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Challenges to Seating and Positioning: Common Seating
Misconceptions that Get in the Way, presented in
partnership with The Permobil Academy

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- [Fawn] Our course today is Challenges to Seating and Positioning: Common Seating Misconceptions That Get in the Way, presented in partnership with the Permobil Academy. Our presenter today is Ana Endsjo. She is an occupational therapist that has worked as an occupational therapist since 2001 in a variety of treatment settings including a acute care, subacute care, outpatient, acute rehab, long-term care, and as a lymphedema certified therapist. She has worked mostly with the geriatric population, focused on seating and positioning and contracture management of the nursing home resident. In January 2016, she started a new role with Comfort Company as the clinical education manager for the long-term care division. And then joined the Permobil family in October 2017 as clinical marketing manager. In this role she developed an education program for long-term care settings with the hope to guide other therapists, rehab directors, nurses and administrators to understand the critical role proper wheelchair positioning plays in the prevention and treatment of serious health complications within long-term care centers. Welcome Ana, we're so happy to have you.

- [Ana] Thank you Fawn. I'm just gonna start to share my screen, so one moment. Okay, so it should be coming up now. Okay, well thank you very much Fawn, and as he explained, my name is Ana Endsjo and I am the National Education manager for Permobil. So there's my faculty disclosure. And for today's course, I'd really like for you guys to be able to number one, name three common misconceptions that lead to poor posture in a wheelchair. Number two, name three reasons why a K4 manual wheelchair is a better option than a K1, K2, K3, manual wheelchair in the long-term care setting. And then number three, describe three negative consequences to the wheelchair user when using elevating leg rest on a manual wheelchair.

So, to start off today's course, I really wanted to share a little bit of my personal experience. And when I first started in the nursing home setting, you know, as Fawn had said I'd worked in acute-care, subacute care, acute rehab, I'm a lymphedema certified therapist. So I pretty much did it all. And I was very confident in being a

therapist, and I was extremely confident in the skill sets that I had. But one thing that I didn't have is my skill-set was wheelchair positioning. And I remember vividly my first day on the job in the Skilled Nursing Facility, and I walked in. The rehab manager welcomed me to the team, told me how excited she was to have me there, and then in the next breath she says, "Oh, and I failed to mention in your interview process "that you will now be the sole therapist "responsible for all the positioning needs "of every resident here at this 120 bed facility." And I absolutely panicked. And I remember thinking, "Oh please, don't let my face "show what's going on inside of my body right now." And you know, any setting that I had worked at before always had another therapist. They were the seating specialist. But now it was expected of me to be that specialist and I honestly, I felt lost and I just didn't even know where to start. And I share this experience with you because I think that in settings where there's more generalist therapist. Like in the in the long-term care arena where we're expected to kind of change hats and see all the whole gamut of types of patients.

I think that seating and positioning is something that we're not taught very well at school, or at least back in the day when I went to school, and that is changing, but then we go into the workforce and we're expected to kind of be gurus in the setting and really position are patients well. And so I had a big task ahead of me and it forced me to put seating and positioning into perspective very quickly, and figure out that it takes much more than a cushion to position my residents well. I quickly had to do research. I quickly had to start taking a lot of courses. I reached out to gurus in this seating clinics and more than anything, most of my learning came from trial and error. And I realize that through mostly trial and error, that seating and positioning really comes down to one very simple equation, and that's kind of what I want you to take out of this today. And the question has three very critical components. And those components are that if you consider each one of these with every single client, no matter how easy or complex that referral might seem, if you always consider, what is the appropriate style cushion? Should I be using a general use cushion, or a skin

protection, or a skin protection positioning cushion? Plus understand the importance and the interplay with an appropriate back support. And then really take into consideration the correct model of wheelchair. That no matter how easy or difficult each of those referrals might be, you are always going to end up with the final sum of an optimal seating system.

And like I said, when we consider each of those components with every single resident that comes across us, then together they'll be able to number one, achieve postural stability so that we can avoid unwanted movement. Such as sliding down, or leaning over, or slouching forward in the chair. Then and only then will we allow for even pressure distribution throughout the greatest surface area of the spine, the pelvis, along the femurs, to really then minimize the risk of a pressure injury from developing and also maybe help to heal any existing wound. And then and only then will we be able to maintain the postural alignment for hours on end so that our residents can functionally, you know, function at their maximum capacity from six a.m. when they get into the chair until four p.m. when they get out of the chair. But then there's always that little misconception that kind of creeps into every aspect of our lives, so why would seating and positioning be any different? And my goal for today is to clear up some of the common misconceptions that are getting in the way of successful seating and positioning evaluations and interventions.

So the four misconceptions I'm gonna focus on, are number one, 90, 90, 90, is what we should be aiming for with every resident. And I know this was really pushed 20 some years ago when I was in school. And it's sometimes even being taught today. And I actually know that it's still in some textbooks, so it's kind of shameful but we're really working hard to change that. And the second misconception is that the K1, K2 standard wheelchairs are the economical choice in the long-term care. Number three, a new cushion is all you need to fix the positioning issue, and then number four, elevating leg rests are a better option when purchasing a chair. Especially a manual

chair. And the first misconception was that 90, 90, 90, that we should be aiming for with every single resident. And when I first started teaching courses and I knew that this was one of the big things that I needed to come of put a big slash through, I started thinking to myself, "Well where in the heck did this even come from?" And I knew it was an old school train of thought, but I just didn't realize how old it really was. And as I said, the more I looked into this, it stems back all the way from the 1880s. And it was actually started by a Prussian orthopedic surgeon. And what was interesting, it's not like today where we can't even sneeze without having best practice of exactly how we should do it, so that we're doing it correctly. He had absolutely no scientific proof, obviously, that this was the posture we should be aiming for. And he really just based it off of that military culture of a very stiff, erect midline, symmetrical posture of a soldier. And I guess he must've thought, "Well, if this is what we aim for in our military, "this would be good for everyone."

