

[MUSIC PLAYING]

**JOESEPH  
EVERHART:**

Our presentation today is about management of the bariatric population with spinal cord injuries. So just to give a little bit of background. First disclosures, we have no financial relationships or conflicts of interest. We will be providing examples of products and companies, but it's not all inclusive list, and we're not promoting any one product over another. We're just making sure to give a lot of examples so that everybody knows kind of what's out there and what is available.

So just kind of a quick introduction, and these are some sort of obvious statements but rehab of patients with spinal cord injuries is already a difficult task. Rehab of bariatric patients is also a difficult task. You combine the two, it's an extremely challenging task. And what we're seeing is that there is an increasing prevalence of obesity in the country, and everybody kind of knows that. So we're getting patients who are pre-injury, already obese or overweight, and then getting injured, then coming to us and so we're having to navigate that.

And there's also the post-injury obesity that can happen with people being more immobile and gaining weight. And sometimes we're seeing patients in the outpatient setting or even back in the inpatient setting who have now are newly obese or overweight. So here are some demographics. This is a lot of information from the spinal cord model systems throughout the country. BMI has actually only been required in the dataset since 2006. So if we look at just the Pittsburgh obesity data. It's an n of 646.

The average BMI is 27.1 which is actually in that category of overweight, just on average there. So anything 25 to 30 is overweight. 30 and above is obese. And total for the whole model system throughout the entire country is 26.6, so not too far off. But that's kind of what we're seeing is that there's a trend upward. And in Pittsburgh, if you look at just our data from one year, five year, 10 year, 15 year, you can see that the trend is going up.

Now kind of a little disclaimer with these numbers is that the number of subjects significantly decreases at each of those time periods. There's just a lot to follow up and there's just also not that many people who've been enrolled in this model system for that long. And if you look at the whole model system, there are certain states who are sort of in this trend, like what we see here too.

But when you look at the whole system, it's more of a fluctuation at the different time points than it is a full trend. So this may not be fully accurate with what's happening. But as we know, and actually Liz mentioned this in her presentation very early this morning, that BMI is not a great measure of body composition for patients with spinal cord injuries because what you're having is a decrease in muscle mass with muscle atrophy over time and possibly an increase in body fat but the weight number may not necessarily be changing. So there is a change in body composition. But it's not being reflected by BMI.

So I wanted to go into some of the research that's currently out there about rehab and people with obesity. So in this study it was a retrospective observational study they had 42 severely obese individuals with a mean BMI of 50.9 and then 42 non-obese controls, and they were matched by sex and diagnosis. And so what they wanted to look at with this population is their length the stay, and then their FIM efficiency and also hospital costs.

The way they've divided length of stay is that this waiting for transfer length of stay is the time from when they were deemed medically appropriate to leave the acute care setting and go into the rehab setting, until the time they actually got there. So just basically sitting and waiting on acute care until they got into rehab. Then their actual rehab length to stay, and then those two combined is the total length of stay.

OK and then FIM efficiency. So FIM is the Functional Independence Measure. It's the outcome that's primarily used in the inpatient rehab setting for measuring burden of care. And FIM efficiency is the total FIM change divided by the rehab length of stay. So it's kind of how many points per day are you gaining? And then hospital costs.

And so what we see with the severely obese, when compared to the controls, they had a longer total length to stay and all of these were statistically significant. I cannot say that ever.

[LAUGHTER]

I'm going to say it one time today. That's it. 98.4 versus 37.4 days. That's the total length of stay. So it's a combination of waiting to transfer and rehab, but also a longer rehab length stay by nearly 20 days. And then obviously the longer waiting for transfer length stays. So there's 42.6 days versus zero days in the non obese population. So again, this is just a snapshot of one center but this gives a pretty good picture.

And look at the increased hospital costs. It's actually nearly three times as much. But interestingly a similar FIM efficiency. So there's a difference, but it wasn't significant. And that severe obesity was actually an independent predictor of total length to stay in rehab length of stay but not FIM efficiency. If there are any questions about this research or anything I'm saying, please pipe in.

