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**Presentation:** Sleep! For your Body and your Brain
**Presenter:** Ashura Williams Buckley, MD, Pediatrics and Developmental Neuroscience Branch, National Institutes of Mental Health, National Institutes of Health

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**CDR Morin:** Thank you. Just give me one moment to bring up Dr. Buckley's information and we will start. Our final presenter is Dr. Buckley she's a staff neurologist, pediatrics and development neuroscience branch at the national Institute of health that was a lot to say. Dr. Buckley is a child around just, sleeps to list and clinical investigator at the national Institute of mental health Dr. Buckley received her undergraduate degree from Harvard University her medical degree from State University of New York at Stony Brook and completed her training in child neurology at Mass General. She was a fellow at the pediatrics and development neuroscience branch at NIMH from 2006-2009. Worship became an integral part of the inter-Merrill NIH autism efforts. We are now pleased to have her present on her sleep presentation for your body and brain. I will bring everything up in one moment. Dr. Buckley are you there?

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**Dr. Buckley:** I am here. Hello everyone. It might make more sense for me to use the slides.

I will go ahead if everyone can hear me. I would like to say thank you for inviting me to speak to you on nurses recognition week - - as long as I'm here. Tell me if people cannot hear me. Otherwise they will keep going. I thought it would not actually talk about my urge - - research but sort of give a view and try to be as comprehensive as possible about the importance of sleep in your life as people and in your patient's lives. And something we don't tend to pay a lot of attention to, but in my travels studying I've come to understand it's actually one of the very most important things in our lives. The way will do this is a very general overview. Complete definitions and talk about normal sleep and where the definition comes from. The organization of sleep networks, common sleep disorders and sleep in general help. One of the things I hope people take away from this is that sleep is actually a complex process. There are a lot of definitions and its reversible behavioral for your perception; that's also not a perfect definition because we do have certain responses when you are asleep and it depends. It's also very dynamic. The reason I'm interested in this from a mental health perspective and that's where my heart lies and I study neurodevelopment disorders. Is that sleep really reflects the state of the health of your body and brain and it also contributes to it. Sometimes polling is a part can be difficult but it's definitely worth looking at in all of your patients. It is something that we are all checking all the time. Why asleep important? It's basically one of the very most essential things we do. I hope I can teach you about that by the end of the talk. And so one of the interesting things is that before the 1950s, we really did not have a body of researchers. It was in the field. The function of sleep wasn't proved very much what we thought was you go to sleep in your brain is off-line. You are on when you're awake and then you're off. That was the extent of it. Then in the 1950s rapid eye movement sleep was discovered. It became pretty clear that your brain was very active during certain parts of sleep and then subsequently we realized its super active during all of sleep. There's a lot of different theories, any of them - - many of them coming to the front pretty recently. None of them explain all the complexities. The most widely affected happens in facilitation of memory retention. There's an extensive body of work talking about replay of your

life during the day that being really part. There are restorations basically a synthesis that your brain uses up everything it needs to think and be alive during waking hours and it needs to restore this. There is a very popular theory of S HH and basically this is predicated on the idea that there's a limit to how many synapses your brain can form why you are awake. Every day with your new experiences you form lots of new analysis and you read to bring those down for conservation of energy and to get rid of the ones that are not important. There is also a new theory which does not appear that has to do with PMS toxin clearance. I know people have been following this and it's been in the news. This is the idea that the rhythmic pulse stations of sleep are really evolved to clear out of your lymphatic system. The bottom line is that we are actually still looking. We don't know why we have a lot of good means and the field of sleep medicine is moving fast. I want to talk to you briefly about - - I should say I will concentrate on the neurology of sleep. One of the things and questions I get from people in the medical community both from doctors and nurses is that there is no formal sleep education even how sleep works we will try to do some of that we talk about how important it is. In general it's a number of complex behavioral physiologic states. Only think of sleep we need to understand its many things it can be a behavior it's a state of the brain, and it's also a process. We can measure that and one of the things I do in the lab is I recalled - - record neurophysiological monitoring to help us define what state we're in.

