Sleep: The Challenge of Aging

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Presenter: Teresa Fair-field, OTD, OTR/L

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- [Amy] And at this time it is a pleasure to introduce Teresa Fair-Field who is presenting with us today on Sleep: The Challenge of Aging. Teresa Fair-Field is an occupational therapist who graduated from Pacific University in Oregon with a bachelor of science in 1993 and from Chatham University with an OTD post-professional doctorate in 2016. She has worked through the lifespan from early intervention through acute settings, home health, elder health, and end of life care. Her primary role is education specialist for select rehabilitation. So, welcome Teresa, thank you so much for joining us today.

- [Teresa] Thank you and hello. I actually love talking about the topic of sleep. It's something that everybody can benefit from from their personal relationships, as well as their professional contacts, so I hope everyone takes away something today that benefits them in a broad sense. Our learning outcomes for today are that you will be able to identify the differences between what are typical sleep patterns or expected sleep disruptions with something more problematic. To identify the confounding factors that affect sleep hygiene, particular to the elderly population. And then appropriate responses for those sleep problems.

We will also talk towards the end of the course about how you can participate in supporting a sleep culture at the facilities where you may work. So, let's begin by talking about what typical sleep is. And sleep researchers call this sleep architecture. So, starting out with what we should be getting, relative to sleep, is shown throughout the lifespan with newborns and all the way through older adults. Now, these are resources from the National Sleep Foundation, their website has a printable infographic that may be useful for you to disseminate at work or hang up at work. One thing to note is that sleep science has changed what these recommendations are. So, this shows a previous, compared with previous versions, this is a 2017 study that produced these results, so it's quite up-to-date. And the research has more subtlety changed the understanding of necessary amount of sleep that we should get at every stage. So,

again, there's something to learn here for people throughout your life. And new findings show that there's actually a narrowed sleep range in newborns, previously 12 to 18 hours and now it's actually more like 14 to 17 hours for those smallest newborns, whereas infants in 4 to 11 months, it's widened to 12 to 15 hours. Toddlers has also widened, preschoolers as well. And then school age children and teenagers has widened, as well, by one hour each. And then adults, interestingly, have been divided into three groups with new age categories of the young adult, adults to the older adults. Now, previous versions of these recommendations did not acknowledge any variation in sleep needs from age 18 and up and we now know that that is not true, so while the recommended amount of sleep has not changed from the young adult age 18 to 25, it has our understanding of how we get that sleep has changed. So, adults has no change, as well. And older adults has narrowed to between 7 and 8 hours of expected sleep.

So, while the ranges haven't changed dramatically, our understanding of the sleep process in those adult age ranges has changed and that's what we'll be discussing today. So, in this 2017 study in the peer review journal, Sleep Health, which is the flagship journal of the National Sleep Foundation, they ruled out this 12 item survey tool called the Sleep Health Index. And they developed this tool in 2014 and then over the next two years surveyed over 2500 adult Americans using the Sleep Health Index. And they use factor analysis and identified three different domains of sleep, which are sleep quality, sleep duration, and disordered sleep. And the index provides 100 point score in each of those subareas and then an overall roll up. And the tool then used regression analysis to determine what independent predictors of sleep are. So, you can see the following, their two years of research that the average American is reporting receiving about 7 hours and 36 minutes a night, which is well within the recommendation for that age group, and that's using a substantial "n" size in their study. But, you'll see also in these notes that on work days the average bedtime is 10:55 p.m. and the average wake time is 6:38 p.m. So, that's an average sleep time

that is 40 minutes longer on non-work days. So, not surprisingly we are getting less sleep on days that we work from days that we're not. Not surprisingly, also, young adults between ages 18 and 29 reported the latest bedtimes. And in this particular study, duration of sleep did not defer between men and women. So, you may wonder who are these people that are sleeping an average of 7 hours and 36 minutes a night because you, in fact, may be getting substantially less. So, the population that was surveyed was about evenly distributed between men and women. There was 48% men, 52% women completing this survey.

Age distribution was also fairly even, as was income across a full range. Of note, older ages did predict disordered sleep, but did not effect sleep quality or duration in this study. And as we'll discuss, disordered sleep means sleep that is broken up across the day, rather than what we call consolidated sleep, which is a single sleep set when we get all of our hours. So, age did predict disordered sleep, but the quality and duration of sleep was unaffected by age. Of note, only 57% of this sample was employed, so that may be an indicator of how much sleep they're getting. The remainder were categorized as unemployed, but it should be noted that this includes students, retired people, those on disability, stay at home parents, or those individuals that were fully unemployed.

The regression model indicated that employment did negatively effect sleep duration, so the length of time spent sleeping, but it did not effect sleep quality and did not contribute to disordered sleep. That is having either a part-time or full-time job meant that you simply spent less time in bed. The racial representation in sleep research is also a critical factor in analyzing sleep, there's a growing body of literature describing the racial and socioeconomic impact on sleep disparities, including the effects of neighborhood disadvantage on the sleep environment, and the impact of psychosocial and occupational stressors, even racial battle fatigue and its effect on sleep processes. Please see the reference slide at the end of the course for those resources and

findings. What is important to know is that prior to this very recent study and tool, there was not a valid and reliable research survey to determine the state of sleep health in the U.S. We can hope that now that there is, the road that would open for additional studies will focus on unique issues effecting the sleep in minority populations, as well as aging. The tool was not designed to be administered to a pediatric population. And the study also included individuals with an identified disability, which directly impacted sleep. So, the study was looking at typical sleep across a broad population. We're going to spend a lot of time on this slide and we'll reference the concepts often as we continue, so we're going to get comfortable here and watch for my pointer. You probably now that REM sleep, rapid eye movement, and non-REM sleep make up a normal sleep cycle, but what do these cycles look like? How many times do we cycle through?

