Fiona Wood Public Lecture Series

Transcript for 'Unlocking the power of a good night's sleep'

Presented by Fiona Stanley Hospital Sleep Physician John McLachlan

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This is a South Metropolitan Health Service podcast where we share interesting conversations about health to inform, educate and inspire our community. This podcast was recorded as part of the Fiona Wood Public Lecture Series, a series of talks initiated by eminent WA burns surgeon and researcher, Professor Fiona Wood. After a break due to the COVID-19 pandemic, the popular community lectures make their return with session 10 focusing on sleep.

It is very possible that many of you have had a sleepless night or two. Some of you may even experience insomnia or other sleep disorders. Sleeping is part of our daily routine and getting the right amount and quality is important to our wellbeing. A sleep physician for over 30 years, Fiona Stanley Hospital Sleep Physician, John McLachlan will help you answer some common questions around why we need rest and the best ways to improve on a good night's sleep. Through his presentation you will learn about the importance of sleep and delve into disorders such as sleep apnoea and insomnia.

If you would like more information or are interested in attending the next public lecture, head over to our website. We hope you enjoy this presentation.

John McLachlan:
It is so good to see so many people here. It's actually really good to see people here. The last time I spoke earlier this year in this auditorium it was empty, and I can't tell you how difficult it is talking to empty seats. Everybody was online and you've got no feedback at all. At least I'll see if you're falling asleep.

As has already been said, I've been working in sleep medicine for just over 30 years now, 35 actually – 5 years less than I've been married. I've been passionate about sleep, not just for myself but for the community, and understanding sleep. It's always been a great surprise to me, we spend – we have a condition that we spend a third of our lives sleeping and yet when I was at medical school there was not one word of sleep mentioned.

Even today the amount of sleep in the average curriculum is measured in hours. We teach people about all these really important conditions, and we teach them about them how to look at them when people are awake. We ignore the fact that those same conditions continue when people are asleep and very often continue in very different ways as we in sleep medicine know.

So, I would like to talk to you about four aspects of sleep this evening and at the end, end up with some pointers, which you probably would have gathered already, about how to improve your own sleep and how to get a reasonable night's sleep. I'm going to start off by talking about what sleep is - no, about why we sleep may be. I'll talk about what sleep is seen as from a sleep physician's perspective so that you can get some understanding of some of the experiences you might feel. Then I'm going to talk about two conditions, the two most common sleep conditions.
The first one is a condition that stops people staying awake and the second one is the condition that stops people sleeping. I'll use that one to help us understand how to sleep for ourselves.

Now, I can't see the slides up there. So why do we sleep? Well, if you think about it as a purely biological construct, most animals are unable to feed themselves or have sex when they're sleeping. So, thinking that you would not think that was a great evolutionary trait to develop. Most animals are particularly vulnerable when they're asleep. They can't defend themselves and are open. I go to do some clinics out in the outback and I see people sleeping out in the bush under the stars. I think they're incredibly vulnerable to predators, fortunately we don't have lions here. But that concept again you would think would select itself out in evolution.

Productivity is important to us today, it always has been, and sleep obstructs productivity. I remember years ago being involved with some people talking about how to keep astronauts going up into the space lab awake for 24/7 for their time there so they could be more productive and do more in the time. They fed those people a series of drugs and one often wonders if some of the accidents that happened along the way were related to that.

So, there's a lot of things to suggest we shouldn't sleep and yet animals across the spectrum sleep between 2 and 20 hours a day. In fact you can see sleep throughout the evolutionary cycle. Even microbes have periods when they are dormant, they're not as active. It seems to be a trait that's been preserved throughout evolution. The question is, why is that? Well, actually it turns out that sleep actually does improve things. It improves our behavioural efficiency. You've already mentioned it helps us to think better, to concentrate, to learn. Being awake – and this is a concept I think about when I first read it some time back – being awake doesn't necessarily increase the number of offspring we have, and therefore doesn't necessarily produce genetic success. In fact genetic success is linked far more strongly to our efficient use of resources and to avoiding risk rather than making children.

We do know that inactivity reduces predation, because if you sleep in a safe place you're out of sight, and also stops us getting injured. So there are some benefits to sleeping in an evolutionary sense. There's reduced brain and body activity, there's not a lot. The amount of brain activity we save by sleeping is probably about equivalent to a slice of bread, but it is reducing the activity and allowing the brain to develop. Interesting that not all animals are able to curl up in a safe environment and sleep.

Some cetaceans, whales, dolphins, etc have to keep moving because they have to come up to breathe. If they don't swim and they don't get up to breathe they're going to die. They've developed this wonderful evolutionary trait where they sleep with half their brain at a time. I wish we could clone our junior doctors to do the same. This is the left hemisphere of a dolphin sleeping and then

it's awake, and you see the right is awake and then asleep. Now, they don't do that throughout the 24-hour cycle, but they have periods of sleep when half their brain sleeps.

Now, interestingly when half your brain is sleeping the muscles on the same side don't work as well and your eye for example won't see. One of the reasons dolphins go round in schools when they are sleeping – they have some of them sleeping, the ones on the outside are sleeping with contralateral hemispheres at the same time so they can still see out and protect themselves. Wonderful evolution.

When I first had to give a talk like this many years ago and my son was quite young, and I said to him why do you think we sleep? He said, “Oh Dad you just go to how stuff works.” So I went to how stuff works and I found it. This is an old version, this is about 15 years old now. The bottom line was we don't really know for sure. That pertains to today. We still don't really know for sure but we've learnt a lot more.