When you are alive you are basically in one of these three states. The brain is sophisticated and finally and if it's working properly in a medically healthy person to ensure the transition between the three states shown here that they are rapidly sleep. When they are not, then you get into serious problems. In fact the paradigm or the good model for sleep state where you have intrusion of when sleep - - REM sleep into weight and fragmented sleep. We will talk about how that happens. It's a complex interface overlapping systems of feedback sleepwear talk about that in healthy function brain ensure that leaves states the transition happens between everything quickly. So for centers of the brain we need to know about are basically the hypothalamus which is where the sleep wake slates lives. The brainstem which in the 1950s we realized where once you are sleep the switch for going into REM sleep or not was and the Falmouth. The patterns of EEG activity and really consciousness itself arise from this interaction between the cortical structures and the hypothalamus and the brainstem through the Falmouth to the cortex. The Falmouth is the relay station. And when it's open, you are asleep when it shut your sleep you are not. And so they relay information and they also are responsible for generating some of the morphology to let us know what the sleep you're in. We're going to review some quick series of cartoons I hope will impress upon you have finally orchestrated sleep really; this is the cartoon taken from an update and published in sleep couple years ago. It is highlighting the network. So there are many centers in the brain that contribute to promoting and maintaining in the brain. We start a left, there's a neuron; dopamine if your moving toward the right part of this cartoon you have serotonin and epinephrine.

Conversely to what we see these things promote arousal because they are increasing and transmission through the arousal center. Whenever I think about things you are prescribing you can develop this population that they are eventually ending up at. The slide where I want to call attention to particular to this cluster of neurons. We talked a little bit about instability between sleep stages and the model for sleep stage instability and behavior between particular medical disorders is narcolepsy so about 15 years ago, this neurotransmitter was unknown. It's a very

interesting cluster of neurons in the hypothalamus. Orexin, in the absence of so Orexin is like a master arousal coordinator. It has projections and you can see to all of those arouse her sentinels all of those neurotransmitter systems. And just drives home the point that if it's really complex as much as sleep is complex this is complex to. These clusters of neurons differentially regulate different types of arousal for instance someone may be most important when you waking up. Dopamine might be most important when you're awake in your motivated behavior. Epinephrine may be most important for tension while you're awake. Their overlapping but they didn't have differential tasks and a master regulator of the awake state. So again to bring it home clinically very recently the FDA approved a new - - for many years we did not have any new drugs for sleep. Now as of a think last year the FDA approved this and probably the most familiar name; we prevent Orexin from coordinating all the centers and keeping us awake and that results in people who have chronic insomnia the point is as we learn more and we dig deeper into how these systems were, we come up with more targeted and better specific remedies to help us manipulate the different problems people may have with sleeker dose with sleep. Talk about the arousal system, the noun REM sleep pathways. The non-REM sleep pathways are coordinated in the interior hypothalamus. That's the VLP of the same center we were talking about. Now when it's time to go to sleep, the VLP O is basically sending and inhibitory signal to the center to shut them down. The VLP O does this in a fashion where they are all shutting down the same time. And so classic medical sleep drugs like the new zolpidem. Those are binding and what they are likely doing is sending signal to the VLP O in saying everyone shut down once. So again understanding how this works and courting fashion helps us understand what we are prescribing and what might be happening to people when we give them the drugs are you affecting motivation? Attention? Arousal? Things like that. Now here's nitty-gritty neurology stuff is REM sleep. That's one of the things near and dear to make it's actually what I look at in developmental disorders. And in major mental illnesses and I think there's a lot to understand about how behavior is affected by how a particular REM sleep does or doesn't work. I want to spend time on this page. The major machinery is in the brainstem like we talked about. The specific pathway about how REM sleep is this achieved is still debated. But it's primarily controlled by neurons and what we talked about the LPT or the PPT. These are interesting the LVT is neurons are the main source of the Falmouth. Hypothalamus. You have your brain asleep, your gathering your from your detail but during sleep you have REM on neuron elaborating so in the sleep stage acetylcholine goes up into the and actually causes at the sending this into the cortex that we think is responsible for the complexity and intensity of dreams and at the same time you have descending innovation we will concentrate on that first cartoon. and then causing descending innovations and oh rising motor neurons are rather hyper motor neurons. You have acetylcholine at the same time that is a sending causing the activated cortex is also descending into the synapses we talked about its causing paralysis. You have that active brain; the other thing I want to mention about that in the call that or the lack of tone very sleep. And you need two things to achieve that. You need descending information, causing the motor neurons too eventually and you also need the in particular epinephrine. When you go to sleep and when you're in REM sleep your epinephrine ceases to fire in those nuclei that we talked about. Epinephrine is responsible in the waking body for maintaining tone and it completely goes away in REM sleep. For the brain that stopped again once again for what this means when you're taking care of patients, is that many people who have illnesses are on SSRIs are on epinephrine or take inhibitors. What that means is a no sleeping bodies they don't achieve; they are people have sleep disruptions because they are on an SSRI and that's actually preventing the epinephrine and from ceasing to innervate