And what happens when we don't? How does sleep get disrupted or disorganized? Now, graphics, such as this, may look familiar to you if you've used a sleep app with a fitness band, which can track your nocturnal movements and heart rate, giving an indication of your sleep trends. Then let's take a closer look at this particular graphic. You see at the bottom that the X-axis here is hours in bed and the Y-axis here is stages of sleep, we have awake, REM, stage 1, stage 2, and deep. Wakefulness here is at the very top, so anytime this bar comes to the top, it's an awake state.

And you see that in normal sleep architecture, you are at a state of wakefulness, of course, at the beginning and the end of your sleep cycle. But, you also see wakefulness occurring a couple of times when you actually wake up before you end your sleep cycle at the end of the night. And those are occurring at about four hours in bed and about six hours in bed and asleep. And that varies, but this rise to wakefulness is a normal part of sleep architecture. You may drop back down to deep sleep if you're undisturbed or you may actually come to full wakefulness if there's a sleep disorder or a sleep disruption in that cycle. You may didn't notice that

anecdotally as you're talking with people about your night sleep as well. You commonly here, oh, I only got four hours of sleep or I only got six hours of sleep, where you rarely hear, I only got three hours of sleep. And that's because wakefulness doesn't tend to occur around this third hour. Around here, you tend to be in a stage of very deep sleep. And it's only in these stages where you rise to wakefulness. The next thing I'd like you to notice is how when you are first falling asleep, at the front end of the graph, with zero hours in bed. You see that the line dropping down from wakefulness waterfalls very quickly through all of these stages, through stage one, stage two, and then into deep sleep in just a matter of minutes.

This is a very quick falling asleep into deep sleep phase. Now, let's discuss those stages of sleep. All three levels, one, two, and deep, are considered non-REM. REM periods are the red bars that pattern across this cycle, the bars that rise up to this point of REM sleep. But, we won't get to REM sleep until we've been asleep for not quite two hours. So, we are primarily at this point looking at the sleep stages that are non-REM. So, think about your own sleep as we talk about this chart because we will assume you're a normal pain free sleeper.

Regardless, it's helpful for us to situate knowledge compared with our own experience as we attempt to learn it. So, in non-REM stage one, which is N1 on the chart, your eyes are heavy and closed, but you may not feel as if you're asleep. At the front of your sleep cycle, you do not spend to much time here before dropping down into stage two, and that's when you feel your muscles both contract and relax, and your heart rate and your body temperature go down. And your here, again, for just a few moments until you drop down into stage three sleep or deep sleep, on this chart. Now, in deep sleep, you're so deeply asleep that your disoriented if woken up and that is the deepest cycle that you will have. And looking at the graphic, you could see that you drop into that deep sleep fairly quickly. And except for a few bursts back in to stage two sleep, you may notice that those are the bursts that happen when your body jumps or jerks, which

suddenly occurs at those stage two spikes. You're in deep sleep for just about the first two hours of your sleep cycle, and again, for a portion of time at about three, three and a half hours in bed. And if you look at the shaded bars at this level, you'll notice that they only occur in the first half of the entire sleep cycle, and that by about three and a half hours in bed, that deep sleep stage disappears entirely. We don't get down to deep sleep again in the later night. In other words, those years I spent waiting for five hours before sneaking presents under the tree or money under the pillow, was very ill placed because my child was much more likely to wake up in the middle of the night than if I had done it shortly after seeing that he'd fallen asleep. Now, let's talk about REM sleep, which first appears as the red bar that you see just inside of two hours, that's about 90 minutes after you fall asleep.

Another thing you notice about those bars is that the width of them is variable. And if you wear a sleep band, you've noticed this across the graph that you get on your smartphone. But, most REM cycles are about 10 minutes long, some a little less, some a little more. REM, as you may be aware, is actually a very active sleep phase in which not only are your eyes moving rapidly, but your heart rate and your respiration rate increase from what they were.

And those are sprinkled throughout the sleep cycle, but don't begin until you've been asleep for almost two hours. You'll also notice that none of those REM cycles occur at the same time as level three deep sleep, they're occurring when you're probably at stage two. So, REM is only occurring when you're already at stage two and then hit that REM sleep phase. This is completely typical, except during these points when you may rise to stage one sleep. And that's typical as well and you see as we discussed when you rise to full wakefulness, even if you don't register being awake. But, this is something that we'll go on to discuss relative to the sleep environment, so I want you to keep it in mind. So, the takeaway message from this slide on normal sleep architecture, and a tip for the quiz, is that in normal sleep, a deep sleep is occurring in

the front half of the sleep cycle, disappears and does not reappear in the back half. In addition, when you first lie down and then finally get up, wakefulness occurs at regular intervals throughout the night. Typically about four and six hour points, but most sleepers do not fully awake during these middle of the night times unless sleep is disrupted. The other thing to notice is that light sleep punctuates the entire sleep cycle, even in normal sleep. By the way, if you're wondering about the accuracy of a consumer wearable in measuring your sleep, there is research to indicate that those devices are fairly accurate at measuring sleep for consumer purposes. They're actually much better at measuring the sleep cycle than they are calories burned because there's fewer confounding variables effecting your sleep movement.