We've done a lot of sometimes cruel animal experiments. There's a picture there from one of them where a rat was kept in a water bath to keep it alive. It was fed nutrients and everything else it needed but it couldn't sleep. It and its colleagues died almost universally within about a month. We've got better models now. Drosophila. Do you know what Drosophila is? Fruit fly. It has some uses. Drosophila has a fair amount of transparency and you can see the brain neurons in the drosophila with a microscope and you can see what's happening. The zebra fish when it's young is transparent, and again you can see through into the brain and you can see its neurons, you can see the axons. If you give it the right dyes you can actually make the metabolic active neurons be visible so you can see when the brain neurons turn on and turn off. So, some researchers around the world including people from across east, have been doing work on these animals. A lot of our experiments have taught us quite a lot from that.

We've also used deprivation experiments. Now some of them are natural like night shift. Some are not natural, some we send soldiers out in the middle of battles and things like that, but Siobhan – I've forgotten her name, Siobhan over east anyway – Siobhan Banks, has been doing a lot of work with sleep deprivation in people. She's found that – one of her experiments found that if you deprive people – and this is deprive people – so they only sleep less than seven hours a night - many people might think that's normal, but she kept them under seven hours a night. She was able to show that as you increase the number of nights they had less than seven hours a night there was a consistent fall-off in their concentration, in their cognitive ability – their ability to think, and their memory. It was directly proportional to the amount of sleep deprivation they had.

Work with Siobhan's group of humans and the zebra fish and drosophila has shown that in certain stages of sleep – and I'll talk to you about that just a little bit later – but in slow wave sleep you can see in these animals studies, you can see that the neurons turn off in slow wave sleep, they shut down and the joints between the cells loosen and the cells start being moved apart. It turns out that as far as we can tell that's related to memory. I like to think of it like pruning the roses, it's taking out the axons that aren't contributing to the memories the body feels are important and strengthening the ones that are important. We know now that almost certainly in slow wave sleep we assimilate the memories of today all day, but in slow wave sleep they get consolidated and those wires get rewired to keep them in the hard circuit.

The brain is very clever because it also looks at memories we've got today and memories we've got from the past and finds similarities and redirects the neurons together. They can see this in the zebra fish particularly. So, slow wave sleep is really important for memory. Fascinating but not particularly useful in this context – point about memory, is that when we fall asleep we have retrograde amnesia for about 5 to 10 minutes. What that means is that if you're reading a book and you put it down and fall asleep, after you sleep for about 10 minutes you'll find it hard to remember the last paragraph or so that you read. Really useful if you're cramming for exams, don't cram just before you go to sleep. We also know that sleep and probably part of the same process, really useful for learning.

A fascinating study was done by David in the States years ago now and he has repeated it a few times. He took a group of people and gave them this complex mathematical problem, or apparently complex mathematical problem. There was actually quite a simple solution. They had the day to try and solve it and very few of them did. He split them into two groups and one group was given eight hours of sleep and the other group was given four hours of sleep. The next morning they were given the same problem to try and solve it. 90 per cent of those that had eight hours of sleep came in, took one look at the blackboard and wrote down the solution. 4 per cent of the group that had four hours of sleep at the end of the day could solve that problem. So sleep is incredibly important to the processes that we take for granted.

So, having said why we sleep, what then is sleep? Well, most people think of sleep something like this; we're lying there, kiss one another goodnight, turn off the light and we're asleep. It's not like that at all. A lot of people think of it like this; you go to sleep, you get down and you slowly wake up as the night goes on. Again, it's not like that. It's much more of a roller coaster. Now, I'm going to talk to you a little bit about the stages of sleep. So, what happens, as well fall asleep we go into a lighter stage first. Now that first – this pointer I'm colour blind, I can't see the pointer so I'll use this here. This first paragraph – the first panel here shows you what we see on the EEG when you're going to sleep in our sleep laboratory. You can see this, what you call alpha rhythm – I've lost the pointer there – alpha rhythm there, which is very much awake. We can see somebody is awake. Then as you drift asleep it gets these sort of non-specific waves and that's a drowsy state. Most people go into that and out of that, in and out of that. It's not just like that it's just drifting in and out, which is why my wife says to me you were snoring and I'll say no I wasn't asleep yet. She says yes you were you were snoring. We're both right because I'm drifting in and out of sleep.

From there we go into a slightly deeper or transitional type of sleep. We see this particular complex as a sleep symbol so we can tell what it is. That's a more sustained sleep, people aren’t sleep but they're vulnerable. The upper airway is not well supported in that part of sleep – and we'll talk about that shortly – but it is a deeper type of sleep. After a period of that we then go into this slow wave sleep. When you get these big, slow waves which predominate in the EEG. That is when the brain is metabolically at its lowest, our breathing is slow, our heart rate is slow, our blood pressure drops, incredibly peaceful, restful place. Bit like going to yoga or something like that. Just very zen, okay? We spend a good period of time in that and then we either wake up briefly or more usually go into this really interesting phase called rapid eye movement sleep, which you've probably heard of. Often called REM sleep, from rapid eye movement. It's when we almost certainly do our dreaming.

We see certain things in that. The first is the muscles drops away completely, the brain looks much more like an active brain and there are bursts of eye movements. REM sleep, I'll tell you a little bit about because it's an interesting scenario. REM sleep is characterised by highly activated, almost awake brain, in a paralysed body. It usually happens within about 90 minutes of going to sleep. It takes about a quarter of the sleep time, much more in infancy, and falls down. But what is really important in it is not only is the brain active, but the muscles from the neck down are paralysed, apart from the diaphragm. Okay now some of you might have felt when you're going to sleep or when you wake up you're paralysed for a bit, and that's just this.

