has a number of publications pertaining to sleep^{1,2} and is a fellow of the Societe Francaise de Recherche et Medecine du Sommeil (French Sleep Research and Medicine Society — SFRMS).

How do you define compliance?

What underlies the term 'compliance' is a number. I prefer to talk about 'adherence'. For me, adherence can be expressed as the percentage of compliance/total sleep time, which is

closer to the everyday life of the patient. For example, the patient results (displayed on the right-hand side of Figure 1) show a patient who went on a cruising holiday with his airflow device, an AutoSet™ CS2. You can see the patient's jet-lag via the software, but the patient was still successfully treated. The AutoSet CS2 follows wherever he goes, even on the sea!

Does your definition of adherence change depending on the patient group you are treating?

My definition of adherence doesn't change between patient groups. My recommendation to patients is to use their airflow device 'all the time you sleep, every day'. Having said that, usage five days per week, and a minimum of five hours per day, is acceptable. But what I say to my patients will depend on evidence of sleep-disordered breathing (SDB), highlighted by the severity of the condition, as indicated by the apnea-hypopnea index (AHI) and the presence of any comorbidities.

How do you measure adherence?

By subjective and objective tools. I have a 'home-made' questionnaire, and I have the data management summary. I can get this from the provider but I ask the patients to bring their device, or at least the data card (for example, if they are elderly patients living far from the hospital). It's interesting to see the downloaded data as there can be some surprises! I systematically download the data and explain the results directly to the patients: the level of leaks, the pressure and the AHI.

What type of questions do you ask in your questionnaire and do you use the same questionnaire for all patient groups?

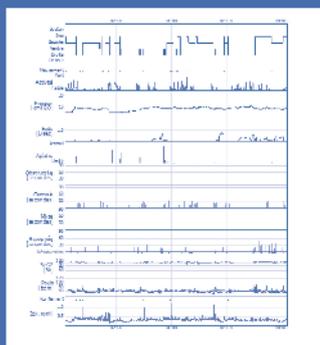
The questions I ask encompass the following:

- Time of going to bed, and getting up
- Compliance and sleep time, to calculate a percentage of compliance/total sleep time
- Description and enumeration of any side effects (using analogue scales)
- Partner's opinion
- Epworth Sleepiness Scale
- Medical treatment

Figure 1

Complex sleep apnea syndrome

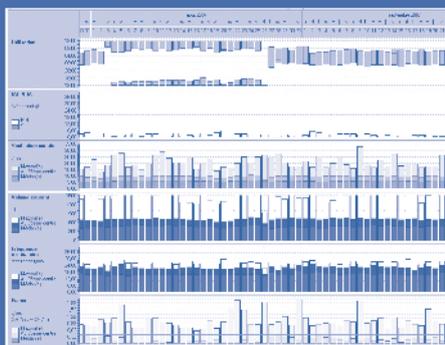
Control under CPAP=10 cmH₂O



AHI=15/h (vs 36/h)

{ AI central=8.2/h
HI=6.8/h

Response of the AutoSet CS2



Mean compliance = 6h40

{ AI=0
HI=1.8

COMPREHENSIVE SUPPORT FOR COMPLIANCE: AN INTERVIEW WITH DR CAROLE PHILIPPE CONTINUED >

Furthermore, for heart failure patients, we use the Minnesota Living with Heart Failure® (MLHF) questionnaire³, which is designed to measure the effects of heart failure and treatments on an individual's quality of life. The questionnaire looks at the effects on key physical, emotional, social and mental dimensions of quality of life.

Does the patient's subjective feeling play a part in the management of your CHF patients?

The fact that they are feeling well is very important, but not sufficient because of the cardiovascular risks linked to oxygen saturation abnormalities and sympathetic stimulation. We have to be vigilant to increase compliance and adherence in CHF patients.

With CHF patients, I explain the pathophysiology of CHF with simple words, emphasising the gravity of the disease and the difference between OSA and CSR. I look for improvement in the dyspnea and not the snore, of course.

From your experience, what are the main contributors to noncompliance?