the motor nuance. Yet what they really have is they are giving them a substance that's directly affecting their sleep machinery. One of the things to keep in mind is this is a profile to bring home again to show the different states of sleep have different nerve dead sugar profiles and some of them are still being worked out and keep in mind that we're not exactly sure how and why what the function is but we give drugs that interrupt this neurotransmitter we have and we don't know much about this one thing on here that I did not talk about and that's MCH. It's a hormone and small population in the hypothalamus and it only comes on during REM sleep and it’s probably one job is to just make sure that in addition occurs during REM sleep at the slightest to bring home the fact that it's complicated. I didn't quite make it in the slight but it's supposed to be the calling on a first and then that Monoami and neurons in the field.

This is a cartoon I really like and it was published years ago it just drives home a couple of things one that there is a reciprocal relationship between cholinergic innovation during sleep and the Monoami. One Monoami goes off the is on. If you follow that solid line until you get the first dark patch mark that's part of the circle the start. That's when you get all the signs of REM sleep. Then there is a reciprocal ambition where now you have the cholinergic’ s that are filing and now you have the epinephrine and the serotonin coming back and turning them off and then sleep is off. This is a very cyclical healthy brain, and cycle that occurs basically every 90 minutes while you are asleep.

Where does this come in? I really like this slide because it is a very simple cartoon that is a very complicated process. How does the factor in? The thing to know is that the rhythm of an individual is a little bit longer than the circadian rhythm that you get in the light dark 24 hour cycle. It's about 24.2 or 24.3 hours instead of 24. Every day, in order to live in the environment, the body has to be entrained to the light/dark circle that exists around. We do that by using lights as the late guys are the time giver. There are other ones like feeding and other things at the very strongest one that we use are light. Light gets the back of the retina not the [ Indiscernible ] calls that are responsible for producing images but these other cells and their one job is to transfuse light into a narrow signal that goes to the [ Indiscernible ] that we talked about and stimulates that to inhibit to this indirect pathway production melatonin that's basically an initial. When light is not stimulating the sell its not a him hitting the production of melatonin and called it the dark signal so I melatonin is allowed to be produced from the pineal gland is usually for about two hours before normal bedtime. It secreted in plasma and it has many different receptors throughout the body. And it coordinates sleep. That's how the CSN directly signals the other centers in the hypothalamus that you talked about as well as the rest of the body to keep trying - - is important because there are other things that are time lock that are important to your physiology and to the core body temperature, hormone elaboration, and it goes on and on. So we talked a lot about the neurology of sleep. In about the network. And how the circadian process sees factors in there. There's another process which is basically called process S me think of that about sleep drive. It's directly predicated about how much sleep you had prior to falling asleep and ideally, in a healthy working brain and body, process S and process C come together to create a weight for pensive it looks like this. In the morning your circadian drive the sleep is Loki your process S or how tired and how brain you needs to be set is low and as those lines can together we fall asleep. Those are the two process models that we are familiar with.

We will switch gears for a little bit. And I get questions a lot from people who are like people tell me that my daughter whose X years old needs X immensely. The truth is we don't really know exactly how much sleep people need we know a lot about what happens on average when people get less sleep than is recommended. And so we had an expert panel of people come together. They just came out with new guidelines in 2015 which are not that different from other guidelines. What they did is they had an expert panel of people I think it was like 18 people who are sleep specialists in all different academic organizations. Review the 300 most recent papers and came up with these guidelines. If we wanted to work this is what the experts recommend. You can see in general from this table that the review and the sleep to function optimally. The heavily weighted toward childhood. Please note here that for people who take care of China, those years between six and 13 is completely normal for children to need nine, 10, 11 hours of sleep at night. We're talking about seventh and eighth graders and then entitled. Which is important. How many of you live in the Maryland Virginia area, but you may know about it and for by a friend of mine to get people to pay attention to the fact that teenagers have a propensity to delay sleep so that they are falling asleep layer. You like to get up later and the school start times are extremely earlier for learning your that is still up in the air about whether or not the school district will move us back. There is good data showing that children do better when they are allowed to achieve those hours.