Why does that happen? I don't know. My pet theory is so that my wife can dream that she's strangling me without actually going to jail. It's like your own personal counselling session, you can have your dreams at night without acting them out. It's really interesting because there are some disorders that I haven't got time to talk about tonight where that doesn't happen and nasty things happen in that situation. The normal sleep is not us asleep and up again, it's a roller coaster. Now this has got four stages because we used to have four stages and three and four are the same now. But you'll see here – see if I can make this work that I can see it. Yeah, there we are. This is a young patient of my some years ago. Stage one and two sleep, and there's a huge amount of slow wave sleep. There's mention of a red blob there, it hasn't come out on the slide, and then they do it again. This keeps on going through the night. So you have four to five cycles of sleep at roughly 90 minute intervals.

You'll notice that the slow wave sleep occurs in the first third of the night, predominantly not exclusively, and the dreaming or REM sleep occurs in the latter third of the night, which is why one often wakes up remembering some dreams. But if you wake up over here and you're woken up by your kids or something like that, you're very deeply asleep, you feel really nasty and you don't remember much in the way of a dream at this stage, okay? That affects certain disorders. But it's a cyclical event through the night, not this light switch on and off.

Historically sleep is quite interesting and it does fit with this. So before Edison and crew came along and gave us light bulbs, people went to sleep when the sun went down and their candles had run out. Now the rich and wealthy went to sleep much later because they could afford more candles, but most of us probably would have gone to sleep earlier because candles were expensive. So people had what was known as a segmented sleep. They go to sleep relatively early, depending where you were in the world could be 7 or 8 o'clock, and they'd have a deep sleep. Three, four, five hours of deep sleep. That's that deep, slow wave sleep. Oh, I can't see where this pointer is, sorry I'm colour blind, I have no idea where the pointer is. That first third of the night with that deep sleep is that first sleep and then people would habitually wake up and have what they call the watch period, usually about midnight.

Those of you who are religious would know the service called Matins that nowadays is done in the mornings but actually used to be at midnight. If you lived in the monasteries, Matins was held from midnight until about 2 o'clock in the morning. But others would get up, they'd go and visit their neighbours have a cup of whatever they drank. They would make children do all sorts of things that you want to do and then they go to bed for a second or lighter period of sleep. Actually if you think about it yourself that often happens now anyway.

You'll get a nice, deep refreshing sleep, you'll wake up for some reason, you might lie there tossing and turning – in my house you get up and go and read a book for a bit, and then you go back to sleep and you have much lighter sleep but a lot more dreaming in that period before you wake up. I find that's interesting. Not everybody agrees that that's what used to happen but quite a lot of the books describe that so I find it interesting.

So, I've described the cyclical nature. The other fascinating thing about sleep is our sleep cycle, our sleep-wake cycle left alone is not 24 hours. We have a 24-hour clock but most of our sleep cycle is about 24.5 hours. There's some good reasons why she invented that, because if it was exactly 24 hours it turns out physiologically to be very difficult to alter the cycle to adapt to moving countries, different lengths of day and night in the year etc. However it is kept together by a circadian clock or circadian system. In the – where that clock is in the middle there is where the suprachiasmatic nucleus is. All nucleus cells in the middle of the brain just above where the nerves from the eyeballs cross, and in there there's a set of genes which are uniquely named the clock genes. They cycle and produce their metabolic products at a rate of about 24.5 hours. When they cycle they go through a pineal gland and they secrete melatonin, the same sort of stuff that you can buy from a local pharmacy these days. But that melatonin in really low doses is the signal to the rest of the body to maintain and orchestrate the biological rhythms of the body.

So, it turns on sleep and when it drops off it turns on wakefulness. It increases your cortisol, it drops your temperature. It also controls your menstrual cycle, your gut rhythm, your cardiac rhythm, all sorts of other things, all done through that cycle. Now because it's 24.5 hours somehow we have to keep it in line with the day. It's no accident that it was designed to be put just above the nerves from your eye enter to the brain, because the most potent stimulus to that centre is bright light coming in there which resets the clock. A bit like when your clock is running fast. I've got a grand – one of these cuckoo clocks and every night when I wind it up I've got to knock it back a couple of minutes to keep it on time. That's exactly what a light does, it keeps you in sync with your day. It's very useful for us in sleep medicine in maintaining things too. There are a lot of other things that interfere as well but that's – I normally give an hour and a half lecture on that. That's enough.

The other thing to bear in mind in sleep is sleep changes as we age. Kids spend almost the whole time sleeping. Babies – a lot of dreaming or REM sleep and a fair bit of non-dreaming sleep. But as we get older the amount of time we spend sleeping drops, even from 20 down to our age, and the amount of dreaming sleep reduces. But the biggest area that drops is the slow wave sleep. Slow wave sleep is related – the amount of slow wave sleep is related to the amount of brain matter we've got in our brains. As we get older all of us are losing grey matter, unfortunately. So it drops. Now the point about that of course is that is where our memory and all that's coming from as well, so it's a bit of a problem. I wouldn't admit it to my kids but it is.

Okay, so having got there, I'm going to talk briefly about the two most common sleep conditions. Is there anybody in this room who hasn't heard of sleep apnoea? Didn't think so. Okay, so sleep apnoea is probably your second most common sleep condition, okay. It was – everybody always talks about fat boy Joe in the Pickwick Papers, it's debatable there was a whole editorial on whether he's got sleep apnoea or another condition called sleep hypoventilation syndrome, but he's a nice picture anyway.

The other great description is a book by Jerome K Jerome called Three Men in a Boat, and they talk about - oh, I forgot his name now, who got - who slept at the bank every day from nine until five, except on Saturdays when he was put out at two, and they described sleep apnoea in that as well.

So what is sleep apnoea? Well, firstly how common is sleep apnoea? Well, it depends on how you look at it and where you look at it. The early – the better studies from the States looking at it – the general population, not sick people, it was a community study where they did home-based sleep studies on random people, showed about 5 per cent of the population – a bit more in men, bit less in women – have sleep apnoea.