The first problem is mask discomfort, and this accounts for approximately 60% of noncompliance. Coupled with this is mask leak.

Device noise is another contributor, but this is becoming less of a problem with the advent of quieter airflow devices such as S8™ II.

“It's clear that once compliant, patients generally stay compliant, but that does not mean that they do not need to consult you any more! ”

Self-image is another problem accounting for approximately 10% of patients, and generally you have to explain the importance of the treatment to the partner. In our consultations, we often have two people: the patient and the partner, to help overcome patient self-image problems.

The feeling of 'constraint' from the therapy experienced by patients accounts for the other 30%. In other words, the perception of benefit the patient experiences. If the patient was symptomatic prior to treatment, the treatment will be more successful. If the sleep apnea syndrome was just a discovery during an assessment for a coronary disease, for example, it's more difficult for the patient to be compliant. The balance of benefit versus constraint is important in determining continued CPAP use. In these cases you have to be convincing.

From your experience, is one patient group more at risk of being noncompliant?

As can be read in the literature⁴, patients with moderate sleep apnea syndrome, no or low subjective sleepiness, and aged <35-40 or >80-85 are most at risk of being noncompliant.

Also, it is sometimes very difficult to put a mask on when you have a neurological problem (eg, hemiplegia), and these patients require particular care in the home. In France, we have the 'auxiliaire de vie', a nurse who goes to the patient's home two or three times per day to help put the patient's mask on.

What methods/equipment have you found successful in managing noncompliant patients?

IN HOSPITAL

- Explanation with support: visual support with plans, anatomy descriptions, educational videos, patient testimonials
- Frequent consultations with the caring physician
- A specialized CPAP nurse in the hospital, to assist with patient education, mask-fitting, and CPAP acclimatization (setting minimal pressure levels and appropriate ventilation mode settings such as expiratory pressure relief (EPR)).

SUPPORT OF FELLOW MEDICAL PRACTITIONERS

It is very important that the other physicians who take care of the patient are informed and understand the benefits of treating sleep apnea. They must support you in managing the patient and give the same message to the patient regarding the importance of therapy. This includes all physicians involved with the patient: the sleep specialist, the general practitioner, the cardiologist and any other specialists.

AT HOME

In the home, it is important to have a good home-care provider who offers good patient follow-up. It is necessary to make sure of the efficiency of the treatment particularly in relation to mask leak, residual AHI and to detect any other conditions that may arise, including complex sleep apnea.

We have a city-hospital network known as the 'Réseau Hypnos' (with Professor Marie-Pia d'Ortho as 'Présidente'). The network organises meetings between nurses and patients who are having problems at home with their masks, pressure etc. The service is open to all members: fellow practitioners and their patients.

PATIENT EDUCATION AND SUPPORT GROUPS

In France we have an association called 'les passerelles éducatives' (run by Dr Racineux and Dr Chambouleyron) which has patient support associations as well as elaborate equipment for making therapeutic educational tools.

How long have you found it takes for noncompliant patients to become compliant?

It's clear that once compliant, patients generally stay compliant, but that does not mean that they do not need to consult you any more!

The data in Figure 2 highlights that the majority of patients who will discontinue treatment do so in the first few months. Figure 2 was generated from a large cohort of patients (n=931) and in this group discontinuation of therapy was also the result of things other than noncompliance to therapy, including weight loss, switching to a mandibular advancement device, moving home and death.

Medical follow-up is very important for all patients. One consultation per year with the physician and two by the provider are important. But, if a patient is hospitalized for a neurological or cardiac problem, you have to make sure that the mode of ventilation is always checked as the nature of the SDB may change and therefore the therapy may need to be adjusted. Figure 1 highlights this point well. Compliance can be improved by the use of the correct airflow device. For this patient, with complex sleep apnea, treatment and compliance were improved by switching from a CPAP device to the AutoSet CS2.