However, 90, 90, 90 is difficult for us as younger healthier individuals to maintain, so why in the world would we expect elderly individuals with range of motion limitations to really be able to achieve or maintain this posture for long periods of time. So within our elderly population, you know, they've gone through a lifetime of stress and strain that really changed their skeletal and muscular structure that's not going to either allow them to achieve 90 degrees at the hips, and the knees, and the ankles. Or, if they can achieve it, they most likely can't tolerate that for long periods of time. And why? What are some of the reasons why they can't? And number one, you know, we're dealing with a population that they're not going to the gym and performing yoga, and Pilates, and exercising, and stretching. They're sitting in a chair or lying in a bed for long periods of time for hours on end. So naturally, what's gonna happen? Muscles are going to tighten, they're gonna shorten, and they're gonna pull on whatever skeletal structure they're attached to. And when it comes to with the seated posture, in the wheelchair, one muscle that shortens probably the most are our hamstrings muscles. And they attach at our ischial tuberosity's on our pelvis. They run down the thigh, cross

the knee joint, and then attach to the tibia and the fibula. So as this muscle shortens, it's going to pull on the pelvis, pull it forward into a posterior pelvic tilt, and it's also gonna draw the knee inward to close that angle at the knee joint. So it's going to be impossible for us to achieve that 90 degrees most of the time. And if they continue to sit in that posture for long periods of time, they run a risk of even becoming contracted. So then it will be impossible to get them back out of it.

Another problem with that theory is that as we get older we're just less linear. And you can see that really well in this illustration here. That through the decades of life we go from a very mild curvature to a very extreme curvature. So sitting up at 90 degree angles really demand a person that can become linear and stay linear. And as we age, as you can see, we become more rounded. We're not able to then fit a curved skeleton into a tight, linear, 90 degree angled chair. And then other changes that occur, that make that 90, 90, 90 difficult is that, you know, we just hurt. Arthritis is everywhere. I'm only 42-years-old and I think I have arthritis in every joint. And when we sit upright in a wheelchair, all the downward pressure coming from gravity that's pushing us and maintaining us in a chair, plus the counter pressure coming up from the seat surface really puts a lot of pressure on those arthritic painful joints. So the client can tolerate it, and whether they realize it or not, consciously or unconsciously, they're gonna slide out of that 90 degrees to relieve whatever pain they feel.

The last thing is that, you know, we're dealing with clients that have mobility issues, strength issues, endurance issues. And as they start to slide into abnormal postures out of that 90 degrees, they're not able to then reposition themselves, perform pressure relieving techniques. And once they've slid into that posture, they're probably not coming back out. Which places them at a high high risk for falls and increase risk for pressure injury. So if you wanna stop unwanted pressure, if you want to stop unwanted movement and pain leading to contractures and falls and wounds, we need to start focusing on postures that an elderly body can tolerate. And I can honestly say

that is not 90, 90, 90. So unlike that Prussian orthopedic surgeon, we do have research that is suggesting that the optimal seat to back angle is not 90 degrees. And I just want to clarify, when I refer the seat to back angle, if you look at this gentleman in a wheelchair, the seat to back angle refers to where the back support. I'm sorry, the back support and the seat support come together. So this angle right here. And the studies on the screen were performed with healthy, young individuals, without any type of postural compromise. So they don't have contractures, they can move freely in and out of any posture they want. And that population reported that 90 degrees seat to back angle was not ideal for them to be able to form their job tasks or to study without pain or having just slide into some type of compromised posture to alleviate pressure.

So they reported that in order to perform their job tasks or to study without issues, they needed a more open seat to back angle of anywhere between 100 to 110 degrees. So that would mean that I would then open seat to back angle to increase that angle right here from 90 to 100 to 110 degrees. So the take home message is, why should we attempt to force our health compromised elderly population to sit at 90, 90, 90, when it wasn't even preferred with this young, healthy population? And seating specialists out there really are working hard to change this train of thought, that 90, 90, 90 is what to aim for. And they really want to increase the understanding of angles in a wheelchair configuration. So instead of trying to position them at 90 degrees, look to open or closed angles depending on what your clients bodies asking, okay? So this way we can then achieve maximum contact with both the seat and the back surface. And when we're sitting in, you know, a 90 degree angle in a chair, 40 to 90% more stress and strain is going straight through the spine. So if you look at my little, this is my Blue Man Group, as I like to call 'em. If you look at this little guy up in the right-hand corner of the screen, he is sitting at 90 degrees. He's got the downward pressure from gravity making sure he stays in his chair, plus the upper pressure coming from the seat surface that's causing a lot of pain and pressure to go straight through a very erect spine. Whereas if I would take this back and I would open seat to back angle, then I

could get some of that pressure off, alleviating, you know, from directly going up and down the spine, where he'll have less pain. You have less risk of his trunk muscles fatiguing, that would then allow this client to sit for longer periods of time in the wheelchair without the risk of falling or developing a pressure injury, or some other health complications. Another problem is that 75% of our weight goes through our pelvis when we're in the wheelchair system.

So, if we try to allow someone who has compromised range of motion, strength and mobility to sit at 90 degrees, they can't tolerate it, what ends up happening is obviously they're gonna start shifting into what we call abnormal postures. And you can see those here at the bottom of the screen. So things like a posterior pelvic tilt with a kyphotic spine. Or a pelvic obliquity with a scoliosis. And when they sit in one of these postures, they're gonna start putting the brunt of that 75% of our weight directly onto whatever bony prominence it is that they're sitting on. So with a posterior pelvic tilt, you're looking at the sacrum, the coccyx, and the IT's. If they were sitting in obliquity for example, you're looking at one of the lower IT's that's gonna be taking the brunt of that 75% overweight. Which obviously is gonna significantly increase their risk of a pressure injury. So there are consequences of erroneously striving for that 90, 90, 90. And by using angles that actually match the clients needs, we're able to achieve, again, maximum contact of the residents body with both the back and support surface. The seat support surface.

So, the first step to ensuring that we get the right angle is in during our evaluations obviously. We need to get the patient out of the chair, put them on a mat table, see how much range of motion they have at their joints, see what their hamstring integrity is like, and then take measurements to then translate that to the seated posture. So I'm gonna take this patient right here for example. I performed her mat measurements and I have found that she has 75 degrees of hip extension. And that is fixed. It's non-reducible. I can't get her past that to come up to 90 degrees. So, if I then try to put

her at a 90 degree chair, I'm gonna have a lot of issues. So when I realized that she had 75 degrees of hip extension, that made me realize that I would have to then open the seat to back angle to 105 degrees in order to compensate for that range of motion limitation. And when I didn't, what ends up happening is we create what are called as gaps. Spaces between the back support and the seat support and the client's body. And you can see this really well in the picture, because I'm actually putting my hand between her and the back, and you can see right here there's huge space between her pelvis and actually the back of the chair.