But they do over estimate sleep duration by some amount compared to a research level accelerometer, between 24 and 67 minutes compared to those devices used in sleep research. But, most consumers find that it's an adequate indicator for their home and novel in trust. Now, we're going to discuss the two sleep process factors, Process S and Process C, as well as dim light melatonin onset and the role of melatonin in the body. In this two-process model, sleep scientists have identified Process S, which is sleep pressure build up, and Process C, which is our circadian rhythm.

And as you may know both effect and influence sleep. In Process S, what's called sleep pressure is built up over hours of wakefulness versus time spent in sleep. At the very beginning of the first sleep phase, sleep pressure is very high because assumably you've been awake for a number of hours. And then that diminishes as sleep occurs and you start to pay that sleep deficit. If you are disrupted later on in your sleep process, recall those cycles of wakefulness from our chart that occur at four and six hours of sleep, you many not get back to your sleep cycle again for a variety of reasons. But, one of which is that after the several hours of sleep that you did get, you may no longer have adequate sleep pressure built up to return to a sleep state. In Process C, the circadian rhythm, that determines the sleep/wake pattern, and we see

that it first emerges in newborns at about three months or 12 weeks old. Prior to 12 weeks, the very newborn tends to have equal phases of sleep and wake across 24 hours. You see another change occur in middle childhood when you see sleep preferences of either a morning person or a night owl begin to emerge. And then, of course, there's another shift in puberty as DLMO, or dim light melatonin onset, causes a one to two hours shift in both bedtime and morning arousal. Though, of course, while bedtimes do shift later, we are generally unable to shift our wake up time to one one to two hours later, so that's when an adolescent sleep deficit pattern starts to emerge. And backed by research, we're starting to see some school districts that are shifting their school start times to later in the morning to accommodate those biological factors for children that age.

Some of you that are parents with kids in school districts may begin to experience that or hear that buzz. In general, this Process C is regulated by what are called zeitgebers and that's a German word meaning time givers and those include daylight, darkness, daily routines that we have, such as mealtimes, and social activities, and self-care routines. An habituation of these zeitgebers prompt the release of melatonin, and we'll look at that more closely. So, melatonin is the naturally occurring hormone, which is secreted by the pineal gland, it's the most essential hormone effecting the sleep/wake cycle.

It's triggered in part by those zeitgebers, which we just discussed, and one of which is the impact of both natural and artificial light. When our body's are exposed to available light becoming more dim, something that occurred from millennia prior to the advent of electricity, it triggers a release of melatonin, which prompts the body to begin readiness for sleep. Of course, our use of both light bulbs and all kinds of screens has interrupted many of these processes. And, of course, I don't need to reiterate that dimming your screens and avoiding them all together at night is an important part of Process C. What may be surprising though is melatonin begins to be released about two hours prior to

the onset of sleep, so if you're using light blockers or dimmers, they need to be activated at least two hours before your planned bedtime and avoiding screens that are not dimmed in order for for it to be maximally effective. Now, many studies that we've heard about in both research and the popular press, discuss the effects of artificial light and blue screen technology on the release of natural melatonin. Now, if the body has been exposed to daytime light during the day and dimming as we move toward sleep, the average onset of sleep, that is the amount of time that it takes for a person to fall asleep from the moment they hit the pillow, is about 20 minutes. If they've been exposed to even blue filtered light, such as your phone with a blue blocker, that number could go up to about 30 minutes.

And then when it's exposed to bright blue enhanced lights, such as we've seen on unfiltered smartphones, participants were still awake from about half an hour to nearly 80 minutes later after their head hit the pillow, that's well over an hour that they've been trying to get to sleep. Of course, since we tend not to be very patient as we're staring at the ceiling, if we keep the phone by the bed and its taking us over an hour to get to sleep, chances are we're reaching for that phone again to entertain ourselves while we're waiting, which, of course, compounds the problem.

Pardon me, so let's summarize the sleep changes that we see, particularly in the elderly. Even though on our earlier slide of the sleep index, it indicated that sleep is not consolidated into one long sleep cycle, but the amount of sleep, the sleep duration, is not largely affected. Still, relatively to the idea of consolidated sleep, we know that even if the individual is sleeping ideally, the elder person does show sleep cycle changes. One including they spend less time in stage three sleep. Now, recall from our sleep architecture slide, that's the deepest phase of sleep. So, an elder individual may never get down to that level three deep sleep, which is actually where it is most restorative. So, they spend less time in those deep phases, and they also have reduced sleep pressure. So, recall that if there's disordered sleep, if sleep is occurring for that

individual in bits and pieces over the course of the day, they never have the opportunity to build up that sleep pressure that produces a long cycle of sleep during the night. There's also reduced strength of that circadian signal, as well as a reduction in melatonin production and a delay in its delivery. Now, keep in mind also, that our elder individuals may not be having the same exposure to light and dark and natural lighting during the day. So, again, that impacts the effect of that circadian signal. We know that they are spending more time in stage one sleep, that's the very lightest phase of sleep, which means that sleep is shallower and more disruptive over the course of the sleep cycle. So, elder individuals are, in fact, more sensitive to those subtle changes in the sleep environment, something that becomes very important when we look at our sleep culture inside of facilities.