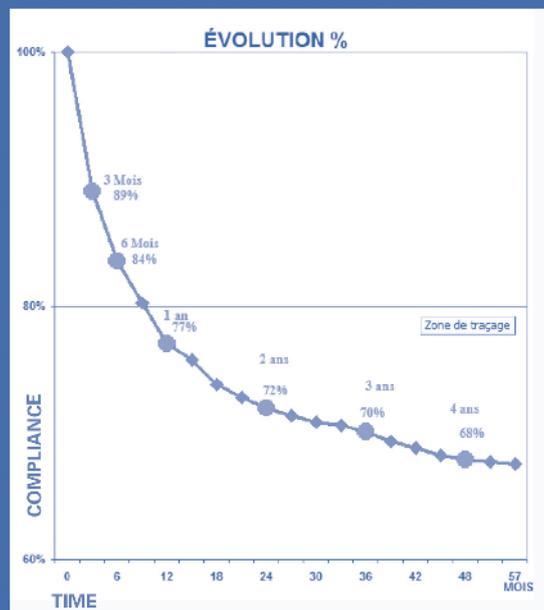
Meetings between patients can also be very helpful as patients then have

the opportunity to exchange ideas and experiences, which all help to improve compliance.

1. Philippe C, Stoica-Herman M, Drouot X, Raffestin B, Escourrou P, Hittinger L, Michel PL, Rouault S, d'Ortho MP. Compliance with and effectiveness of adaptive servoventilation versus continuous positive airway pressure in the treatment of Cheyne-Stokes respiration in heart failure over a six month period. *Heart* 2006;92(3):337-42.
2. Ugon A, Philippe C, Pietrasz S, Ganascia JG, Levy PP. OPTISAS a new method to analyse patients with Sleep Apnea Syndrome. *Stud Health Technol Inform.* 2008;136:547-52.
3. Rector TS, Kubo SH, Cohn JN: Patients' self-assessment of their congestive heart failure. Part 2: Content, reliability and validity of a new measure, the Minnesota Living with Heart Failure questionnaire. *Heart Failure* 1987; Oct/Nov: 192-196.
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Figure 2

Compliance rate versus time



- > Explain the treatment and its importance
- > Look for and treat the unwanted effects
- > Keep observing and treating long-time patients

Compliance for NIV users: An interview with Dr Anita Simonds



Dr Anita Simonds is a Respiratory Physician with a clinical and research interest in sleep-disordered breathing (SDB) and respiratory failure in adults and children. She has investigated the physiological basis of breathing difficulties during sleep and carried out trials of noninvasive ventilation (NIV) in a range of conditions. Dr Simonds was awarded the Margaret Pfrommer medal for clinical and research contribution to Long Term Mechanical Ventilation, by the American College of Chest Physicians. The Margaret Pfrommer memorial lecture was published in Chest in 2006. Dr Simonds works at the Clinical and Academic Department of Sleep and Breathing, Royal Brompton Hospital, London.

Please tell us about your current work and research.

We have about 1500 patients on our Home Ventilation Program. Our research has investigated long-term outcomes from noninvasive ventilation (NIV), the impact of NIV on survival in neuromuscular disease, the practicalities of initiation of NIV, and we perform comparative studies of different ventilators.

Recently we have shown that over 50% of patients with mild to moderate congestive cardiac failure (CCF) have SDB and, together with Cardiology colleague Professor Martin Cowie, we are closely involved with the Serve-HF trial of adaptive servo-ventilation (ASV) in heart failure patients with predominantly central sleep apnea.¹

We have an acute service which specializes in weaning neuromuscular, obesity hypoventilation, post surgical and chronic obstructive pulmonary disease (COPD) patients. A proportion of these adults and children then enter our Home Ventilation Program.

How do you define compliance in NIV patients? Do you use terms other than 'compliance'?

'Ventilator-compliance' is a term frequently used and measured in hours of use. 'Adherence' is a term more often employed in drug therapy literature and has the advantage of implying that the patient's role in pursuing therapy should be active, and not passive. This is equally, if not more, important in NIV and CPAP therapy, as arguably more effort is required from the patient at the onset of therapy.