So when there are gaps, we're unable to stabilize the pelvis, the spine, and extremity, and the client will start to shift into an unwanted posture. And in her case, she started to shift into a posterior pelvic tilt. And what happens is she has absolutely no femoral contacts. So her femurs are hanging off the front of the chair. She has no support throughout her gluteal surface, none throughout her lumbar spine, and again, all the blunt of the pressure is going straight onto her sacrum and her IT's, and then at one pressure point along her back. So this not only decreases her stability to cause her to maybe slide in the chair more, but again it's going to increase the risk of a wound where those areas are making direct contact. Because now, the pressure is entering in small areas instead of throughout the entire femur and throughout the entire gluteal surface and throughout the entire spine, it's only entering in small surface areas like daggers that are going to create a pressure injury.

And of course, I have to speak of this because we are talking about nursing home settings, and, you know, we really do see an overuse of tall reclining back chairs in that type of setting. And the danger of this style of chair is that they're commonly reclined way too much. So I think a lot of times families and CNAs come in and they're like "You know, Mom doesn't look comfortable, "so I'm just gonna recliner as far as I can." Kind of like a La-Z-Boy. And I'm gonna open her up and she's gonna be sitting at more of 130 degrees or 120 degrees. And that's almost lying flat in a wheelchair. And what

happens then is that the client begins to slide forward out of the chair, placing, you know, going more until posterior pelvic tilt, putting more pressure right under those bony prominences, increasing their risk to fall. So opening a seat to back angle too much through the use of a tall reclining back chair can be just as detrimental as not opening it at all. So I just wanted to make sure that you guys were aware of that.

All right, so now I've told you everything you shouldn't be aiming for, what should we aim for when it comes to seat to back angle and what I should be doing? And the first question that's probably popping into your mind is, "Well how do I adjust seat to back angle in a wheelchair?" And the answer brings us back to that simple equation that you guys saw in some of the first slides. And it really forces us to remember two of those key components in that equation. And the first method is by using a model wheelchair that has the capability to open up the seat to back angles. And it does it through the actual canes on the wheelchair itself. And you can use in conjunction with a wheelchair model that has the ability to adjust seat to back angle, you can change out the sling back and also use a back support that through the hardware or maybe through its strapping mechanism also gives you the capability to open or close seat to back angle to whatever is ideal for that specific client. And whether it be through the back canes on the appropriate model of wheelchair, and or, if you can't go and buy a new model wheelchair that has that ability, but you can change out the back support, then when we're able to open and close seat to back angle we're then able to increase the contact of the person with both the seat and the back support surface to fill in those gaps that were created. And you can see that very well right here. Closed tight 90 degrees. Person can't tolerate it, can't even get their pelvis all the way back into the chair. So you have huge gaps created, the femur isn't making good contact. If I open seat to back angle, either through the model of wheelchair or through the back support that I have put on to the wheelchair, I am then able to get the pelvis all the way back in the chair, and the cushion that I have now put into that wheelchair system can actually do the job that it was intended to do. Because we're very quick to blame cushions. Oh,

you know, I read its description. It said it's supposed to do this, that, and the other, but it's not doing it. It's failed, it's a failure. It was a waste of a cushion. I spent money on the wrong thing. Well how can a cushion do its job if we don't even have the pelvis in the pelvic well that where the manufacturer intended for the pelvis to be in order for that cushion to do all the great things it's supposed to do? So if we don't have the appropriate seat to back angle, and the pelvis isn't all the way back where it's supposed to be, that best fishing on the market is gonna become ineffective.

Another great thing about changing seat to back angle is again, I told you, it allows for more contact with the back support and the seat support. So now the pelvis is all the way back, you have more contact along the entire your femoral surface, throughout the entire gluteal surface, and more along the spine. So instead of one small point of contact, you're having a greater surface area so you have an even pressure distribution. And allows for more stabilization. So again, if I take it one step even further and I take off that straight back, I put on a specialized back support that has the ability to be conformed to the clients spine, whether it be on normal or an abnormal curvature, I can then fit this wheelchair system like a glove to that person's curvature and I can stabilize the entire trunk, the entire gluteal surface and along the femurs so that that person is nice and stable in their seating system.

All right, so now what I'm gonna do is I'm gonna move on to misconception number two. And this misconception is that the K1, K2 standard wheelchair is the economical choice. And yes, they absolutely do have a lower upfront cost, however, due to the fact that they have that fixed 90-degree angle and the lack of adjustability, these chairs are incapable of creating a seating system that will fit the client like a glove that I just talked about. So in the long run, they might end up costing the facility much more money because of a higher incidence of falls, pressure injury development, and other very serious health complications due to the lack of adjustability. So, I'm gonna let you in on another personal secret of mine, and that is that I love car shopping. I love the

smell, I love everything about it! And this picture perfectly depicts the adjustability that is available in a car seat. It depicts what pushes us to upgrade a vehicle with maximum adjustability. And when you buy a new car, that salesperson will spend up to 15 minutes on trying to sell you on the trinkets of the seat alone. And he will dazzle us with how it conforms to your body, how it's ergonomically correct, and boasts about things like you can recline. Which is opening seat to back angle. How you can add lumbar support. It might even have two settings for lumbar support. How you can create a fix tilt, which you can see right here in the picture of the lady. How you can adjust the armrest height and angle so that you're getting appropriate contact and stability to take pressure off your neck and your shoulders while you're driving. How you can bring the chair forward so you aren't straining to reach the steering wheel and the pedals. How you can lower or raise seat to floor height according to your height so that you can better see out the windshield and also access the pedals better.

He even boasts that there's a little button that you can set so that every time you get in that car the seat is perfectly matched to conform to your body. And he makes you think about that 20 minutes to one hour commute that you have daily, and that how you deserve to be comfortable and that you need to be safe. And we will. We'll spend extra money to upgrade to all those options. And rightly so. There's nothing wrong with that. Correct ergonomics is very important. We need to take care of ourselves to reduce pain and reduce the risk of injury because we only have one body. And I honestly have had a car where I started having hip pain because the seat was not ergonomically correct and it caused me a lot of pain, and I ended up trading that car out. So we're not wrong in opting for this in our car seating system, but what I want to get you thinking about is why do we strive for this for ourselves and our vehicles, but these principles kind of just poof, slip our mind when it comes to seating our clients in their wheelchair system? This is the exact same principle. We need to start translating this concept to the seated posture of our residents. Especially the elderly population. That's not spending 15 minutes to 30 minutes to one hour at a time commuting.