When it was looked at in New Zealand in the Maori population, 16 per cent of the men – well, think of Jonah Lomu and company, big people – much more sleep apnoea. In Australia several studies have looked at that. Mild sleep apnoea, anywhere between 9 and 38 per cent. Not great statistics, we need to do better studies. But more severe sleep apnoea probably 15 per cent. In those of us over 65 or 70, it comes up as high as 49 per cent. But that all depends on what you call sleep apnoea, okay, and I'll come back to that.

So, what then is sleep apnoea? Now I do need a pointer here. This is one of us sliced through, so our nose there breathing through there, teeth here breathing there and a tongue with muscle in the tongue called the genioglossus. When you're standing upright you can breathe through your nose or mouth and the air goes into your airway quite easily, the airway is open. When you lie down and you're in awake or light sleep this muscle in the tongue contracts to overcome gravity and keeps the airway open. When you get into deep sleep it can relax. Now it may or may not relax enough to block that airway. That depends on who you are, how old you are, what shape your face is, how much alcohol you've had, how big you are, all sorts of factors determine the size and shape of the airway and predispose that airway to collapse more easily.

So when you're getting to the deep sleep, slow wave sleep and particularly the dreaming sleep – the REM sleep, that muscle – when you get into REM sleep in particular the muscles in the body are paralysed, including that muscle, so it can't keep the airway open anymore so it drops back. So some of us start snoring. Then as we get into deeper sleep it drops back further and it blocks off so [snoring noise] becomes [choking noise] and you wake up and start breathing again. As my wife says she never knows whether to wake me to stop snoring or leave me to die. I don't have sleep apnoea I just snore badly. So that's really what happens with sleep apnoea, it's a simple mechanical problem.

There are clues to sleep apnoea and this is a New Zealand patient with sleep apnoea. He knows I've got the photograph. The clues to having sleep apnoea are people who are big - BMI more than 30, a thick neck - more than 17 inches, heavy snoring - not just mild snoring heavy snoring, people who are noted to stop breathing at night - and many of you will have noticed partners have stopped breathing, people who have got high blood pressure, diabetes and not on this slide is heart failure, renal failure and almost any other chronic condition that needs care to manage and has a higher prevalence of sleep apnoea, and impotence in men. Sleep apnoea is a common cause of impotence. In that group of people you look for sleep apnoea but we should look at long before it hits that group, that's the extreme.

It's very difficult to know exactly who to look for but if people are heavy snorers, have stopped breathing and are sleepy in the daytime, that is the target group in my opinion. It's not just a funny condition or an annoying condition because people snore, it has consequences. It has effects on cardiovascular and cerebrovascular events, so it causes heart – it precipitates heart attacks, angina, strokes. I've just given data here from the sleep heart health study from the States, which looked at cardiovascular endpoints. You can see here that if this is controlled , people who snore, people with mild sleep apnoea have increased risk, people with severe sleep apnoea have a significantly higher risk. But when you treat them, that risk comes right down again. Exactly the same data for strokes. It's not just of passing interest, it is a significant disease that causes a lot of problems in our community.

So how do we diagnose sleep apnoea? Well there's the problem. Our diagnostic ability is very poor. If we just look at people and say I think you've got sleep apnoea, it's worse than flipping a coin. I've been doing it for 30 odd years and it's still worse than flipping a coin. So, we have to do what we call a sleep study and most of my patients think like this, once you've been wired up you can't sleep. But actually if you're very sleepy it's not a problem. Probably once a year I get a patient in the laboratory who doesn't sleep, maybe once every two years – it's very uncommon. So a sleep study involves putting a lot of wires in the head to look at the brainwaves, so people see when people are awake and asleep, other wires around the face here to feel the – measure the activity in their tongue – that muscle in the tongue, others look at the breathing. We put a band around the chest and tummy to look at the movement of the chest and tummy to see breathing. We put an ECG on to make sure you stay alive overnight. We put an oxygen clip on your finger or your ear to look at the oxygen in your blood. In our laboratory we also put a hot electrode on to measure the carbon dioxide – because most of our patients are not straightforward patients they have complex problems – and we let people sleep and look at it.

We can do a very similar study at home where you can be wired up. Either people come to your home in New Zealand or here you go to a pharmacy or somewhere, they wire you up and send you home looking like a terrorist. We can also do very simple things. If we think somebody is very likely to have sleep apnoea we can do a very simple study where you just put a finger probe on looking at oxygen, something to look at breathing and a strip around the chest here which a person can put on themselves at home and post it in or drop it in the next day. They give us similar information, different information for different severities. We get a tracing that looks something like this. This is just part, this is just the respiratory side, I've taken off the EEG because it's hard to understand. But just so you understand if you have a sleep study or look at a sleep study what it means.

The top tracing there that's going up and down like a sign wave is the oxygen saturation in this patient's blood. The next one is the carbon dioxide. The next one is the airflow through the nose and the next two are the bands around the chest and abdomen. I think even the village bobby could see that there are periods when there are big breaths and periods when there's little. In the periods when there's little, you'll see there's no flow. There's a straight line in that nasal airflow there. So those are periods where the patient is not breathing and the chest and abdomen are working harder and harder to try and get him breathing, and there's a couple of deep breaths when the patient wakes up and the oxygen drops with it. This is a five minute page and this patient has had what eight or nine apnoeas in five minutes.

We grade – rightly or wrongly, we've been battling with how best to grade it. We grade it by the apnoea hypopnoea index, effectively how many times you stop breathing per hour. Up to five per hour is considered normal, some people consider it a big higher than that actually. Mild sleep apnoea 5 to 14, moderate 15 to 29 and severe 30 or more. So, that just gives you some idea. That's per hour not per night by the way, okay.