'Concordance with therapy' is another useful concept as it indicates that an agreed treatment plan has been reached between healthcare team and patient. A negotiated plan can be particularly valuable with older children and teenagers.

Does your definition of adherence differ for acute vs long-term NIV users? Does the definition differ from that for OSA patients?

Principles of treatment adherence are similar in CPAP and NIV users. In some patients the consequences of poor adherence are more rapidly evident in NIV users, but in both groups recrudescence of symptoms and a deterioration in clinical state can occur relatively rapidly.

In acute cases treatment uptake will usually depend on whether symptoms such as dyspnea are rapidly reversed, and requires sensible application of the technique by an experienced team.

How do you measure adherence in NIV patients?

In acute cases we measure adherence objectively on charts recorded by nurses. Once patients are well enough to take part in decision-making we set negotiated targets.

For long-term home users we employ subjective measurement and objective downloading of data from ventilators. My view is that it is best to be explicit about this and encourage patients to discuss adherence problems so we can jointly work towards solving them.

Do you show the downloaded data to patients? What data do patients respond to best in relation to improving adherence?

Yes, we download data and discuss in general, but usually talk about compliance in terms of problem-solving. I don't think a confrontational response helps. So if hours are low, we'll try to understand what problems the patient has faced or whether the patient has difficulty understanding why CPAP/NIV is needed. We negotiate a joint plan, with agreed targets.

From your experience, what are the main contributors to nonadherence in NIV patients?

For acute NIV use mask discomfort, rhinitis, noise, unfamiliarity and confusion all play a part.

For long-term users interface problems, occasional gastric problems and inconvenience may affect use. It is particularly important to involve the family in decisions and ensure that the patient knows about the benefits to be expected from NIV, so any initial difficulties will be overcome in favor of pursuing the treatment.

Is one NIV patient group more at risk of being nonadherent?

Most studies, as well as our own experience, suggest that adherence is not as good in COPD patients compared to those with chest wall or neuromuscular disease. We have also



found that starting earlier in the natural history of a disease—eg, Duchenne muscular dystrophy patients with nocturnal hypoventilation—means that hours used at night will be less than in patients who present with overt daytime hypercapnia (and are therefore likely to be more symptomatic).

In amyotrophic lateral sclerosis (ALS) patients, adherence and symptom relief are better in those who have significant sleep-related symptoms and mild to moderate (but not severe) bulbar weakness.

We have not seen a major gender difference in our group. In teenagers there have been no problems with compliance/adherence other than in a small group with Congenital Central Hypoventilation Syndrome (CCHS).

It is also becoming evident that settling some CCF patients onto ASV may be challenging, at least in part as these patients are less sleepy as a result of their sleep-disordered breathing compared to those with standard OSA. Having said that, early studies suggest ASV is better tolerated than CPAP² and comprehensive support at the initiation of therapy is likely to help considerably.

What methods have you found successful in managing nonadherent NIV patients?

In our experience the best way to tackle nonadherence is to identify underlying difficulties and then to systematically problem-solve.

It always helps to revisit the original sleep studies or investigations that indicated need for treatment. Patients value these being explained in detail. If the circumstances have changed (eg, significant weight loss in obesity hypoventilation patients), these studies will need to be repeated. Other pathology should be considered, such as restless legs in a heart failure patient with central sleep apnea.

We also check daytime and nocturnal blood gas control to see if ventilator settings require adjustment. Additional data on flow limitation can be helpful to see whether upper airway obstruction is occurring and leading to respiratory arousals. Patients will indicate if the interface is the main issue and this is best dealt with by having a wide variety of interfaces available and skilled staff who can fit these accurately to the patient. We would then negotiate a forward plan and work closely with the patient to achieve targets.

Based on the results of a trial from our unit we ask adult patients to use NIV for a very minimum of four hours during sleep but to aim for longer, up to the whole sleep period. Some who are gradually acclimatizing catch up with an hour or two in the day or evening.

We occasionally use behavioral therapy in patients with extreme claustrophobia, but often a small nasal interface and maximal support from the team at treatment initiation works here.

How long have you found it takes for nonadherent patients to become adherent?