They're sitting in these wheelchairs for hours on end. Six hours, eight hours, 10 hours at a time in their wheelchair system.

Why shouldn't we be giving them the same adjustability and the ability to conform to their curvature like we want so badly in our new car? So what I'm gonna do is I'm gonna compare some of the commonly used manual wheelchair models in our nursing home setting, and I'm gonna start by letting you understand the names. And pictured here I have a K1 through K4 wheelchair model. And as well as their number code, they also have an actual name. So the K1 is our standard wheelchair. K2 is the standard Hemi. K3 is a lightweight. And the K4 is a high strength lightweight chair. And I think an important concept for us understand is that all products, from tennis shoes, to wheelchairs, to book bags, whatever it may be, are all built with a very specific purpose in mind. And it's important for us to understand that the K1 through the K3 wheelchair model were built to be cost-effective wheelchairs for short-term users without much physical compromise. They are not intended for long-term users with a complex medical history and a changed of skeletal and muscular structure like our residents. And you can actually ask a manufacturer. You can ask dealers and they will tell you that. That was the purpose that they were constructed. It can be easily compared, for example, to maybe walking into Walmart and you buy a \$20 pair of sneakers that you know, is gonna get you through the day. You're not gonna have too much pain walking around, cleaning your house, or going grocery shopping.

But if you wanna do something more specialized where you're gonna be spending hours and hours on end in this chair climbing a mountain or running a marathon, you don't need a \$20 pair of Walmart sneakers. You need a very high-end pair of sneakers that were built to withstand that stress and strain to avoid injury to our body. And that's exactly how it is with wheelchairs. So manufacturers may vary very slightly in standard features, but in a nutshell, important features to understand when you're talking about wheelchair models is number one seat to floor height. So with a K1 wheelchair,

standard wheelchair, there is absolutely no height adjustability. So what you see is what you get. And the seat to floor height, which is, you know, from the bottom of the seat surface to the floor, is usually 21 inches off the ground. And that's without a cushion.

So, when you start adding a two inch, three inch, four inch cushion, you're talking about a seat to floor height now of about 23 to 25 inches off the ground. And in order to self-propel you must be an extremely tall person to reach the floor, achieve a good heel strike without having to slide your pelvis forward in order to reach the ground. So when that seat to floor height is too high, just like in this case with a standard wheelchair, the client does. They have to slide forward into a posterior pelvic tilt in order to propel. So by using the incorrect seat to floor height in a chair, we are setting our clients up for a risk to fall from the chair and to definitely develop a pressure injury. So the K2 model chair. So let's move on up the track here, is the hemi height chair. And you actually can see it better on the K3 pictures. So right here you'll see these two little knobs. And that knob allows us to take it from 21 inches off the ground to 19 inches off the ground. But other than that, it's the same exact shell as the K1 chair.

If we start moving on to a lightweight chair, the K3, you actually, most of their manufacturers can get you somewhere up 17 inches off the ground of seat to floor height. But again, if you start to add a cushion with two to four inches in depth, you're still looking at a pretty tall person to get a good heel strike without compromising their pelvis positioning. Another key feature to understand about these wheelchair models is that the K1 and K2 wheelchair are very heavy. They usually weigh about 36 plus pounds, and that's without leg rests, without a cushion, without a specialized back support, without anything. So if you're thinking of your self-propellers, they're at a high risk of repetitive strain injuries and joint pain, specifically at the shoulders. And think about how many of your clients using these chairs, come back to you as a referral with shoulder pain. And especially if you're using them in the facilities with carpeting,

because that adds even more resistance to the propulsion. And the other problem with these wheelchairs is they don't have an ability to change the center of gravity. The axis is stuck. So they actually have to go quite far behind them in order to start the propulsion anyway. So then you add weight to that, you're talking about a bad position and then trying to push an even heavier chair. A K1 through a K3 chair is not a great choice.

All right, so, what do the dealers say? What do the manufacturers say? How do they describe these chairs? And they confirm that a K1 through a K3 wheelchair was constructed with the bare necessities. There are no outstanding features on these chairs to help conform to the clients specific individual shape. There's no frame adjustment, the only modification on some of them is you can play with the seat to floor height, but you cannot increase stability, or create more contact with the users body. Instead, you have a situation of a wheelchair with a fixed 90 degree angle with an inability to open or close to seat to back angle, you have fix arm height, minimal adjustment in seat to floor height.

So in conclusion, there's no modification that can be made that would allow you to prevent falls, to prevent pressure injuries and other health complications. And if you look at it, the skeleton of the K1 through K3 is exactly the same. All right, so let's switch gears and let's start talking about the K4 model wheelchair and how is this different than the other three models? And why should we be using a minimum of an adjustable K4 with our clients? And I do think I need to stop here and just make one clarifying point. In nursing home settings across the country there are small pockets of the country that have Medicaid or Medicaid funding that actually pay for wheelchairs, and cushions, and backs supports, et cetera. And if you happen to live in one of those small pockets of the country and you can justify a K5 or a power wheelchair and that's what your client needs, then by all means, go for it. Get that for them. But for the purpose of today's course, I'm gonna focus on the majority of the states that do not

have funding. And I understand first hand that cost is quite an issue in this type of a setting. And we need to kind of justify every single penny we spend. So you're probably not gonna be able to spend a K5 or a power chair. So this K4, adjustable K4 is a pretty good option for the money with everything that you can get in terms of adjustability.