So, the question then always come having made a diagnosis, who do we treat for sleep apnoea? Do you treat everybody? Well, probably not because a large number of people on a sleep study will have some apnoea. They'll stop breathing five, six, seven, eight times an hour. It has no physiological consequence. They may snore a little bit, may snore a lot, but it doesn't have huge consequences for them and they're not sleepy. Sleepiness is a thing that most people with sleep apnoea worry about. Spouses worry about snoring, people worry about sleepiness. It turns out that people who are not sleepy find it very hard to use the treatments that we have available today, the main treatment we have available today. We tend to target the people who have got what we call sleep apnoea syndrome. In other words they've got sleep apnoea and they are very sleepy. They're falling asleep in the lecture. They're falling asleep at work operating their computer. They're falling asleep watching the tele, maybe that's normal, I don't know.

We also treat people who have got very severe sleep apnoea and for publicly funded treatment in this country is people of the age of 30 plus and those who are high risk, although the high risk ones are a challenge. People who have had a stroke and have got mild sleep apnoea are very, very difficult to treat because they can't feel a benefit all they can feel are the complications of the treatment and so it's hard to use it. We don't treat those – we treat those who can use the treatment. So in most areas if you have a diagnosis of sleep apnoea they'll try you with a CPAP machine – I'll talk about it shortly – and if you can use it, you carry on using it. If you can't use it then we have to look at something else. Because there's no point giving you expensive treatment that you can't use.

We often forget in this country that – we always talk about machines, but actually we should remember there's a lot you can do before you get to a machine. Make sure you're getting a good night sleep. Don't take a truckload of booze before you go tonight – to sleep. Don't use a sedative before you go to sleep, it makes it a whole lot worse. Stop smoking because it blocks your nose. Treat the nose if there's nasal blockage because if you have to suck harder through your nose the upper airway collapses more. Avoid sleeping on your back. My wife is a past master of that, the elbow gets me over. But if you do that you can often take mild to moderate sleep apnoea into nothing to mild sleep apnoea. Getting your weight down is a big one. If it comes down a lot it can be very successful, it's often hard. Then be very careful if you're sleepy and driving, and that's a whole another ballgame.

1981 Colin Sullivan described, in the Lancet I think, CPAP or continuous positive airway pressure. This is a cartoon from his original paper where he used a vacuum cleaner – can't remember which brand – blowing in reverse and blowing through the – I can't get my – blowing in here. He had a mask that he made for the patient and it blew air into the nose and then out there. The idea was that the air pressure coming in here would produce a positive pressure – a bit like a hovercraft cushion – to stop the back of the airway collapsing. He described it and was very successful and

he invented ResMed who make CPAP machines, and he has done very well for himself. But that started really sleep medicine from the sleep apnoea side of things.

Nowadays there are many companies producing machines. They look more sophisticated than they used to. Those are the two most common ones used here, ResMed and Phillips. There's a variety of masks. There are so many masks that you can use it's just there's – we can fit masks for almost every shape and size of person, different masks for different people. The ones that look the weirdest – these two over here, are actually surprisingly often the most comfortable. This one over here is a more old fashioned one; that's one of my ENT colleagues who was modelling it for me. So there's a large number of masks and there's an art to fitting those masks, so the people who provide them should be able to help if you need them.

But apart – we always talk about CPAP and then nothing. But there's a lot more we can do. We can use a splint that fixes to your teeth to pull that jaw forward. If the airway is collapsing if we pull the jaw forward it means the tongue can drop back a bit further without blocking. It can be very successful. Unfortunately it's fairly costly depending. If you get a proper splint put in it can be two to thousand, even six thousand dollars. It's not always the most comfortable. Those splints can make a lot of people salivate, gives them pain in the jaw, so you've got to choose people carefully. Not particularly good for severe sleep apnoea because it reduces the AHR by about 50 per cent, so if you're stopping breathing 40 or 60 times an hour, you've still got severe sleep apnoea. However, in people in whom it's effective it can be highly effective. You do need to see an orthodontist because it does change the shape of your jaw and cause problems with your teeth, so it's something to be looked at but you have to be careful with it.

ENT surgery is useful, as I've said if you unblock the nose. If you've got polyps in your nose or a deviated septum and we unblock the nose, helps the snoring tremendously but also helps the apnoeas. We sometimes do ENT surgery where we cut out stuff at the back of the throat and that opens up the airway and stops it collapsing. There are more sophisticated options than the picture I've shown there. In severe cases – and I haven't done one for 15 years now – we can put a tracheostomy in like this patient of mine here. He was my – it's funny, it's probably my most grateful sleep apnoea patient. He used to come and sit in my clinic and try and persuade other patients to get a tracheostomy. But it bypasses – seriously. It changed his life. He couldn't use CPAP because of schizophrenia. But it bypasses the whole upper airway so you breathe through your throat, so it actually solves the problem. When I first started in sleep medicine we used to do tracheostomies in everybody before Colin Sullivan brought CPAP along.

You can use bariatric surgery and the Corkery Group in New Zealand did some wonderful work where they showed almost everybody, about 90 per cent of the people who were treated with bariatric surgery, their sleep apnoea completely went away and their diabetes medications were reduced to minimal. So it can be very effective. More recently there's been work that is still experimental but it's getting out there now where you put like a pacemaker under the skin with a wire going up to the nerve to the genioglossus muscle. That pacemaker is a sensor, it can sense when you're breathing and stimulate that muscle just as you start to breathe in, so it tenses it to make it contract. It seems to be working pretty well to be honest, but it's still expensive, it is implanted and there's always a bit of a concern about what's going to happen to those nerves in the long term.

But so far people have been using it about 15 years now, 10 to 15 years, and they seem to be fairly effective and fairly innocuous. I think that's something we're going to see coming out in the near future.