It doesn't have to be just us talking. The take home point that I get from this is that bariatric patients, and again this is not spinal cord specific yet, but that they can reach similar outcomes to non-obese patients, it's just going to take a little bit longer and a little more resources. And to be honest with you, in practice, as far as working with spinal cord injury patients and also bariatric, it does. It can happen. We have had really good success and actually really good outcomes with individuals of all shapes and sizes. It's just that it does take longer.

So we are seeing an increase in that rehab length of stay and so we have to advocate appropriately and make sure that they can be there as long as they need to be. Yeah.

**SPEAKER 1:** Do you do you know why the cost is so significantly different? Like what is the outlier that makes that cost almost so that it doubles or triples?

**JOSEPH EVERHART:** That I don't know. It might be in that paper. I don't know exactly if they cited what their costs were coming from exactly. I mean, as you know, being a nurse and everything that there's a lot more time on skin care, and we're actually going to talk about that a little bit more--

**SPEAKER 2:** [INAUDIBLE] pretty expensive, right? Do we pay more to rent from Sizewise or things like that?

**JOSEPH EVERHART:** Like equipment rentals?

**EVERHART:**

**SPEAKER 2:** Just equipment rentals.

**SPEAKER 3:** I wasn't thinking about the equipment rentals. Right. They're very expensive. OK.

**JOSEPH  
EVERHART:** Yeah but also just the total time there. So you're in there longer, therefore you're going to use more resources just because of time. But, yeah I'm not sure. And the link to that article is available. It's on this paper in the references too, so if anybody wants to look more deeply and kind of figure out where the costs are coming from, they could do that.

So now let's look at rehab outcomes in relation to actual patients with spinal cord injury and obesity. So in this study, they looked at the National Model Systems Database, and there's 1524 patients and they looked at this window between October 2006 to October 2009. So in that three year window, there is 1524 patients discharged from those facilities.

And of those, 25% were considered obese upon admission. And so that's using 30, a BMI of 30 or higher. Their main outcomes that they were looking at were change in FIMs and FIM self care and mobility scores. So the FIM is kind of divided into those two things plus cognition, but they wanted to look specifically at the FIM for self care and mobility ratings. And then also discharge destination. So they wanted to know are these people going home? Are they going to skilled more often? That kind of thing.

So here's the results. Patients who were obese were actually more likely to be married and slightly older than non-obese. I don't know why that increases your likelihood of being married, but it's gaining the happy weight after marriage. Who knows? But I guess that's a good thing. So the people who are obese with incomplete paraplegia had lower self care and mobility FIM gains compared to the normal weight patients. And the numbers were actually 1.9 on the self care. So 1.9 FIM points less total. And 1.5 FIM points less total in the mobility category.

And then same with obese patients with paraplegia, also had lower scores, and those were actually a little bit even lower. So in the self care category 2.2 points less total, and in the mobility category 2.7 points less. So that ranges anywhere from three to five FIM points less total gains made during that rehab stay. And if you look at the FIM, the minimally detectable change and also the minimal clinically important difference are right around that number. They always fall in that and around that number four, I think it is. Three point something.

So it is a significant difference. And for incomplete and complete tetraplegia, there were no significant differences between obese and normal weight, as far as their outcomes with their FIM scores. And weight did actually not affect the likelihood of a community discharge. In fact, in the incomplete tetraplegic patients, they were actually more likely to go home by an odds ratio of 2.0. So you're actually twice as likely to go home if you were obese and had an incomplete tetraplegic injury. Again I don't know why that is, maybe it has to do with that whole being married thing. I'm not sure, but that's what they found and, that was actually a significant result too.

So just some take home points with this. So what we can say is that obese patients with paraplegia may have a slightly increased burden of care based on the results that they showed in that study. And in another study, they demonstrated that there is a three to seven minute reduction in caregiver assistance per one FIM point increase. OK, so if these individuals are making three to five points less total increases in their FIM gains, then that kind of computes to that with the obese incomplete paraplegic population nine to 21 minutes of additional assistance per day, and obese complete paraplegia 15 to 35 minutes of additional assistance per day.

And then obese patients with tetraplegia require a similar level of care to the normal weight patients, and I think this is most likely because at that level, with those types of injuries, there is a significant burden of care regardless of weight. So if you look at someone who has a C5 complete injury, they're going to require total care for many, many of their mobility and self care activities as well as bowel, bladder, and nursing care and medical care. And similarly, with someone who's overweight or obese, it's going to require that same level of care regardless.