So now we're gonna perform a little visual exercise and I want you to close your eyes. I want you to think about your nursing home, and I want you to mentally walk up and down the halls as I'm talking. Think about the wheelchair model that each of your clients are in. And think that they're most likely in a K1, K2, K3 that we've had in our storage closets forever, right? And as I read the criteria off for someone that a K4 chair is appropriate for, I want you to start making a mental list of how many of those residents are in the wrong model wheelchair that need your intervention. And I will guarantee you that by the end of this exercise, you'll probably put close to 85% of your long-term care residents name on that list. So let's begin and as your mentally walk from room to room, make that list and this is the criteria of someone who should be using a minimum of a K4 chair. So a K4 chair is good for someone who uses their wheelchair all or most of the day. Remember, K1 to K3 chairs, that was not the specific reason that they were developed. They were developed for short-term use. K4 chair use is developed for long-term care use. It's also good for someone with limited mobility or non-ambulatory. Our clients fit this criteria. Because now the wheelchair is their primary mode of locomotion.

As well, a K4 is good for someone who has poor postural control. Meaning, this is a person that's leaning, or slumping, or sliding when they're sitting up against gravity and it's gonna get worse throughout the day if they're not having the appropriate interventions. It's also good for someone who needs more than a standard size chair. So if you're looking at someone that needs beyond a 16-inch depth, then you're already rolling out a K1, a K2, and some models of the K3. So those chairs come

standard in 16 by 16 or 18 by 16. Like I said, that might vary from one manufacturer to the other, but the majority of them, that's their standard size. So if you're like me, I need an 18 by 18, then you already or you have someone who needs a 16 by 18 or 18 by 18 or 20 by 20, they automatically jump to a K4 model. It's also good for someone that complains of pain or discomfort, because through the ability to change angles in the K4 frame, you'll be able to then match that clients range of motion limitations to the chair to help alleviate that pain. And then lastly, it's good for someone that cannot functionally propel the weight of the other K1 through K3 chairs. A K4 chair is even lighter than the lightweight K3, and will reduce significantly the risk of repetitive strains.

So again, if you have a self-propeller, especially with cardiac and pulmonary dysfunction, or maybe they have a progressive disease like MS or Parkinson's, with noted endurance and strength issues, then at least the K4 model will help them to function at maximum capacity. So I'm hoping that after that little exercise we just did, you have a list, and your eyes are now open to the amount of Part B referrals that you probably have waiting for you to help position them correctly. So another important fact that I think I need to clear up about the K4 model wheelchairs is that there are some K4 model of wheelchairs out there without adjustability. So, if you were to go just order a K4, you're gonna call your distributor today and say, "I would like a K4 model wheelchair," and that's all you say, they're gonna send you out one with no adjustability. So it's just a glorified K3 chair. It's just a little bit lighter. So when you go to order a chair, you have to justify and specify, excuse me. The adjustability that you want. So you have to say "I want seat to back angle adjustability, "arm rest height adjustability" et cetera.

So now probably your wheels are turning again and you're saying to yourself, "Well, what is the adjustability that I can get "in a K4 model wheelchair?" And the first adjustability is that seat to floor height. And with most manufacturers, adjustable K4's, they can get 14 inches off the ground. Some models could even get 13 inches off the

ground. So even with the addition of a two to four inch cushion, a shorter to even average size person is gonna get a great heel strike for propulsion without having to slide their pelvis forward. You also get armrest height adjustability. Which I don't think we give enough credit to. Why that is so important? So I want you to think about your shorter clients. And if the armrest height is too high, what do they have to do? They have to elevate their shoulders, abduct, and try to get their arms up on the armrest. That's gonna cause, you know, stress and strain to the neck muscles, to the shoulders, could cause contractures, nerve impingement, repetitive strain injuries. And then if you're thinking about a taller client, in order for them to touch the really low armrest they had to slide down. Or maybe lean over into an obliquity or slide into a posterior pelvic tilt to even make contact with the armrests. So by placing armrests at a height that's not correct for our patient, we actually are promoting them to slide into an abnormal posture.

The other thing is seat to back angle, and I'm not gonna harp on that, 'cause I already did that with the first misconception. But I do want you to see right here where I'm circling on the screen. And I told you that the adjustability comes in the backings, which you can see right there. And this one has a little screw system so you actually just unscrew the screw and then you would change the seat to back angle. So you would open it or you would close it. And it says on the dial, it'll say 85, 80, 90, 95, 100, 105, they're usually five degree increments. And then when you get the seat to back angle that you want. So for example, the example I showed you earlier I needed 105. I would open this to 105 and then I put the screw in, and I'd set it to 105 degrees. All right, so the next one is back height. And that's really great, because in settings like nursing homes, when patients expire we're expected to use that chair with somebody else. So if I had one person who was very short and my next person is very tall, I can adjust where that back is going to support them. And then lastly, a fixed tilt. And you can create this very easily in adjustable K4. And tilt is one of those things that's been proven to really help with pressure redistribution and also really keeping that person

back in a wheelchair. And this is just a print out. So again this is in your slide deck. And this is supposed to be just a quick reference. A great little print out that you can peg up on your corkboard, and it really just compares the K1 through K4 of what adjustability has. Different measurements so that when you're choosing what style I should go for, this kind of helps you justify what might be the best choice. And I always say that by using a minimum of a K4 model wheelchair is like hitting a home run. We're asked to use these chairs over and over with different clients. And you wanna look for a chair that can be adjusted and readjusted to conform and mold to various body types, instead of trying to mold all the various body types in a nursing home to one chair. You're not gonna be successful that way. So hit a home run and have one that can be changed and readjusted as many times as you need.

All right, on to the third misconception. And that is that all that is needed to fix the seating issue is provide a new cushion. And, you know, I think that when we have seating referrals, and I'm gonna totally own up to this. I was guilty as charged when I first started in the seating world. And you have that referral come across your desk and you look at the person, the first thing our minds go to is, "Okay, what cushion are they on "and what cushion should I replace it with?" And we need to think back to that simple equation again that I spoke about and remember that the equation is not a cushion, plus a cushion, plus cushion, gives you an optimal seating system. The equation is, a cushion, plus a back support, plus the appropriate wheelchair model will get you to an optimal seating system. And when we only consider the cushion, we're just putting a bandaid on that issue. And it's gonna rear it's ugly head again once that bandaid falls off, and you'll receive that person back on caseload. And you're gonna start thinking to yourself, "Oh, that must've been the wrong cushion. "Let me replace it with another one." But no, it might be the angle. It might be that the back support didn't immerse them and envelop them and stabilize their spine so you're never gonna be able to stabilize the pelvis without stabilizing the spine. So we need to keep in mind that when we're looking at a seating system, the pelvis does not work alone. We're

therapists, we know this. You're not gonna control the pelvis without thinking about the trunk, and you're not gonna change the trunk without considering the pelvis. So overall alignment of an individual is definitely impacted by the back support, by a head support, by the appropriate model wheelchair, and it goes all the way from head alignment down to ankle and foot alignment. So there is no way we are gonna fix the entire body alignment by just changing out the cushion alone.