And dehydration tends to be a factor that disrupts sleep. Now let's look at normal sleep compared to abnormal sleep, including parasomnias and dyssomnias, which we will begin to distinguish occur in the elderly. So, we're going to talk about parasomnias first because though rare, it's what we think of when we think of disorders of sleep, the stuff that we hear about in movies and stories, parasomnias are those things that occur at the level of arousal and around the transition between sleep and wakefulness, which results in an altered psychological state.

Since they tend to occur when an individual is partially disrupted during a sleep phase, recall that these are clustered in the first part of the sleep cycle, so we tend to see more parasomnia behaviors occurring in the first part of evening sleep. These are things like night terrors, nightmares, sleep walking and the like. Night terrors may be familiar to you since they occur in the front part of the night, caregivers are usually still milling around when a night terror strikes. Caregivers tend to attempt to interact and console the person who's exhibiting an autonomic nervous system response, but that person is visibly in fight or flight. If returned to bed, they tend to have amnesia for the episode, that is they don't remember it even occurring. There is a genetic component

to parasomnias and they tend to occur in a fairly small percentage of the population, about 1 to 7% in children and about 2% of adults. Sleepwalking episodes are usually short and can occur as a repetitive motor behavior, such as picking or pacing, but, of course, you've probably heard about more unusual sleepwalking stories where a sleepwalker will exit the home or try to, or be found in the neighbors yard, et cetera. Sleepwalking episodes tend to last less than 15 minutes, but episodes of up to an hour have been reported. If awoken, the person who is sleepwalking may be combative or violent if you attempt to interact with them. Up to 40% of children have had one sleepwalking episode in their lifetime and about 2 to 3% of children have more than one a month.

So, interestingly, the same number of adults continue to sleepwalk later in the lifespan. As a response, the best reaction to either sleepwalking or night terrors is to keep the person asleep or in their existing state to minimize the interaction and steer them back to bed without attempting to wake them or process the incident. So, understand that they are having a parasomnia, return the individual, and so, sleep, not wakefulness is the cure. And that's often where we make a mistake as a caregiver, we think that rousing them into wakefulness will disrupt the activity, but actually returning to sleep without interaction is the cure to that activity.

So, safely steering them back to a safe sleeping place is the safest and surest strategy. Confusional arousals are quite common and these are also partial arousals from sleep, like the ones we just saw, but these actually occur in the waking up phase, whereas the others are front of the night sleeping phase disorders. So, here, the individual has an elongated waking state and requires a longer than expected time to become alert. Again, it is pretty common in both children and older adults, as well as the sleep deprived. Since this is somebody coming into wakefulness, the best thing to do is to keep them safe and to have minimal interaction with them and not forcefully attempt wakefulness. The individual needs to settle into the environment and naturally come to

a fully alert state when they are ready. And this might sound familiar to some of you who've had grumpy interactions with people that have had kind of difficulty reentering during the morning. There's a handful of other parasomnias, such as sleep related eating disorders where individuals consume, usually, highly caloric and forbidden foods, or strange foods while in a sleepwalking state. As well as REM sleep behavior disorder in which individuals can be violent and combative during REM. These are fascinating case studies, but largely outside of the scope of today's lecture, but just to keep in mind if you see unusual behavior in a child or older adult or it's paired with what might be considered diminished alertness, remember that it could be a result of a sleep disorder and will be important to mention to the team.

Now, the word dyssomnia comes from "dys" meaning dysfunction and "somnia" meaning sleep, so dyssomnia is a generalized difficulty with either falling asleep or staying asleep. And people with dyssomnias have either poor quality or quantity of sleep, or poor organization of sleep, relative to the normal sleep cycle that we saw on the earlier slide. So, as a result of dyssomnia, a person may have excessive daytime sleepiness, of course, but could also have cognitive and behavioral changes that are correctable with sleep improvement. And as speech and language professionals focused on cognition, these are some things to keep in mind when you're doing those cognitive assessments is to take a look at how they are sleeping, as a function of daytime cognition.

So, as a result, sleep should always be considered by the entire team or discussed as a team when you're considering factors that effect a resident or client safety or performance. Several studies sited increase in sleep problems in older adults and these tend to be both intrinsic and extrinsic in nature. As we recall from the earlier slide, the National Sleep Foundation determined using their sleep index, that older adults were no different from other adults in either sleep quality or overall duration, but showed that significant difference in disordered sleep, meaning sleep was not well

organized in the older adult. So, in what ways is it disordered? So, these are the types of dyssomnias that are prevalent in older adults either falling asleep or staying asleep. This is, again, from the 2017 data, showing 94% reported waking up at least once during the night and 57% woke up too early in the morning. And then insomnia, again, the difficulty falling asleep in the front part of the night, effected 36% of the sample and a far greater number of women then men. Researchers believe that's related to continuation of hormonal changes in postmenopausal women. And then 27% of the sample subjectively reported feeling as though they just didn't get enough sleep. So, is this a standard sampling of older adults in our residential communities?

It probably is, though neurological conditions, such as stroke, acquired brain injury, or dementia, are not represented in these numbers, these, again, are community dwelling older adults. So, we can expect in our treatment populations that these number would, in fact, be far higher. In this sample, 99% of respondents had one or more chronic medical condition, such as hypertension, osteoporosis, or diabetes, 16% had chronic renal disease, whereas less than 2% of the sample had a diagnosed condition of sleep apnea, and that's something we'll talk about shortly. So, dyssomnias can be further characterized as those that are extrinsic or occurring outside of the body, versus intrinsic, related to the function of the body.