Right, sleep apnoea hour and a half lecture in a few minutes. My last bit is on insomnia, which is the opposite, people who can't get to sleep. I think everybody knows what insomnia is but there is a strict definition. A difficulty in getting to sleep or staying asleep or waking up earlier than you would like despite having enough opportunity to sleep at night, and in our definitions accompanied by daytime effects – fatigue, mood changes, irritability etc. This should carry on three or more nights a week for three months or more before it's truly insomnia. However, based on those symptoms – this is from Australia, from the Sleep Health Foundation a couple of years ago now, showed that people who have one or more sleep-related symptoms of insomnia three nights a week or more, a startling 60 per cent across the population. 60 per cent of this group here has a problem two or three nights a week of either getting to sleep or staying asleep.

If you look at the presence of daytime symptoms, the fatigue, the irritability and that, it's still quite prevalent but surprisingly more prevalent for youngsters than us oldies, okay. We're stronger, I don't know. But anyway, it is very common. If you look at the official definitions between 12 and 15 per cent of Australians have insomnia by those strict definitions, so it's a common problem. It's more common than sleep apnoea, probably. Why do some people get insomnia? Well, this is an old conceptual slide now. It turns out some people have premorbid conditions that allow them to get sleep apnoea. People have got significant anxiety disorder, people have got genetics – there's certainly certain families that run with insomnia, and people have a circadian rhythm disorder where that sleep clock doesn't quite match with the daylight – that's a whole talk on it's own.

In that setting, you get something that precipitated, some life event, a death in the family, divorce, selling the house, moving country, some severe illness in you or your loved one, just stress – preparing for a lecture, that sort of thing will precipitate insomnia. Now in most of us that event will come, it will go and we'll go back to sleeping again, even if we've got the premorbid conditions it usually goes away. But in some people we get something that perpetuates it, keeps the insomnia once it's started keeps it going. What it tends to be is what we call – a terrible term – maladaptive behaviours, but people start – because they can't sleep at night, start doing things to make things better. Taking a long nap in the afternoon, spending longer in bed, taking some alcohol before they go to bed - none of which actually help you sleep better and in fact they make it worse in time – and then start getting anxious about sleep and thinking about sleep and that perpetuates that. So the precipitating factors disappear but those other things just keep it going and won't let it go.

So, once that's set up, you try to go to bed and your brain is aroused, it's active, you're thinking. You've got all these emotional things going on in your life, wondering about uncle Tom who's just died or how I'm going to pay the bills tomorrow or whatever it is just keeps you going. Then you start getting unrealistic expectations, you think I've got to sleep 10-12 hours a day otherwise I'm not going to be able to function tomorrow. If I don't sleep tonight I'm going to be dead tomorrow, I'm not going to be able to do anything. I've got to sleep. The harder you try of course the worse it gets. Then people start developing these maladaptive things, taking more and more time in bed. Daytime naps, having a regular sleep schedule to try and accommodate the problem.

Then because of all this you start getting moody, fatigued, irritable and the whole cycle keeps – as you get more moody and irritable and fatigued you get more worked up as you get to bed because you're now getting angry because you're going to bed, you know you can't get to sleep and how am I going to function tomorrow, and it just gets worse and worse in this cycle. That's a very short synopsis.

For most of us sleep isn't like that. We pay minimal attention to sleep. We don't intend to go to sleep. We don't put any effort into it and we're not concerned about sleep. It's just an automatic process, we get into bed and passively abandon our environment and fall asleep. That happens with everybody here doesn't it? But that's normal, okay. But when these other factors come in that good sort of behaviour, in other words get into bed in the right environment and fall asleep, changes so you get into bed and you're immediately awake and your mind is racing. How am I going to cope? What am I going to do? Am I going to get enough sleep tonight? Why is she snoring? Why is the dog barking, etc, etc, and you keep getting worried and worried and worried about it. Then you start doing things, as I've already said. This is the one I like. I read for a bit because I enjoy reading, I put my book down and go to sleep. My wife reads for the whole night because she can't sleep. The same thing but for different reasons.

Now, traditionally insomnia has been treated with sleeping tablets. This is just a picture of temazepam in the dotted line there. But more and more we've moved to what we cognitive psychological manoeuvres to treat sleep, cognitive behavioural therapy which I'll go through briefly now. You'll see here, this is a graph taken from a Canadian, he's done a lot of work on this. You'll see that the temazepam within eight weeks gets people sleeping pretty well, but over time it starts getting less effective. But if you use the psychological techniques, it takes longer to get going but it keeps going for ever. It's like the old adage about giving a person a fish or a fishing rod. Give them the means to control their sleep rather than just a tablet to help for now.

So what is CBT or cognitive behavioural therapy? Well, there's a cognitive component where we teach people about normal sleep, what is a normal amount of sleep – I haven't touched on that. A normal amount of sleep is considered to be between seven and eight hours a night, okay. If you're habitually getting less than seven hours a night you're probably not getting enough sleep. I think you mentioned it right at the beginning, there are some elegant experiments in kids to show that if you sleep deprive them, give them six hours a night for two weeks, they gain weight. You can show hormonal changes in hormones called leptin and ghrelin which actually induce that, and if you then give them enough sleep their weight comes down again.

We go through these sort of things so people understand what is normal sleep and they don't have unrealistic expectations. We also sometimes need to do some psychotherapy to deal with those issues about not getting enough sleep and the aggression that comes with it and the anxiety that comes with it. But as physicians we focus on the behavioural components because they actually work and they're often a lot easier. The behavioural tools we use are called stimulus control therapy and sleep restriction, and they are not rocket science. They really aren't.

So, what we want to do is change the relationship that people with insomnia have when they associate the words bed or bedroom or bedtime with anxiety, with frustration, and they start doing sleep incompatible activities.