Once patients have got through the initial month, adherence is usually stable, unless intervening health problems arise.

What type of ongoing support is required to manage adherence?

For CPAP users we download from smart cards. These are not yet available for all ventilators. Information on adherence is definitely crucial to achieve optimal clinical management, and is likely to become more important to treatment purchasers. It is possible that the newer self-titrating ventilator modes will help adherence— this very interesting possibility is under investigation.

1. The purpose of this trial is to evaluate the long-term effects and cost-effectiveness of ASV on the mortality and morbidity of patients with stable heart failure due to left ventricular systolic dysfunction, already receiving optimal medical therapy, who have SDB that is predominantly central sleep apnea.

2. Morgenthaler TI, Gay PC, Gordon N, Brown LK. Adaptive servoventilation versus noninvasive positive pressure ventilation for central, mixed, and complex sleep apnea syndromes. *Sleep* 2007; 30(4):468–75.

NIV

Noninvasive ventilation (NIV) is the delivery of ventilatory support without the need for an invasive artificial airway. Noninvasive ventilation can often eliminate the need for intubation or tracheostomy and preserve normal swallowing, speech, and cough mechanisms.

Noninvasive positive-pressure ventilation (NPPV) is delivered by a nasal or face mask, using a volume ventilator, a pressure-controlled ventilator, a bilevel positive airway pressure device, or a continuous positive airway pressure (CPAP) device.

Benefits

In acute respiratory failure, NPPV offers a number of potential advantages over invasive PPV. These advantages include the avoidance of intubation-related trauma, a decreased incidence of nosocomial pneumonia, enhanced patient comfort, a shorter duration of ventilator use, a reduction in hospital stay, and ultimately, reduced cost.

<http://www.emedicine.com/med/topic3371.htm>

Compliance: Key research articles

1. Weaver TE, Grunstein RR. Adherence to continuous positive airway pressure therapy: the challenge to effective treatment. *Proc Am Thorac Soc* 2008;5(2):173–8.

Despite the high efficacy of continuous positive airway pressure (CPAP) to reverse upper airway obstruction in sleep apnea, treatment effectiveness is limited by variable adherence to prescribed therapy. When adherence is defined as greater than 4 hours of nightly use, 46–83% of patients with obstructive sleep apnea have been reported to be nonadherent to treatment. Evidence suggests that use of CPAP for longer than 6 hours decreases sleepiness, improves daily functioning, and restores memory to normal levels. The decision to embrace CPAP occurs during the first few days of treatment. Although many strategies in patient interface with CPAP or machine modality are marketed to improve CPAP usage, there are few data to support this. No single factor has been consistently identified as predictive of adherence. Patient perception of symptoms and improvement in sleepiness and daily functioning may be more important in determining patterns of use than physiologic aspects of disease severity. Emerging data suggest that various behavioral interventions may be effective in improving CPAP adherence.

2. Richards D, Bartlett DJ, Wong K, Malouff J, Grunstein RR. Increased adherence to CPAP with a group cognitive behavioral treatment intervention: a randomized trial. *Sleep* 2007;30 (5):635–40.

STUDY OBJECTIVE: To improve adherence to continuous positive airway pressure (CPAP) treatment in participants with obstructive sleep apnea (OSA) using a cognitive behavioral therapy (CBT) intervention. **DESIGN:** A randomized controlled trial. **SETTING:** A major teaching hospital in Sydney (2005). **PARTICIPANTS:** One hundred individuals (96 men), ranging in age from 32 to 81 years, diagnosed with OSA. **INTERVENTION:** Two 1-hour CBT interventions (including a video of real CPAP users) plus treatment as usual (mask fitting and information) or treatment as usual only. **MEASUREMENTS AND RESULTS:** Hours of CPAP usage was assessed at 7 nights and 28 nights. Adherence was defined as usage at least 4 hours per night. Questionnaires measuring self-efficacy, social support, and expectancy (mediators of adherence) were given after intervention or after usual treatment. A higher adherence to CPAP therapy was found in the CBT group (2.9 hours difference) relative to treatment as usual ($P < 0.001$) at 28 days. Only 4 participants in the CBT group did not initiate treatments after their titration study, compared with 15 in the treatment as usual group ($P < 0.02$). The CBT group had significantly higher scores for self-efficacy ($P < 0.001$) and social support ($P < 0.008$) but not for expectancy. **CONCLUSIONS:** The CBT intervention resulted

in both increased adherence and 'uptake' of CPAP and therefore would be expected to reduce the social, economic, and health-related consequences of untreated OSA.