Some extrinsic factors can be room temperature, ambient noise or light, stress, and sleep behaviors, which are called, in general, sleep hygiene. Intrinsic factors inside of the body can be pain, respiration, sleep apnea, internal regulation, we'll talk abut restless leg syndrome, as well as possible seizure activity, for example. Here's another question for our quiz, you'll need to categorize an item on the quiz as either extrinsic or intrinsic, so let's begin to break these down. One of the easiest extrinsic factors to address in modern society is the room temperature. It's been identified that room temperature, ambient room temperature between 60 and 67 degrees at night is the most conducive to both falling asleep and staying asleep, however, we know that

elderly people tend to keep warmer home and room environments as a matter of preference due to more sedentary lifestyles, issues of circulation, et cetera. As caregivers, if we support residents in dropping their thermostat temperature at night, it may effect their sleep quality. Research does show that dropping core body temperature at the REM sleep cycle point, significantly impacts sleep duration and quality particularly in our elderly sleepers. We'll look more at core body temperature when we discuss internal regulation, which is an intrinsic factor, but this is one way that an intrinsic factor of room temperature, pardon me, an extrinsic is related to an intrinsic factor, how they're connected.

So, according to that study, the elderly population is, in fact, more sensitive to room temperature changes affecting their sleep cycle, which causes more frequent waking and can decrease REM cycles. So, as you recall, they have lighter phases of sleep, lighter stages of sleep and tend to wake up because their body temperature does not have the opportunity to drop, which prompts deeper levels of sleep occurring. Clothing worn to bed also impacts thermal regulation. It's discussed here because the clothing you wear outside of the body is an extrinsic factor that you can control, however, it's often a matter of strong personal preference and a cultural one, as well, so changing one's bedtime apparel may not be easy to do as changing the temperature, mechanically in the room environment.

So, considering whether the individual wears several layers of clothing to bed and more or fewer layers of blankets and covers on the bed, may effect how they're able to externally regulate their nighttime body temperature. While that cocoon warmth does, in fact, help individuals fall asleep, initially, the body's impaired ability to lower its temperature when it comes to phase two, if it's covered in clothes and covers, can actually cause wakefulness and prevent subsequent sleep cycles. So, lowering that thermostat later in the evening, after the person has retired and adjusting that setting based on how many clothes and layers they wore can have a positive effect on

nighttime wakefulness in a too warm condition. And remember, some of those spikes into the awake state for yourselves or your loved ones, may be occurring when your throwing the covers off and you're too hot. Those are the things that tend to cause full wakefulness rather than letting the individual drop back into a lower level of sleep. Ambient noise is something we're going to talk about here, though your ability to control it as a daytime worker may be limited, however, if you come armed to the team with this information, you can advocate for your residential communities to be watchful of nighttime noise. So, research shows that a decibel level of 40 decibels is recommended for optimal sleep, and that's equivalent to a quiet evening street in a residential neighborhood. Other comparisons of 40 decibels, I probably don't need to describe this to a speech therapy audience, but a quiet rural area is about 30 decibels, a conversation in the home is about 50.

Most vacuum cleaners are about 70 decibels, even the expensive ones, so changes are our heavy duty facility vacuums are far above that. So, again, considering that the deepest sleep occurs in the front part of the evening, it makes more sense if we're having staff run the vacuum on the hours shortly after the residents have gone to bed. At this time their sleep pressure will be at their highest and their sleep cycle will be at the deepest and they're less likely to be disrupted.

And yet how often do we hear about the staff waiting until the wee hours of the morning to complete their vacuuming in the halls? Now, let's discuss ambien light. So, not just city dwellers are effected by ambient light coming into the room, facility residents might be effected by a parking lot street lamp, for example, or streetlights on adjacent streets, as well, particularly as residential communities are converting their streetlights to the intensely bright LED bulbs. So, one thing to check is that window coverings are adequate to establish room darkness by either inquiring with the resident if they're woken up by light or by communicating with the nighttime staff. If it appears to be a problem that window coverings cannot fix, facility administration can request

that a shield be placed on city streetlamps, for example, or if possibly through facilities management, depending on who owns the streetlamp, where it's located. Nightlights are fine since they tend to be low wattage and located near the floor, and , of course, they're essential for resident safety. A lamp at eye level or overhead on dim is less desirable since it can cause wakefulness at those normal waking intervals. The team tends to carefully need to balance resident safety with their sleep needs. Ambient light also refers to the amount of light exposure that a resident receives as bedtime nears, so thinking back to our melatonin slide, residents that use electronic devices, as they often do to combat loneliness or boredom in the evening hours, may not be aware of the current research on the effects of blue light, which can delay sleep. So, checking that function for our elders devices is important, as well.

Again, that demonstrates how an extrinsic factor can impact sleep quality. Stress and psychosocial factors. This is something we can all relate to to some degree, but also uniquely affects our elder population. Stress leads to hyper arousal or perseveration, which both delay falling asleep, as well as causing you to become fully awake at those normal middle of the night times, preventing you from dropping back into a deeper sleep cycle. If the person finds they're unable to get back to sleep, once they've come awake during one of those middle of the night points, it may be due to perseverative thoughts. In addition, psychosocial factors that have been recorded specifically in the elderly are increased bereavement and grief in the nighttime hours and fear of dying during sleep.