Course these are all aggregate numbers and everyone is different. I think it's particularly interesting that there are people that have decreased and increased tolerance for inadequate sleep. And studying people who can get down I and six hours and I do not have an issue maybe they have some differences in their arousal networks. Also the other thing I want to point out is that there been a number of really interesting studies about vigilance and reaction time that show that your self-judgment of sleepiness is actually really poor. Most people who get by on six hours a night and think they are five actually have deficits in their reaction time and judgment. This is a cartoon that showed. I actually like it and it's one of the things that got me interested in REM development a rapid eye movement and one of the things to show here is that in the early parts of life REM sleep is 50% of your sleep time. You have an intense amount of sleep up until age 4 or five preschool years and on. Then after your teens or young adult. The percentages of sleep in the structure of sleep so how much revenue much waking a pretty much consistent.

Sleep patterns and characteristics is another table where people have reference that really after toddlers around three or four, they are consolidation of sleep time starts to look like adult patterns. So he for school your sleep starts to resemble an adult pattern. One other thing I'd point out is that older adults for those people who take care of older adults are more likely to have poor sleep efficiency so really not sleeping well given the time that they are in bed. Those are most likely to be secondary reticle problems in sleep disruption. We still probably need 7 to 8 hours of sleep as an older adult and if you are not getting that are secondary to a medical problem.

These are some numbers my primary passion asleep in your development and how important I think it is that we pay attention to optimum sleep during a critical time. And that last bullet is the thing that comes home to me. That when you are developing really up until four or five years old were you can see the time and sleep equals time awake sleep is the primary activity of the brain. I think you really need to take attention to why that happens; development one it is not given. Sleep changes in adult, I just want to point out that your changes that we likely talked about and

teenagers who tend to have a delayed sleep phase it's not uncommon that as people age there are sleep phase advantages of people feeling tired earlier in the evening before dark in getting up early again and your older patients, sleep disorders tend to increase. They are getting less than the recommended amount you want to be looking for things like insomnia and sleep apnea.

All of that said, we talked about the networks and how they had to be working and all of that can be beautiful and then there of course is everything else in your life. What is the culture in your house? Are there infants in your bed. Is it okay for you to nap in the afternoon in your culture? What is your macro sleep environment? Are you living in envelopment whether our light so is on.

Part of what I do is tried to get the objective sleep measurements. Of what the brain is doing and how well is transitioning and I like to use polysomnography in the way that its stage is by recognizing the mythology and in relation to each other. E.g., or the EOG and the EMG for muscle tone.

This is a cartoon that shows you the bare bones of what we need to record those things from the head. The eye leads and that we usually do tone from the chin that will help us figure out when you are experiencing the paralysis of REM sleep. That's a waking EEG from central leads. It generates a report or rather a 32nd epic that looks like this that we read. We also can see there are a lot of lines in this page. We also record other parameters of health while we are sleeping we talked about sleep actually there's some a different things that are regulated and we want to look about how your breathing and what is your heart rate. Those top line that is the in black they are the central leads in the brain. The redline is a muscle and that's the chin we talked about the EMG we. Looked at the heart we look to whether or not the person snores, we will have several leads around that chest if you see that PSG done to help us figure out whether or not you are apnea and what type of apnea you might have. This is what we would get; this is what we read the raw data. Then we do that and we staged that over an eight hour. Here we end up with something like this this is a hit program. What I want to point out here is in the normal brain you can see you go down from a wake into stage I which is likely stage to which is deeper and then [ Indiscernible ] stage III and blew down there in the Brennan you go step back up again. He do that only long and I want to point out that [ Indiscernible ] sleep is heavily weighted toward the first third of the night and rapid eye movement sleep is heavily weighted in red there at the top toward the latter part of the night. This is helpful especially in pediatric sleep medicine when you're trying to figure out a typist disruption a person happier rings like. When you know when they occurred it helps you figure out what they are. We talked about and we looked at what a normal know Graham looks like - - and then we come over here and see what it would look like. When sleep is fragmented by anything in this case it's frequent arousals for whatever reasons, you don't actually do that between non-and - - non-REM. This is a major six categories of the classification of sleep disorders. That is in the new conversions Lee of the international sleep disorder. You have insomnia, sleep-related breathing disorders. Those are the two most common. Central disorders of the hyper somnolence and that poster child for that being narcolepsy. Circadian rhythm sleep wake disorders we talked about delayed sleep phase being something that you see in young adults advanced sleep stage disorders as well I just want to mention here shift worker shiftwork was something that can really wreak havoc not just on the circadian timing of hormone regulation but also in the time when you're not working, people rarely get the

sleep that they otherwise would if they weren't working shifts and so on top of the circadian, disorder of shiftwork they also probably have sleep deficiency. Sleep-related movement disorder the most common of which is restless leg.