Watching tele all night, reading all night to try and make themselves sleepy and they just don't get anywhere. Everytime they get into bed they arouse and they have this unhelpful reaction to going to bed. We want to change it to one where you go from bed, bedroom, bedtime to drowsiness, relaxation and sleep, so it's back to normal. So, what do we do? It's not difficult. You don't go to bed until you're sleepy. I often get this nudge, hey it's 10 o'clock it's time to go to sleep – go to bed. I'm not sleepy why am I going to bed? I'm just going to lie there and think, okay.

Get into bed and if you're not asleep in 10 to 15 minutes get out of bed. Don't lie there thinking and worrying. Get out of bed, get into the lounge, read a book do something like that – do some knitting I think somebody was saying – something like that until you are sleep and go back to bed. You keep doing that until you fall asleep and stay asleep, okay. Very simple. Don't use an alarm clock, just guess the 10 to 15 minutes. No matter what time you went to sleep, so if you started going to bed at 10 o'clock and you didn't fall asleep until three o'clock, you still get up at the same regular time very morning; seven o'clock here it doesn't matter. You set the time. I'll come back to that shortly. No matter how little sleep you've had, you go to bed.

So first of all we're training the stimulus getting into bed and falling asleep – it's like training your dog to sit or lie or whatever. We're training you or ourselves to get into bed, go to sleep. If it's not we take you out of that condition and re-present the condition until it happens. You'll be getting out of bed for quite a long time, so eventually after a night or two of this you'll be getting sleep deprived, and what happens when you get sleep deprived? You fall asleep, yeah. Okay. Bed only for sleeping and sex – sorry it's a and don't take long naps in the daytime because that takes away your need for sleep at night.

That stimulus control, sleep restriction. What we do is I tend to get my patients to keep a sleep diary for two weeks marking when they went to bed, when they thought they fell asleep, how often they were awake and when they got up. We can fairly quickly over that period work out roughly how many hours a night they're actually physically sleeping. Most of my patients with insomnia will be spending 10 or 12 hours in bed and getting about five or six hours of sleep broken up. So what we then say is right, we want to align the time you're spending in bed to the time you're sleeping. So if you're getting up at seven o'clock – that's a good time for you, you think, okay – and you're spending six hours sleeping you can go to bed at? Sorry? One o'clock. But only go to bed at one o'clock if you're sleepy and then you do that whole stimulus control again, okay, and keep that regular sleep/wake rhythm.

Now, if you do that, if you keep doing the stimulus control and you restrict the time in bed, just like your credit card you're going to have to pay it back at some point. So you'll build up this debt over a period of time and my patients who do this, within two weeks if they actually stick to that, are all sleeping through their six hours. It's not enough. I've told you, you need at least more than seven hours, so we then once they're sleeping for two to three weeks getting – sleeping through, we then make it go to bed half an hour earlier. Another two or three weeks. Until we find the spot when they get into bed and they're starting to wake up again, and you find the sleep sweet spot. You keep working on that for a while until they're sleeping normally and then when the next funeral comes along they have to go back to basics, but they've already got the basics to do it,.

Now, I'll mention right – yeah, I'll mention right here, you can actually buy a lot of this online. Yeah, I did say that. There's a couple of very good online resources for CBTI - charlie, bravo, tango, indigo. CBT for insomnia. The two best ones are called sleep IO and shut-eye, and they're from two people I know well in the sleep area, and you can pay for a course of cognitive behavioural therapy. It will go through all of this and give you all the tools you need. If you're really struggling, if you can't do the simple one, I get my patients to do that. You could also go and see a sleep psychologist if you've got the bucks, because they're quite expensive and most of it is not covered by Medicare.

So, what about those of us who don't have true insomnia or anything else, just want to make sure we're having a reasonably good night sleep. First of all, exercise. It doesn't have to be vigorous but light to moderate exercise taken in the late afternoon helps promote sleep at night. It also helps keep you fit, keeps your muscles going, reduces falls, fractures and all sorts of other things and it's cheap. Avoid caffeine and alcohol at night. This is from somebody who will quite happily have a port or a cup of coffee before going to bed. But for most people alcohol doesn't help you sleep. It helps you get to sleep but as soon as it wears off you have the opposite, you have insomnia. Alcohol doesn't help. It also makes sleep apnoea a whole lot worse. Caffeine for most people is not a good idea because it tends to wake you up, so try and avoid it unless you're one of those unique people.

Keep your worry time somewhere else. Don't get into bed and start worrying about bills and things. Either pay your bills or work out a plan and do your worrying in the lounge before you go to bed so you've got the day finished and you've now come back to bed. Go to bed only when you're sleepy. If you're wide awake there's no point going to sleep. You're not going to fall asleep. Wait until you are sleepy. Make sure the bedroom environment is conducive. You do not want your office with your computer and your stereo and everything else in there. You want a calm environment where it'll be – it looks nice and you can light a few candles and have a relaxing, calm environment. Please don't have a TV there. I can't tell you how difficult it was to get the TVs removed from the sleep centre bedrooms in this hospital. They were built in every room in the hospital and it took me a year to get rid of them. But watching TV doesn't help you sleep and I haven't even started talking about the blue light and the effect on the circadian system.

Bed for sleeping and sex. Relaxation, things that are going to help you get to sleep. Keep a regular sleep/wake cycle with the accent on the time you wake up in the morning. Don't focus too much about the time you go to bed but keep a relatively regular getting up time, and work around that. It'll keep you going. Really importantly, try and get some bright light in your face when you get up. Get some bright – get into the sunshine, we have an abundance of it here. Get it in your face when you get up. Have your breakfast outside, get some light there. That will reset that clock and keep you going so you don't start running out of sync. Be careful about naps. Nana naps are okay – so are grandpa naps – but don't overdo them because the more you sleep in the daytime remembering as we get to the wrong side of 65, we have less time – we need less sleep, it's going to take away from the sleep you need at night.