So, any number of team members can explore these causes of nighttime stress whether it's a single issue or a collection of concerns. So, discussing these with the resident during the day and during your treatment sessions could be an important point of revealing what could be impacting their sleep. So, you may have the ability and rapport with the resident to reveal some of these issues and then pass it on to the other team members, as well. Many mindfulness techniques are available that the

individual can be taught to perform while they're trying to get to sleep or return to sleep. So, teaching those with return demonstrations during daytime therapy hours can improve independent performance of them at night when they're most needed. Maybe keeping a log of these activities or something by the bedside, a recording device, perhaps, for an individual to record and express their thoughts. Also supplementing your speech therapy program with a PT or wellness program if they're not already involved or an OT referral if they're not already involved or mental health, whoever's in charge of mental health in your environment may be indicated, as well. Sleep behaviors, you've probably also heard called sleep hygiene, are those habits that we have and how they effect sleep. Educating our residents on how these habits impact sleep and providing ways for them to engage and participate in healthy habits, can dramatically effect their sleep, as well.

That includes limiting any daytime naps to about 30 minutes, avoiding stimulants and depressants, such as alcohol, near bedtime. Of course, as we are moving them towards greater wellness enterprise, the recommendation for coffee and caffeine is often a question and that's to stop drinking coffee about four to six hours before bedtime. So, with an individual with an early bedtime, that means that they're probably not having coffee after lunch and watching their consumption of coffee in the early afternoon hours, for example.

Nicotine and alcohol cessation, of course, is a good idea for their health overall, but both of those can significantly impact sleep cycles. Even if an individual believes that they will help them or her get to sleep, it may be true causing them to fall asleep initially, but then do cause wakefulness later on in the sleep cycle. Of course, daytime exercise is a powerful tool to improve both sleep quality and duration. Exercise also needs to be completed about four hours before bedtime and that's where some of us that are getting working out after our work hours, may be impacting our body's ability to quiet down for sleep. An individual should also avoid heavy foods at night since

digestion can delay sleep onset. And the individual should, of course, get adequate daylight during the day to stimulate that melatonin onset, which we've discussed. This can be accomplished by outside or courtyard time, adequate exposure to windows and natural light, opening up those closed blinds we see in so many rooms in both shared and private room spaces. Often residents that are in their rooms for much of the day, also keep their windows covered during that time, which is detrimental to the body clock, as well as mood and engagement, so, again, the education and support of the therapy team is critical here.

One thing to be aware of is what we call the sleep maintenance zone and activation, but not exercise in the few hours before bedtime is essential to having good nighttime sleep, and sleep researchers have called this the wake maintenance zone. Where older adults being studied were accumulating more sleep in the hour or two leading up to bedtime than younger participants, these are the individuals that are falling asleep in the hallways at four o'clock.

So, we need to make our residential environments aware that residents need to maintain that wake maintenance zone in the pre-later afternoon, pre-dinner hours to ensure that they have optimal sleep pressure at bedtime. And if we think about where we stagger our activities, it's usually around the morning, mid-morning, early afternoon, and then our activities schedules tend to drop off right at the time we need those residents to actually be awake in order to have a good nighttime sleep. So, thinking back to the intrinsic factors effecting sleep, chronic pain and discomfort in positioning are the most commonly sided reasons for poor sleep in older adults. In our treatment population it will most certainly be a significant factor. In this module, we'll be looking at how those diagnose a specific issues effecting the older adult impacts sleep and how we can mitigate some of those factors. So, in a very large study of Japanese elders, they had an "n" size of 3,732 elderly people over 65. 68% of that sample complained of bodily pain effecting sleep. So, there's clearly a high percentage

of pain in the elderly population. Those who endorsed higher rates of pain also reported taking longer to fall asleep, more frequent awakening and poorer sleep consolidation then typical. The mechanism effecting sleep is unclear, relative to pain there's a number of confounding variables, but it's understood that pain increases that level of arousal, which then interferes with the body quieting down for sleep. Further, of course, pain medications are medications for underlying conditions causing pain, may be effecting sleep cycle as a side effect.

Typically, non-pharmacological interventions are recommended, such as imagery training, or progressive muscle relaxation that could be provided by the therapy team or a wellness program that you design, as well as a sleep restriction program devised by the medical team if sleep is delayed by three or more hours or two to three hours on successive nights and we'll discuss that in a later slide. Now that we're moving into respiration, I wanna establish a background of understanding, and apnea is any cessation of breathing lasting at least 10 seconds during which there is no respiratory effort. And of apneas there are three central obstructive and mixed. In central apnea, you see an impaired neurological signal in which the brain isn't effectively triggering respiration.

Whereas with obstructive apnea, you see a mechanical problem interfering with respiration, either at the upper airway, including the tongue, the soft palate or pharyngeal collapse. In mixed apnea, aspects of both are present. Hypopnea, on the other hand, comes from the root of "hypo" or below and is defined as slow or shallow breathing that's inefficient and causes desaturation of at least 4% or greater. So, with that background, we're gonna discuss the significant aspects of respiration effecting the elderly. So, sleep disordered breathing refers to general disruption in breathing during sleep in a large portion of the elderly. So, sleep disordered breathing is directly dependent on age and we see prevalence as high as 70%, depending on the population being studied. In one study, 44% of adults over 65 were recorded as having

at least 20 events per hour, which is a significant loss of oxygen. Of significant interest, there's evidence of a direct correlation between sleep disordered breathing and dementia in individuals younger than 80. So, that means at age 80, there's some other factors that start to effect cognition, of course, but in those younger than 80, the higher the severity of sleep disordered breathing, meaning the more episodes per hour, the lower cognitive functioning and the more severe the effects of dementia, pardon me, I'll say that again, the more severely disordered, the breathing during sleep, the more severe the cognitive decline. Once sleep disordered breathing has been identified, CPAP is recommended to reduce the number of offense per hour and we'll discuss CPAP a little further on.