**MALLORY**

**KOCH:**

OK, so some considerations to think about when we get a patient who has obesity and now spinal cord injury on rehab and kind of the steps we take to start get the rehab going. The first thing is equipment acquisition. So oftentimes on your units, you're not going to have equipment or wheelchairs that support you know someone that's 400 pounds or up to. We've had someone in the 700 pound range on a rehab unit, so right off the bat we're looking at what kind of wheelchair they're going to need.

So where are we going to get a bigger wheelchair, whether it's a wider wheelchair or even a shuttle chair, which are the type of wheelchair that Joe will talk about in a little bit? Bathing and showering chairs. So we usually contract through a company called Sizewise, and they have different shower chairs and toileting chairs that are designed for people with larger weight capacities. One thing from an OT perspective, they are not usually tilt-in-space, and they do not have strapping, and they're low to the ground. So even if you have something that is a certain weight capacity and it can hold their weight, it's-- I rarely feel safe putting someone in that type of chair. So that's something to be mindful of, if that's even going to be safe if someone has decreased course ability or can't keep themselves in a chair.

Hospital beds. Do we need a wider hospital bed? Is it going to have the low air loss needs that we need to support someone who is overweight and also now has a lot of more skin needs if they have loss of sensation. And clothing, a lot of these patients are coming in from degrees of trauma. So even in any population in rehab they're coming in not planning to be here, and so they don't have their own clothes, and so we need to find clothing that's going to fit this patient to make their rehab stay comfortable and appropriate for rehab. So we've had some people go out to the big and tall and find things up to 8x, or we've had patients that have had their own means of clothing that they bring in. But it's just something to think about whenever you're planning for someone that has obesity, a spinal cord injury, and that rehab stay.

Time of equipment acquisition. So again we're calling out to a lot of places. We need people from the hospital to bring it into us, Sizewise. We have to go get clothing, so it takes a day or two, at best. And so sometimes the first days are just kind of treating the patient in the hospital bed, and kind of starting to educate them and provide some support in their room until we have the appropriate equipment to safely get them up to start the rehab in a gym setting.

Treatment space. So you're thinking we have a larger patient we need larger equipment, and there might need to be more than one-- oftentimes there needs to be more than one person caring for this patient. So single rooms are preferred and large rooms. So just to give you a little bit of perspective, we have a 20 bed spinal cord inpatient rehab unit here. Two of the rooms have 1,000 pound ceiling track lifts, whereas the other rooms have 550 pounds. So we try to make sure that the room available is available for them if we're going to need the ceiling track lift that is actually sturdy enough with the sealing hardware to get these patients out of bed. So they are preferred for room availability.

And then thinking about plinths or your mat tables to treat these patients. A typical plinth is about 500 pounds, and then a bariatric one to 750 to 1,000. So sure it's great if you get the patient on the mat, but think if there's going to be another patient some equipment and then a therapist that weight can really rack up pretty quickly. So just being aware of your weight capacities on your therapy equipment is important too. And then again just regular therapy equipment. The universal gym, the [INAUDIBLE] bikes, things like that. Can their chairs even fit to be able to use that equipment, or do you need to get creative with medicine balls, theraband, and dumbbells.

So getting to that FIM or outcome measure. It's very true to spinal cord injury in general, however it's not a great predictor of progress or function of progress for the bariatric spinal cord injury population. Because if you consider, as an example, someone that's 400 pounds, and they're completing something at MOD assist, that's still 200 pounds of care that someone needs to provide for them.

And you want to make sure that you're being safe, and so if you need that second person, it's important to get them. But any time in the FIM that you have two people, whether it be by two people with MID assist, you're immediately getting that one FIM score. So reflecting, you know you might have a one, even though you're making a lot of gains because you still need two people for your care.

Piggybacking that a little bit, safety. So when you're dealing with any patients of course, you're thinking about your own safety as a health care professional and also the safety of a patient. So being mindful of your body mechanics. If you think that you could squat and roll the patient, or is it just going to be much more comfortable and get a second person or third to make sure that you're staying safe when you care for these patients, being mindful of your body mechanics.