3. Philippe C, Stoica-Herman M, Drouot X, Raffestin B, Escourrou P, Hittinger L, Michel PL, Rouault S, d'Ortho MP. Compliance with and effectiveness of adaptive servoventilation versus continuous positive airway pressure in the treatment of Cheyne-Stokes respiration in heart failure over a six month period. *Heart* 2006;92(3):337–42.

OBJECTIVE: To compare compliance with and effectiveness of adaptive servoventilation (ASV) versus continuous positive airway pressure (CPAP) in patients with the central sleep apnea syndrome (CSA) with Cheyne-Stokes respiration (CSR) and with congestive heart failure in terms of the apnea-hypopnea index (AHI), quality of life, and left ventricular ejection fraction (LVEF) over six months. **METHODS:** 25 patients (age 28–80 years, New York Heart Association (NYHA) class II-IV) with stable congestive heart failure and CSA-CSR were randomly assigned to either CPAP or ASV. At inclusion, both groups were comparable for NYHA class, LVEF, medical treatment, body mass index, and CSA-CSR. **RESULTS:** Both ASV and CPAP decreased the AHI but, noticeably, only ASV completely corrected CSA-CSR, with AHI below 10/h. At three months, compliance was comparable between ASV and CPAP; however, at six months compliance with CPAP was significantly less than with ASV. At six months, the improvement in quality of life was higher with ASV and only ASV induced a significant increase in LVEF. **CONCLUSION:** These results suggest that patients with CSA-CSR may receive greater benefit from treatment with ASV than with CPAP.

4. Lin H-S, Prasad AS, Pan C-J G, Rowley JA. Factors associated with noncompliance to treatment with positive airway pressure. *Archives of Otolaryngology* 2007;133(1):69–72.

OBJECTIVE: To identify risk factors that may predispose patients with a diagnosis of obstructive sleep apnea (OSA) to fail treatment with positive airway pressure (PAP) owing to noncompliance. **DESIGN:** Retrospective medical chart review. **SETTING:** Academic tertiary care center. **PATIENTS:** Patients who underwent polysomnography during 2 periods: from March 1999 to July 2001 and from March 2003 to December 2003. **MAIN OUTCOME MEASURES:** Of the 949 patients identified, only 131 patients had complete medical and follow-up records that were adequate for analysis of compliance. Compliance was defined as using PAP for at least 4 hours per night on 70% of the nights monitored. We used chi(2) and logistic regression analyses to assess correlations among PAP compliance and various patient variables as well as among

sleep and titration study parameters. **RESULTS:** Of the 131 patients analyzed, 48 patients (37%) were noncompliant with PAP therapy. A statistically significant correlation was found between a low apnea-hypopnea index (AHI) and PAP noncompliance ($P = .004$). **CONCLUSIONS:** In this study, a low AHI was identified as a risk factor for noncompliance with PAP treatment. Therefore, patients with OSA and with a low AHI may warrant closer follow-up to allow early identification of PAP treatment failure owing to noncompliance and to allow timely institution of other treatment modalities, such as surgery.

5. Joo MJ, Herdegen JJ. Sleep apnea in an urban public hospital: assessment of severity and treatment adherence. *J Clin Sleep Med* 2007;3(3):285–8.