So, I know you're aware of sleep apnea, but hopefully this will expand upon some of your understanding. So, the most common factors seen in obstructive sleep apnea are obesity, male gender and age, and heredity, meaning that it tends to be undetected or under diagnosed in elderly women, in particular. Now, this is particularly interesting giving in the prior slide where we discussed the relationship of respiration and dementia because we tend to see higher levels of dementia in women and fewer women have their sleep apneas identified.

So, this is an area where research is expanding and you might want to consider getting your elderly clients and family members into a sleep study, particularly the women, and I'm already noticing this trend in research on the West Coast. Another thing to consider is the finding that obesity is no longer predictive of sleep apnea once an individual reaches their 70s and 80s if it hasn't already been diagnosed at younger ages. That's because across body types and BMI, we see what's described as an age-dependent loss of pharyngeal motor units. So, there's a current study underway that's evaluating the effective and overall strength training program on the performance of those motor units, so that could be a potentially exciting finding. But, the takeaway message is until those results come in, you just won't find a downside to an appropriately administered

fitness program for your elderly clients because exercise and sleep are so closely associated. So, as promised earlier, here we are, again, discussing internal regulation, particularly thermoregulation. We already talked about completing exercise well before bedtime to allow that core body temperature to drop back down to baseline. But, let's also look at what naturally occurs in the typical sleep cycle. So, again, your body's drop in core temperature actually prompts the body to enter stage two sleep, and then the core temperature comes up again at the end of the sleep cycle to stimulate waking. Now, this isn't a full and typical sleep cycle in which the individual isn't awaken by various other events. If their able to stay awake as expected, it's the rise in body temperature that helps stimulate natural waking.

Here, we're discussing periodic limb movement disorder, which you see as PLMD, or PLMS, which is no quite the same as restless leg syndrome, it's actually twice as common and can be co-occurring with restless leg syndrome. The difference between the two is that periodic limb movement disorder occurs when the individual is asleep, whereas restless leg occurs when the person is trying to fall asleep but remains awake. Treatment for the condition is standard sleep hygiene, massage and foot wraps at bedtime have been somewhat effective in the literature.

Again, overall wellness and fitness programs alleviate occurrence of this condition. Iron supplementation or medications may be used depending on its severity or impact, as well as any co-occurring conditions. So, with restless leg we have a neurologic condition, which is the urge to move the legs, accompanied by parasthesia or a burning, prickly sensation. And as you see individuals, this occurs in all ages. Prevalence in the elderly is variable, it seen from 40 to 20%, depending on the study. Again, this occurs at night when the person is awake and lying down trying to get to sleep. The sensation is alleviated by movement, making this a major cause of nighttime wondering in our residential communities. And the treatment response is just the same as we discussed regarding standard sleep hygiene, which is massage and foot wraps,

wellness and fitness. Supplementation and medication should be discussed. So, how does Alzheimer's effect the sleep cycle? We'll discuss this for our last few minutes because we see that the sleep cycle pattern is similar to same age individuals without Alzheimer's, except the deviations that do occur tend to be more severe. That is individuals with Alzheimer's spend even less time in REM sleep compared with their same age peers. There is even greater disruption in their Process C, again, recall that that's the circadian rhythm. They are producing less melatonin than their same age peers. And they have greater dysregulation of their body temperature. So, again, some of those external sources of sleep improvement or environment improvement will be particularly interesting for individuals in Alzheimer's units. Incidence varies depending on the study, but tends to be about a third of individuals with Alzheimer's have disordered sleep.

It can be a significant source of stress for caregivers who then have their hands full during the daytime and the nighttime, as well. Treatment for the individual is the same, depending on the issues effecting sleep. But, we see that sleep hygiene may need to be managed and maintained by the caregiver instead of the individuals themselves. Studies that look at CPAP compliance for diagnosis of sleep apnea or sleep disordered breathing, showed that if it's introduced in the early stages of Alzheimer's, and has the opportunity to become habitual in those early stages, then it can be as successful as an individual without Alzheimer's.

Again, medications may be recommended, depending on the severity, as well as any co-occurring conditions. So, other assessment and treatment approaches. The first line is sleep logs and sleep diaries, something that we should be initiating in our residential communities and very appropriate rule for speech therapy practitioners. A sleep medicine specialist, if you make a referral, will send you back with a recommendation to keep a sleep log before you come back for a further workup. Pulse oximetry is helpful as a screening device, but on its own, not a definitive diagnostic tool.

Polysomnography, which is a full sleep study, is the "gold standard" of sleep assessment, it measures brain waves, oxygen, heart rate, respiration, et cetera. And a comprehensive workup would include all the contributing disease factors, as well as psychosocial, psychiatric, and behavioral factors, as well as cognition. So, I'm just going to give a nod to pharmaceuticals, we've already talked about sedative hypnotics being discouraged, they tend to have adverse side effects, as well as issues of daytime sedation, motor incoordination, and increased fall risk, in addition to what the individual may already be experiencing. So, there's a lot of reasons, there are some pharmaceuticals that are recommended, including the benzos and antipsychotics depending on the mechanism, but it's usually not the right answer and certainly isn't a go-to.