Insomnia is defined as a persistent difficulty with sleep initiation. Duration consolidation or quality and there has to be despite the fact that you are given an adequate opportunity. And you have to have daytime impairment. That is the working definition we adopted. Chronic insomnia people who have had it they've always had it that is 10% of the population. It's much higher if you count transient conditions. The people who have things go wrong in your lives or they are not adjusting correctly it might be if it's not something that is going on for years and years but it is affecting your life if you count those it's probably a third of the population that would complain of insomnia. It's reported to be highest in women and people with psychiatric disorders and people who have lower socioeconomic status. It is a big public health problem. Sleep-related disorders and the most common sleep disorder characterized by abnormalities if respiration during sleep. There's extensive work on sleep apnea in particular and how that wreaks havoc on your physiology and also on your cardiovascular system. That is about probably 25% of the population if you measure it by something that you call the apnea hypoxia index. How many times you have an obstructed event during sleep. Be a quarter of the population. If you don't count the [ Indiscernible ] but you really are just trying to find out people who have daytime sleepiness it's less than that is probably somewhere between 3% and 7% of the population trending higher in men.

What we are worried about with sleep disorders is daytime sleepiness. The primary mechanism of impairment here which is rare but mostly we are talking about sleep restriction. Less than recommended or less than optimal per night. It's really impairment in the prefrontal cortex. This has implications for safety. We are talking about people who are unable to make decisions that they normally would make. The effect of sleep loss is really trying to drive home the fact that sleeps deprivation and even if it's an hour less than recommended it has measurable effects on the brain. It has measurable effects on the body as well. Including increasing stress hormones; even see here that melatonin has other roles besides setting the clock. Including developmental roster also the CMS. The SCN is regulating hormones like corticosteroids and body temp to. When you rip your sleep you are affecting all of that. It's all coordinated.

The impact of sleep problems is the goal of the body. We deficiency in a number of tests have been done and they've shown it's pretty well-established that the increase in this marker for cardio metabolic disease with sleep deficiency. It's interesting there are not a whole lot of studies on the changes in immune function with sleep this - - restriction. The best known what the study of antibody response to vaccination is. It was a paradigm where for six days prior to vaccination, people were restricted to four hours a night. What they found was that compared people who had more moral healthy leap - - normal healthy sleep. The production of antibodies in response to the vaccine was severely impaired. It did not go away and eventually 2 to 3 weeks later they were comparable to the control but it took a long time. That's the best evidence that in general from an animal evidence people do feel that sleep restriction definitely impacts your immune system. The sleep studies have been very interesting the last four or five years sleep restriction decreases the hormone. Hormonal issue no you had enough CE that gets decreased and on top of that it shows increases dreaming which is the hormone that tells you that you're hungry. So that disruption

definitely plays right into metabolic intolerance that he's fine with sleep restrictions all of those things will set you up for pretty terrible increased risk of diabetes and obesity. Mental health and wellness is one of the things I am very interested in. I think that sleep is a great window to figure out. The relationship between sleep and disorder and sleep in your psychiatric illnesses has been known for decades. Most psychiatric disorders are associated with sleep disturbance. And when I say most I mean like 80%. It's part of the diagnostic criteria for all the major categories. Psychiatric illnesses most common comorbidity associate with chronic insomnia. This is something I find interesting there was a very nice review published in the study of neurology in 2013 and what they were trying to say was look at the data in circadian genes particular some of the evidence that you just they needed common mechanism it disrupted the circadian clock is actually giving you the sleep disruption and the behavior given that in the area the psychiatric research; these are actually the same route you're seeing two different things. That's true and you can identify the sleep disruption before the behavioral abnormality might have a window into treatment.