Secondly, the best cushion on the market, and I think I talked about this already, is gonna lose all of its effectiveness when we don't combine it with the correct wheelchair model and the correct back support. So all of the components when used as a system, not as individual pieces, but as a system, allow us to open or close seat to back angle, immerse and envelop the person so that we can get the pelvis back into the pelvic well of the cushion so that that cushion can do its intended job. And then lastly, a back support is just as critical as the cushion in an ideal seating system. So what is the role of a back support? And I think a back support is there to assist us with a lot of things. And here I'm just gonna take a quick look at a lot of them. And the first thing is that by immersing and enveloping the spine, we can then conform to the person's shape and capture whether it be a normal or an abnormal curvature, allowing us to make contact along the entire spine, throughout the entire gluteus surface, and throughout the femurs. Instead of just only making contact at the apex of a curvature. And by doing this, we really eliminate the risk of small entry points of pressure, which are called peak pressures that normally occur at apex.

So again, if we don't use a specialized back support we just use a straight back support that doesn't mimic the persons shape, you're gonna have just like a dagger-like entry point only at the apex of the curvature. The other thing that we gain is that when we start to use back supports that actually mimics the persons shape, we now make contact along the entire spine. So it's a lot easier to stabilize something that's not teetering off of only one or maybe two points, but it's very easy to stabilize

something that's making contact along the entire surface. So better stability will minimize unwanted movement in the chair and promote optimal posture, leading to better function. And also, by allowing us to create even pressure distribution throughout the entire spine, you're gonna prevent the risk of a pressure injury because you don't have just one dagger-like entry point of pressure to enter into the body. And the other really good thing about using back supports is usually a more specialized back support has a hard shell, so it's very easy to, and you can see that in this picture. See how it's like a hard shell? And you can add a head support, you can add mounted laterals that really give that extra stability for those very complex clients.

So, by using the equation we can prove the interplay between the model wheelchair, the back support and the cushion, and how they all go hand-in-hand to stabilize the pelvis and the spine for that optimal alignment. And this picture here does a really great job of driving this idea home for me. And this was a case study of mine, with a resident, where the cushion itself was not bad. And one thing that did not change from the before, the after, is I did not change her cushion. What I did change was her model of wheelchair and her back support. And when we were able to change out the model of chair, I was then unable to tilt her back to relieve pressure off of her reddening sacrum. I was able to add a specialized back support because the tall tall reclining back that she was in didn't allow me to take it out because of the bar and all the kind of hardware back there. And I was able to permanently set her seat to back angle to 110 degrees, that allowed her to function without postural compromise. And the CNAs in the family couldn't come in and recline her too far any longer because it was a set angle. And by fitting her with the appropriate back support, I was able to immerse and envelope her to conform to her very weak trunk to help promote better upright midline alignment. I was able to add a mounted lateral onto a hard shell for that additional support. I was able to add a head support so that she could eat and interact with her environment. I was able to increase the surface contact with her trunk so that she no

longer felt pain right at the apex of her kyphotic spine where all the pressure was entering.

So again, by considering you the entire equation and the interplay between all those three components, then and only then was I allowed and able to get this woman to her optimal seating system. And, by changing all of that, and I had her pelvis all the way back in the chair, she now sat inside the contours of this cushion instead of on top of them because she was halfway up the cushion. So now I allow the cushion to do its intended job. All right, the fourth misconception is that elevating leg rests are the best thing. The sliced bread when it comes to a nursing home setting. And that they are better than the standard leg rest. And I think that with novice therapists for seeing world, they just don't realize that sometimes that use of elevating leg rest and actually combat what we're trying to achieve.

So to get to the bottom of this misconception I actually went out and I asked a bunch of therapists that I did case studies with. "So why did you choose elevating leg rest "over standard leg rests?" And the most common answers I received were because they keep the hips back in the chair. They help reduce edema. They decrease the pressure off the pelvis and they assist with lower extremity alignment. And this train of thought leads therapists to think that elevating leg rests are the best option when purchasing a new chair. They do all of this, they must be the right option, right? Wrong. And let's explore some of the reasons as to why this is incorrect. And the first answer I received as to why therapists use the elevating leg rest is that it keeps the hips back in the chair. And we talked about earlier that, you know, we're dealing with people who have shortened, tightened muscles. And again, the most commonly shortened muscle is the hamstring muscle that pulls at the ischial tuberosity, pulling the pelvis into a posterior pelvic tilt. If we then add elevating leg rests, the higher we elevate the legs it's going to pull on that already tightened hamstring muscle and increase the posterior pelvic tilt, sliding that person right on out of the chair. Which is the exact opposite of

keeping the hips back in the chair. So again, the higher you go, the more it pulls on that tightened muscle, and the more it's gonna pull that pelvis into a posterior pelvic tilt, sliding that person right on out of their chair.

The second thing about elevating leg rests when it comes to reducing edema. And I don't know if many of you know of RESNA, but RESNA is kind of the who's who when it comes to seating and positioning, and they do a lot of research. And they put out position papers, and they have a paper specifically on the reduction of edema. And they say that in order to reduce edema in a leg with an elevating leg rest, that elevating leg rest has to be 30 centimeters above heart level in order to reduce edema. And on a manual wheelchair that we're dealing with in a nursing home setting, like the K1, K2, K3, K4, even a K5 wheelchair, is never going to elevate high enough to get this leg 30 centimeters above this heart level. And what they do say is you can achieve that with tilt and recline functions that are usually seen in power chairs or some very advanced manual chairs. But in your standard wheelchair that we're gonna be using, you are never going to be able to reduce edema with an elevating leg rest. And elevating leg rests on a manual wheelchair actually can decrease optimal circulation, because as you elevate the leg rests, you're actually cutting off blood supply to the groin. And you're gonna start inhibiting flow to and from that lower extremity.