And in my experience among the rehab therapies, speech therapists are often the experts in those pharmaceutical interactions and how they impact the individuals. So, one important thing to note as we're discussing your role on the rehab team addressing sleep, is to hone your knowledge of particularly how an individuals medication may effect their sleep cycle. In some studies, melatonin replacement has been showing promise, but in Alzheimer's it also has mixed results, so there's not a definitive answer in evidence-based practice around melatonin supplementation, at present. Those therapies that tend to combine bright light exposure with melatonin supplementation seem to show better response. So, looking at CPAP, which, again, we know is not curative, it may reduce the number of respiratory events for an individual. And, again, we discussed if it's introduced early, may be tolerated equally by residents both with and without Alzheimer's disease. Thinking about sleep restriction, that's the ability to administer by changing the sleep pressure of an individual, bringing them back over time to a regular bedtime. And an individual that's unable to fall asleep until 2 a.m., for example, you restrict their sleep until they're moving to an 11 p.m. bedtime and then stick to that and that's something that a physician may recommend. So, as we close, I want to discuss that shaping the supportive sleep culture. Again, we talked

at length about therapies role in providing adequate sensory stimulation, exposure to natural light, providing those activities during the wake maintenance zone, including some sensory wind-down programs that may be meaningful for the individual that would prompt those sleep behaviors. And again, things that all of us on the rehab team can do, promote the light exposure during the awake hours. Look at later afternoon programming to provide something for individuals in that wake maintenance zone. And if you have a particular interest in the sleep process, coming forward as a sleep team champion or forming a sleep team in your workspace or work environment. And really beginning to hone in and address sleep as an impact of daytime behavior. And just talking about and beginning to discuss as a group, the impact of those nighttime interactions and cleaning routines. And, again, some rehab team roles. And if the team is seeing behaviors that could be associated with poor sleep, taking that investigative dive should be step one, it's the person factor upon which all other aspects of performance are based for them and ourselves. I'm gonna close with questions and resources, my own email address, along with the Academy of Sleep Medicine, and a number of references for you to consult if you're interested in further study. Thank you for your time today.

- [Amy] Thank you so much Teresa, we appreciate your time today, as well. I know we're a little bit past the time, past the hour, so those of you who do need to log off, please feel free to do so. If we have a few moments to address a couple questions that are coming in, Teresa, I'd be happy to read those for you, is that okay?

- [Teresa] Absolutely.

- [Amy] First question is just asking if you could please define sleep pressure, again.

- [Teresa] So sleep pressure is one of those sleep processes where pressure for sleep is built up over hours of wakefulness, so the longer you've been asleep, sleep pressure or the need for sleep builds up in the body and that's what sleep pressure is.

- [Amy] Thank you for clarifying that. And then also what is wake maintenance zone?

- [Teresa] The wake maintenance zone is those hours before bedtime sleep in which the individual should be awake. So, again, that tends to be around the dinner hour, later afternoon, when we tend to see residents or elders nodding off, when, in fact, they need to be kept awake in order to have good nighttime sleep. So, the wake maintenance zone is the handful of hours occurring before nighttime sleep is expected to occur, generally around the dinner hour, I would say.

- [Amy] Thank you. Can you talk briefly about how poor sleep can contribute to some children being diagnosed with ADD or ADHD? Are you able to speak to that?

- [Teresa] Absolutely, I've dabbled in sleep in pediatric populations, as well, although it's a little bit outside of the scope of this course, but I will refer you that there's a number, a large amount of research about how sleep can maybe not impact diagnosis, but certainly impact behaviors that are seen in children. And that's one thing that threads over to our content regarding the elderly, as well, is we often look to other issues when we see concerning behaviors when we should perhaps be looking to sleep as one of the first items in ensuring that the individual has kind of a full set of tools with which to approach their day, and that's particularly true for our vulnerable populations, including children and the elderly.

- [Amy] And then one last question. This might be more clarification at this point, but when patients are excessively sleeping during the day, I imagine it effects the sleep

pressure, what is your recommendation on the amount of rest people should have during the day?

- [Teresa] Well, again, keeping in mind, there was one slide that emphasized that naps should be kept to about half an hour, but it's also true that elders are getting their sleep in chunks throughout the day. And so it's kind of a balance between keeping them active and awake and also appreciating their need for increased rest kind of punctuated throughout the day, which may occur as a nap, which is completely appropriate. And again, we may not need to intervene where there's not a problem with nighttime sleep, we may only need to intervene when we see those behaviors or complaints that sleep is a problem.

- [Amy] And then one last question. Can you explain what is nighttime perseveration, please?

- [Teresa] Certainly, so perseveration, getting stuck in a thought loop. So, often that occurs at night and for our elderly individuals, it's when we see those psychosocial complaints, like loneliness, like grief, where an individual just kind of spins in that space, cognitively.

- [Amy] Perfect, thank you so much for clarifying that. I think we'll go ahead and wrap it up there. Again, thank you so much for joining us Teresa, it's always a pleasure to have you here and learn some really fascinating things about sleep and certainly a lot that I did not know, so we appreciate you sharing your expertise, for sure.

- [Teresa] Something for everyone.

- [Amy] Something for everyone, for sure. So, thanks to all of our participants for joining us today. We really appreciate your time, as well, and look forward to seeing everyone again soon. Take care everyone.