OBJECTIVE: To assess obstructive sleep apnea (OSA) severity, continuous positive airway pressure (CPAP) adherence, and factors associated with CPAP adherence among a group of patients with OSA receiving care at a publicly funded county hospital. **STUDY DESIGN AND SETTING:** A retrospective cohort study in a 464-bed urban public hospital in Cook County, Illinois. **RESULTS:** A total of 507 patients were included. They had a mean (SD) age of 46.9 (11) years, mean body mass index of 46.2 (11.0) kg/m²; mean and median baseline apnea-hypopnea index (AHI) of 71.0 (44.4) and 69.5 episodes/h; mean Epworth Sleepiness Scale (ESS) score of 15.8 (6.1). Of these patients, 53% were men, 74% did not have health insurance coverage, and 77% were African American. Mean CPAP adherence of the 323 patients with follow-up data was 3.87 (2.62) hours/day, with 47.7% of subjects using CPAP objectively for \geq 4 hours/day. Women were 2.49 (95% CI, 1.39–4.46) times more likely to be nonadherent than men, after adjusting for race, marital status, and age. Of the 172 patients who did not follow up, there were disproportionately more men. When individuals without follow-up were assumed to be nonadherent, the overall compliance rate was 30.4%, and women were 1.72 (95% CI, 1.03–2.88) times more likely to be noncompliant than men, adjusting for race, marital status, and age. **CONCLUSION:** This study population experienced severe OSA. CPAP adherence was low, with women having a higher likelihood of nonadherence than men. With the epidemic of obesity and increased awareness of OSA, this population should be further studied to diminish future health disparities in the treatment of this disease.

NEWS UPDATE

FACTS & FIGURES

- Diabetes affects over 250 million people worldwide and is expected to affect some 380 million by 2025.¹
- Each year another 7 million people develop diabetes.¹
- Each year, almost four million deaths are attributable to diabetes. An even greater number die from cardiovascular disease made worse by diabetes-related lipid disorders and hypertension.¹
- A person with type 2 diabetes is two to four times more likely to develop cardiovascular disease (CVD), and 80% of people with diabetes will die from it.¹
- In 2007, the world was estimated to spend at least \$232 billion (US) to treat and prevent diabetes and its complications. By 2025, this lower-bound estimate will exceed \$302.5 billion (US).¹
- In the USA alone, the annual costs of diabetes amount to \$170 billion (US).³
- Obstructive Sleep Apnea (OSA) is the most common form of sleep-disordered breathing, accounting for over 80% of cases.²
- Estimates suggest that up to 40% of people with OSA will have diabetes, but the incidence of new diabetes in people with OSA is not known.⁴

References:

1. Diabetes Atlas, third edition, International Diabetes Federation 2006.
2. Wikipedia, website accessed 19/05/2008 http://en.wikipedia.org/wiki/Sleep_apnea
3. American Diabetes Association, website accessed 16/05/2008 <http://www.diabetes.org/diabetes-statistics/cost-of-diabetes-inus.jsp>
4. Meslier N, Gagnadoux F, Giraud P, Person C, Oukel H, Urban T, Racineux JL: Impaired glucose-insulin metabolism in males with obstructive sleep apnea syndrome. *Eur Respir J* 2003;22(1):156–160.

2008/2009 Calendar of events

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9–13 September 2008	Glasgow, UK	ESRS European Sleep Research Society
2–4 October 2008	Adelaide, Australia	ASA/ASTA 2008 Australasian Sleep Association/Australasian Sleep Technologists Association
4–8 October 2008	Berlin, Germany	ERS 2008 European Respiratory Society Congress
25–30 October 2008	Philadelphia, USA	Chest 2008
28–30 October 2008	Atlanta, USA	Medtrade 2008
8–12 November 2008	New Orleans, USA	AHA Scientific Sessions American Heart Association
19–22 November 2008	Düsseldorf, Germany	Medica
19–22 November 2008	Bangkok, Thailand	APSR 2008 Asian Pacific Society of Respiriology
13–16 December 2008	Anaheim, USA	AARC International Respiratory Congress American Association for Respiratory Care
28–31 March 2009	Orlando, USA	ACC 2009 American College of Cardiology
5–8 April 2009	Darwin, Australia	TSANZ Annual Scientific Meeting Thoracic Society of Australia and New Zealand

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