So, I love this quote - and I'm not going to read it, it's there for you to read - but to get a healthy sleep try and work so it's an automatic function without having to work harder getting to sleep all the time, using those simple tools. Thank you.

MC:
Thank you, John. Please join me in thanking John for such an informative and entertaining presentation. Now, because he has been so informative we've gone slightly over time.

John McLachlan:
Sorry.

MC:
No, that's fine. We're probably going to limit questions. We're happy for you to ask a few questions probably three to five tops. Myself and a colleague here have a mic so put your hand up and we'll get to you as quickly as we can. Oh right at the back, excellent.

Audience member 1:
Yes, you mentioned about positioning to help you sleep. What are good positions and what aren't?

John McLachlan:
I only mentioned position really regarding sleep apnoea. So if you have a heavy snoring partner or whatever, or yourself, if you sleep on your side that upper airway can stay open more. If you don't have sleep apnoea or snoring it really doesn't matter what – just a comfortable position.

Audience member 2:
Thank you for your very informative talk. Just a quick question, modern parents have a lot of modern technology at their hands. They have baby sleeping next to their bed or in their bed, they have a monitor to see what the baby is doing next door – if it is next door – do you find in your experience that there are more younger people, younger parents, that struggle with sleep?

John McLachlan:
It's a complete mixture, but you're right technology has totally destroyed sleep. Ever since Edison invented the light – well maybe he didn't invent the light bulb, but anyway since the light bulb came along. We've had gramophone and iPhones and sleep monitors and all these things. All this technology has actually invaded both the quality of sleep and also the amount of time we have for sleep. One of the things I didn't mention was that in all these devices that you all carry and I'm carrying, emit a blue light. Blue light is the most sensitive on the circadian rhythm, right, going into your eyes. If you give that light – I say get that light in your eyes in the morning to reset your clock– if you get that light at night before you go to bed, it shifts the clock the wrong way and makes it harder to get to sleep. But you're quite right, all these things interfere and I don't know the answer to that because everybody is selling the technology all the time.

Audience member 3:
Hi, could you go into a little bit more detail about the effect of benzodiazepines and other sleepers on the sleep cycle and long-term effects?

John McLachlan:
Yeah, so long-term effects on the sleep cycle are not much. The benzodiazepines, most of the sedatives to start with work really well. They get you to sleep. Depending on how long they work,

they wear off during the night. So, the ones that work through the night leave you sleepy the next day. The ones that are designed to give you a good night sleep wear off during the night and so you get the first night – just exactly the same as alcohol I might add – you get a deep sleep to start with and when they wear off you get a rebound wakefulness so it's harder to stay awake in the early mornings.

Over time they do become addictive, which is a big problem, okay. However, over time they also lose their efficacy in keeping you asleep. I get people coming to me who have been using benzodiazepines for example for 10-15 years, and they used to work really well but they've still got insomnia now because they no longer work. But they're now addicted to the benzodiazepines. So, they're a hard one. We do sometimes use sleeping tablets as sleep physicians along with the behavioural therapy, but we all use one of the so called Z drugs, zolpidem, zopiclone and – I can't remember the other one, which give short-term effect early in the night to help get people get to sleep past that anxiety stage, but we used a sleep – the behavioural therapy along with that to get people sleeping in the long-term.

Audience member 4:
Thank you. When insomnia is mainly caused by constant pain, any recommendations on - so tried a lot of the CBT side of it and relax, turn everything else off, but it's the pain that's constant.

John McLachlan:
Yeah, look I see a lot of people with chronic pain and to be honest until you can get a pain specialist to help with the chronic pain the insomnia is really hard to deal with. The problem is the lack of sleep contributes to the chronic pain. It's a very bad, vicious cycle. I try to work with the Pain Team to get the patient's pain maximally treated and then use behavioural therapy, which has been successfully used in a number of conditions, fibromyalgia, chronic pain, even people with cancer, and it's been very successful but you've got to deal with the other problem as well. It doesn't work on its own.

Audience member 5:
Thank you very much for a really interesting and humorous lecture, I love your humour. Is it possible after many years of shift work, short changeovers of 10 hours, to get your sleep pattern back to a healthy situation?

John McLachlan:
Yes, but it takes work. It takes work and I don't have time to go into it now but I'm happy to talk to you another time. Shift work is a whole paradigm we need to, you know. It's really appalling that we work in organisations that mandate shift work and yet we do shifts really badly. We tend to choose the shifts that have been demonstrated to be bad and to rotate things badly and it's a constant – look, I employ a whole lot of scientists who work in the sleep lab, I have the same problem because they have to work three shifts. It is a problem but there are better shifts, there are safer shifts, there are better strategies for managing people who have to work other times, we're just not very flexible in health care and that's universal it's not just Fiona Stanley. But yes, there are things and can always talk about it.

Audience member 5:
Thank you.

Audience member 6:
You explained about sleep apnoea but what about the snoring? What actually physically happens with snoring and is snoring alone detrimental to your health?

John McLachlan:
The same thing. The snoring is just that first bit. Sleep apnoea the airway closes off completely, snoring is just the vibration without actually closing off properly, okay. That one in the middle, the muscle is working but it's just touching the back there. There's a vibration at the back of the throat, that's all the snoring is. It can be difficult to treat but again, the principle is the same, unblock the nose, lose some weight. Usually that combination will help things. If not, you can get some ENT surgery to fix it, you can use a splint to fix it, it depends on how bad it is. I keep on telling my wife snoring is not a crime though.

MC 3:
So look, I think that's all we probably have time for this evening. Thank you again John. Please join me once again for thanking John.

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