So there are a lot of other options with trying to reduce edema in a seated posture, but elevating leg rests are just not it. And I know that we got a lot of pressure from the nursing staff. A lot of times I'd have someone come to me and say, "Mrs. Smith's legs are huge. I need to give them elevating leg rests." And instead of just saying, "No, not gonna do it. Doesn't work." RESNA put out this position paper with all this research and unless I go get a tilt and recline function and a power chair, it's not gonna work. Let's think of other ways that we can as an interdisciplinary team talk about ways to manage her edema. So I'm not gonna go through this slide, but again, this is something that I wanted to hand you because I do want to empower you with a way to

talk about this with nursing staff or with family, so that you can come up with better ways to decrease edema. And one of the big things I do wanna talk about is just this number two. So it's the only thing I'm gonna talk about. I am a lymphedema certified therapist. I do remember when I went through lymphedema courses. My lymphedema certified therapist that taught me said, "you know, you wanna do edema in the chair, "get elevating leg rests." But again, we have to remember, lymphedema was that therapist specialty area. Not seating and positioning.

We know that when it comes to seating and positioning, that's not best practice. But what we can do in terms of if you need to put a compression stocking on that persons leg, TED hose are not compression stockings. Those are antiembolism stockings that are meant to be used when someone's actually lying down. They're going to roll down. They're not going to do what it needs to do if you try to put that on someones leg while they're sitting up in a wheelchair. If you truly wanna use a compression stocking, good idea, but it needs to be a true medical grade compression stocking where the grade is higher, closer to the toes, and it gets less as it goes up towards the calf, up the thigh towards the heart, so that it mimics the pumping mechanism of taking fluid from the lowest, the most distal part of your extremity back to the heart. So you need to fit someone for a true medical grade compression stocking, not a TED hose. And that's something that's really important for us to talk to our nursing staff about.

So the rest of these you know are just ideas. Look at them. If you need to bring this in and mention some of these, go for it. All right, the next reason that I get that a lot of people use elevating leg rest was because they decrease pressure on the pelvis. We know that's false as well. Because, again, think about that tightened hamstring that's pulling that pelvis out. And the higher and higher and higher we go on the leg rest we have less femoral contact with the seat surface. So all the pressure is going downward from gravity back onto the sacrum, the coccyx, and the IT's that the 75% of the pressure is now going on to. Which significantly increases their risk of a wound. So

again, you elevate a leg rest, less femoral contact being made, gravity is taking that pressure straight back on to the bony prominence that you just had them sit on.

And this picture I thought was really good. A good visual for us. And what this is, is on this side I have someone with a standard leg rest, and on the other side I actually put an elevating leg rest. And the elevating leg rest is set at it's lowest setting. And even its lowest setting, see how much higher it takes the femur off of the seat support. So off of the cushion. And because of that decrease in femoral contact, it really is pushing pressure more back onto the femur. So you will never get as much femoral contact even in an elevating leg rest set at its lowest setting, as you are capable of with a standard leg rest. So just thought that was interesting. All right, the next thing that I was told is that they help with lower extremity alignment. And they really just do not. So as you elevate them higher, again, you have no femoral contact with the seat support. So this leg is kind of just hanging out, and when gravity starts to take effect and the patient starts to fatigue, then you really start seeing the leg either internally rotate at the hips or externally rotate, AB-duct or AD-duct. And you might see the legs falling between the leg rests or falling over to the sides of the leg rests. But there's more chance of them, the leg to kind of sit in an abnormal posture. Windswept deformity is very, very, very, very prevalent. This is very prevalent, where you see the knees starting to rub together where the legs are AD-ducting.

And so, as those patients sit like that for longer periods of time, you also have a higher risk of maybe them becoming contracted in that position. Whereas when you use a standard leg rest that allows you to have good femoral contact, they can sit in the cushion, they can have a leg trough that helps align the pelvis, because they're actually sitting in the cushion not above the cushion. Then you're gonna be able to keep alignment for hours on end in that wheelchair system. All right, so I always say knowledge is power, right? And I think that, I'm hoping, that by clearing some of the misconceptions you are well on your way to successfully go and pick up some

referrals. Provide your clients with the most appropriate seating system, and recall that simple equation. That if you use it with every referral that comes across a desk, will help you to be successful. And by understanding the critical interplay between all of those components of the equation and clearing up these misconceptions, I'm confident that you're gonna see fewer wheelchair systems looking like this scenario on the left hand side of the screen. And many more wheelchair systems looking like the scenario on the right. And I guarantee you, you're gonna be more successful in preventing falls, you'll have less incidence of pressure injury development, you'll be more successful in healing existing wounds and your facilities are going to love you for it. So thank you so much for attending and I think now we're gonna open it up to the questions and answer portion.

- [Fawn] Okay, we do have a question coming in. So Susan's asking who manufactures K4? And it seems like her question kind of broke off, but if you wanna just explain that K4 is more a category and go over that, that would be great.

- [Ana] Sure. So there are lots of manufacturers of a K4 chair. So a K4 chair as Fawn just said, like if you remember back to the slide, it is a category of a wheelchair model. So you have K1, K2, K3, K4, just like we mentioned in the course. So you might have Invacare, you might have Key Mobility. There's lots of manufacturers out there that manufacturer a K4 chair. You can get them sometimes through distributors. If you do deal with Medline, or what are some of the other distributors? Direct Supply, one of those kind of distributors, or if you're in the pocket of the country that has some kind of funding, you might go through more of a dealer that will bring to you a K4 chair. But the one thing that I wanna mention about that is please just remember that not K4 chairs are created equally. And you have to ask for a K4 chair with adjustability. So if you just say "I want a K4 chair," they probably were gonna send you one with absolutely no adjustability. You have to say what you want. So like when I would order I'd say, "I need a K4 chair that has seat to back "angle adjustability. "I definitely need armrest

height adjustability. "I need seat to floor height of 14 inches off the ground." And that way you'll actually get exactly what you're looking for. So I hope that answered the question.

- [Fawn] Would it be difficult to justify a K4 with full adjustability for insurance coverage in a more mobile patient? The person does ambulate some, but has scoliosis with spinal curvature, low back pain, and kyphosis.