Other health consequences of inadequate sleep that are important are of course drives the - - drowsy driving crashes. According to data in 2009, drowsy drivers were involved in 2% of all crashes and 2.5% of all fatal crashes. That doesn't sound like a lot and but it is and it's totally preventable. It goes back to what we talked about the people and the impression of how sleepy they are is not great. We are basically talking about impaired reaction time and not 2011 the joint commission report found there were more errors in taking care including disclosure to blood and body fluids if they work extended shifts. Extended shifts are greater than 40 hours a week. Those are just anecdotes and things to bring home of how important it is to be aware of when you're not getting optimal sleep. It's something to talk about and to try to make better we can.

These bullets are from workplace health and safety in 2014. It specifically talked about nursing. One of the things they are most concerned about is the amount of time that people spend in shiftwork or changing the hours that you work frequent pics of 21 million people work alternate shifts. As we talked about before which you at risk for deficiencies because you're not making up those hours on the off time. The second bullet here is the Bureau of Labor Statistics in 2012 that a quarter of the American workforce works more than 40 hours a week. I'm assuming all of that extra time is not made up my sleep. You still fit the rest of your life; sleep is probably getting shortchanged. The CDC reports 40.6 million people report they are getting six hours or less we talked about how that's not acceptable. The task force put together by the American Academy of sleep medicine and the sleep researcher society workforce and they assume people who are getting less sleep of people who had their rhythm disorders so they might be getting seven or eight hours or just not getting it optimally when they should and when they add this they estimate the number of people who are sleep deficient is more like 50 who are sleep deficient is more like 50 million people to 70 million people. The idea here is insufficient sleep to work is a huge concern. For everyone really. For patients but also for the healthcare worker. We really want to not overlook. There was a study in 2003 for nurses health that he and found that there is an increased risk of coronary events and women who worked as nurses and from when you worked eight hours a night to less than seven. Just that one hour difference increases your risk for all coronary events. These are examples but you can pull one out after the other and it's why [ Indiscernible ] the evidence is so strong and so amenable to change in several academic organizations and agencies have developed their own guidelines on sleep and fatigue and you

can see the most recent is the American Association and identify states that have mandatory overtime restrictions. They do it because it is a safety issue for you and your patience and for everyone. When you're not respecting the fact that to function optimally people need sleep.

To wrap up with the Key learning points and sort of very broad overview and the thing that I love for people to take home is just that sleep is very complex. Sleep is actually very complex and we don't understand. There are a lot of great theories about why we do it, but there are is not consensus on why it happens we need to be [ Indiscernible ] sleep patterns and behaviors there are so many different things that going to sleep him optimally. Also to take home that unhealthily sleep has really far-reaching consequences on every aspect of your help. And one last plug this on there is that neuropsychiatric disorders and sleep the relationship there probably has a lot more to be gleaned than we have. And that's actually the thing that keeps me coming to work. That is my presentation, I am happy to take any questions.

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**CDR Morin:** Thank you so very much - - very much. That was fantastic. We were just saying that we should go home and go to sleep because I don't think we got enough sleep in the last two days. I did get one question email to me. From the cycle diagram, what is the normal estimated time between the awake and REM one cycle.

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**Dr. Buckley:** Is different depending on your age group. By the time your adults probably 90 minutes.

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**CDR Morin:** Perfect. Are there any other questions?

Are naps recommended? If so how long?

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**Dr. Buckley:** I think the answer is for home. - - Home. It depends. It is one of the standard treatments for people who need to consolidate sleep because they have a sleep disorder like narcolepsy. So you would recommend naps for people who are trying to consolidate their sleep and people do that as hormone treatment. I think once you are past the age of three or four, and you are living in the culture that we live in, if you are five big need to nap you probably need to work on consolidating your nighttime sleep. That is my feeling. Again, there are cultures that a nap is part of their day. In the culture that we live in if you find you need to nap, and also if you find that your very tired probably need to see someone and have that examined. That would be my feeling.

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**CDR Morin:** Excellent. Are there any other questions out there? Dr. Buckley, would be okay that if we do get questions, for you that we provide - - we can forward them to you or give them your email without the okay?

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**Dr. Buckley:** That's fine. Absolutely. My pleasure.

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**CDR Morin:** Perfect.

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**CDR Hadsall:** Thank you again Dr. Buckley. Dr. Riccardi, Captain. Dennis, this Myers, Lieutenant. Commander. Collaborate we greatly appreciate your input, your professionalism and

excellent recitation. Thank you for the unique individualized and ethical nursing care that each and every one of you provides on this call in on a daily basis. Continue to excel in your field of practice and again thank you so much and happy nurses week. Have a wonderful day.

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[Event Concluded]