- [Ana] So every situation is different, of course. And again, it also depends on where you are. It depends as well on how many hours. Is this the patient's primary mode of locomotion? You know, do they use this to be in the household and perform their daily tasks? So, you know, of course, justifying any wheelchair if the person is mostly mobile at walker level would be difficult. But if this is their primary mode of locomotion, absolutely not. Again, if you're in a part of the country or you're not in a nursing home setting, so if you are in home health or outpatient or whatever, I highly suggest getting a good dealer in your area to come out and they will be able to walk you through all the steps of that justification. And when it comes to justifying that with insurance, that usually is diagnosis driven. So you'd have to look at what that specific patient has. But it is not difficult as long as you have good documentation supporting why they need that to function optimally. In a nursing home setting without any funding, it's not difficult at all because that usually falls on the facility to purchase what is necessary for your patient. So it really is just you documenting and making a justification to your facility to purchase what you need. So again, it just all comes down to good documentation.

- [Fawn] Okay, and we have one last. Hold, let me see here. We actually have a few more. Let me look here. How can you convince faculty to invest if they are not... I'm sorry, not faculty, facility. A facility to invest if they are not interested?

- [Ana] I deal with that problem for many years. So I understand that problem completely. The truth of the matter is, I took it one patient at a time. And you're not gonna go out there. It's unrealistic to think that you're gonna convince a facility that they need to go buy a whole new fleet of wheelchairs. Absolutely not. And there's two ways that you can go about this. So when I first started and I couldn't convince them to go buy a model wheelchair with the adjustability that I needed, I started with something else. I started with the back support. So, if you can't go buy a wheelchair, that, you know, a K4 wheelchair that has that adjustability in it, you start doing other things. Start to use a back support that through the hardware does have that adjustability. It's easier to get a back support covered than it is maybe the wheelchair, right? The other thing that I did is, you know, I eventually as I started doing little things like that and they started seeing that I was very competent in seating and positioning, and I was decreasing the risk of aspiration in that client, and I was decreasing the risk of falls, and that patients pressure injuries started healing, they started trusting me and it truly was one patient at a time. And I was a stickler, and I would take that patient in upon evaluation and I would make sure that I ran into that administrator in the hall or I ran into that DON in the hall and I just show them how bad they looked, and how it was impossible for the CNAs to feed them. And I would really talk to them. And then I would do my intervention and I would then show them exactly what was able to be done now, and one patient at a time I got things changed. So then it got to the point where they're like, "You know what, if I Ana says that this is necessary, "she knows what she's doing "and let's get what is necessary for that patient." And what kind of an infuriated me in my facilities is that people are very quick to go and purchase a tall reclining back chair because they're very common. But they're just as expensive as an adjustable K4 chair.

So if you're in a facility that's all about buying tall reclining back chairs because they think that's what's gonna help an issue just because of their ability to recline it back, it won't be that much harder to get them to get you a K4 adjustable chair. But that is a big issue. And the other thing that I recommend, and I don't know so much with

wheelchairs, but I do know with cushions and back supports and such. I would call a manufacturer and ask for a rep to come out and do a presentation for you. And usually they can get you some trial equipment. I know companies also have trial kits for sale at a very reduced cost so that you can actually start having that equipment on site to trial and then show the effectiveness of a product to your facility before even purchase it. So if anyone needs some suggestions on that later on, feel free to email me and I can get you some information on that. But it's all about trialing and showing them that it works before having to put the money forth to buy it, I think. But that is a difficult area.

- [Fawn] All right, a few more questions here. Do you have any good tricks or tips on making manual adjustments in an acute care setting with K1 through K3s? For example, towel rolls for lumbar support, et cetera.

- [Ana] Yeah. So honestly, all of those things, like a towel roll, those are great things to simulate what you want out of your product. But those things are not gonna stay in. But a lot of the little tricks that I have done. So definitely seat to floor height. Let's talk about that one real fast. That's a big thing. If you have someone who's one foot propulsion or propel with both feet and you just can't buy another chair right now, you need to get lower, definitely look for a drop seat. That's a big one. So it's a big good trick to use in there, is get a drop seat in there. And there are a lot of manufacturers that will go over cross bars and really get you very close to the ground. Another good trick when it comes to just trying to get maybe a seat that needs a little bit more firm of the surface. You have a hammocking seat sling and you can't go replace the wheelchair, definitely just order a simple insert. A firm insert to the cushion which is not very expensive. And so now you can take away the whole issue of the hammocking. When it comes to making contact with the spine, like you were just talking about with the towel roll, again, that's a good thing to simulate to see if a back support would help. But I get asked this question all the time, and I always say to somebody, "A cushion should never "walk out the door with a back support." And that's not me

talking from a manufacturer standpoint, that's me talking from a therapist standpoint. And I always say this because, you know, we're therapists, and I've said this before. You can't address the pelvis without addressing the trunk. And you're never gonna be able to stabilize that pelvis without looking at what's going on at the trunk. And I always make this analogy. You can go to Shoe Barn and you can buy a \$50 pair of Saucony sneakers. And you can go to Fleet Feet running store and you can buy \$180 pair of Saucony. So you got the same brand, very big difference in price, but what's similar between those two shoes is the thin flimsy foam insert that goes into the shoe. If you have an issue like plantar fasciitis, or Achilles tendon issues, or bunions, you need to take that thin flimsy foam insert out and you need to put in a specialized insert. Or go even get an orthotic to deal and accommodate for whatever the issue that you're having is. And that's the same with the back support. They just put a flim slingback on because something has to walk out the door with the wheelchair. But it is impossible to accommodate or correct for any type of curvature of the spine, even a normal curvature with a sling back. So you have to take that off. That's the thin flimsy foam insert and you have to put something better. There are very expensive options out there for back supports and there's very non-expensive options. But get something that's going to conform to that person's spine. So when it comes to filling in gaps when it comes to lumbar support or not having someone lean, those are just bandaids. You have to have something that can withstand prolonged pressure in a wheelchair that can actually conform to that persons spine. And you're only gonna get that from the back support. I'm trying to think of other tricks to the trade that I have. Those are really the only things I can think of right now. But if you have a specific one, you can go ahead and ask and maybe I can figure it out.

- [Fawn] I don't see any other questions coming in, so I'll go ahead and close this session for today. Thanks so much Ana for a great talk.

- [Ana] Very well, thank you guys!

- [Fawn] Thanks everyone. I hope you join us again on Continued and occupational therapy.com. Ana has another course coming up soon, so please look for it in the library. Thanks everyone, have a great day.