And then also for the patient I, as an OT, I don't do much gait training, however our physical therapists use our Guldman ceiling track walking lift a lot when they're working with gait training with our bariatric population just because of fall prevention. They might not be using it for the actual gait training purpose, but if a patient that you know is larger than you goes down on the floor, it's going to be harder for them to get up. You know, you might go down with them, and it's just not worth the risk of injury. So using the equipment that you have available to you.

And again for rehab, important for everyone, but even a little bit more in this population or helpful is being really diligent on thinking about discharge right on admission. So what was their previous level of functioning? Were they obese because maybe they were kind of sedentary? Do we need to build up some endurance and strength just to get them going?

Caregiver support and availability. We've had patients that have spent most of their time in bed. And their significant other or caregivers have been unavailable to them. Are they going to need even more care now? Or how can we include the caregiver to see what kind of needs are there and make sure we're including that whole supports system and making sure it's available at discharge?

Home set up. What does their home setup look like? You know, what was it like before? Is there something that we can do to even make it better now that they have a spinal cord injury? Was it not really safe before, and we can just enhance what they were using? Is it going to have the space? I mean thinking of door frames here. You know, up on our unit, the door frames are about 35, 36 inches, which seems like a lot, and the average home a lot of doorways are more in the 25, 26, a little bit more, sometimes less range. So when you're thinking about bariatric wheelchairs, it takes a lot of space.

And transportation. If you go-- now these patients are going to need larger equipment, might need a wheelchair. How are they going to get to and from appointments? Maybe right off the bat letting them know, hey, this is the resources for access, you know if you're going to go home and you need to get to an appointment.

So using the team approach. There are a lot of considerations for nursing care for these patients. And one of the biggest is staffing considerations. So in the morning, when you have shift change and people are getting ready for therapy and it's time to pass meds and change dressings, you now have someone who is larger, has a lot of surface area that needs a lot of skin care, very diligent skin care needs. And for safety purposes, they might need two to three people, so that's taking two to three people off your unit or keeping them on the unit but in one room. So thinking about how many nurses you might need to staff in order to safely take care of this patient.

Again FIM doesn't always reflect progress. So for toileting needs, you know the FIM score, if it takes two people to toilet this patient, someone helping to hold their legs open maybe for a cath and then someone cathing, right off the bat again that FIM score is a one.

Space for care kind of gets back to the overarching rehab considerations. You're going to have-- if you think about, you're in the bathroom, and you have the patient's wheelchair that you're transferring them from. Maybe they're able to safely get into a shower so you have the shower chair. You have the patient who might be upwards of 400, 500 pounds, and then one to two to three caregivers. It is crammed, really crammed, and oftentimes even our accessible bathrooms are not fit for these patients.

Just to give you guys a little bit of perspective, the Sizewise shower chairs are the seat width go from 20 to 30 inches. And so once you add on wheels and leg rests, they're actually wider than our door frames here at Mercy. So even though the chairs exist, we have to kind of take other routes to get them into-- we're fortunate enough to have a shower room, but they actually don't even fit in the patient's individual room. So something to be mindful of.

Skin care. This is another huge thing to think about. These patients have a lot of folds. They have a lot of areas that are prone to developing moisture. And now that they have a spinal cord injury, might not be able to sense when they're having breakdown or moisture under these fold, so a lot of cleaning, a lot of drying. Sometimes we, or oftentimes on our units we use products called InterDry and forget what it's made of, don't know if you guys know.

**AUDIENCE:** There's an InterDry Silver, but has like a [INAUDIBLE].

**MALLORY** OK.

**KOCH:**

**AUDIENCE:** I don't honestly know.

**MALLORY** It comes in a roll, and you can cut it to strips, and once you clean and the nurses powder, and even sometimes  
**KOCH:** when I'm in there for OT doing bathing, we'll put it in the folds and it just helps to maintain the integrity of the skin in those areas. And Hibiclens which is the chlorhexidine red, foamy wash that a lot of hospitals are using now to prevent bacteria growth. Another thing, it's kind of a catch-22. You know we're trying to prevent sweating and moisture in these folds, and then we're having people work out building up moisture and sweat. So just again, being super diligent on skin integrity.

Bowel and bladder. Some of the most difficult things. I'm an OT, nurses can vouch too, but I think managing bowel and bladder and trying to get bowel and bladder independence is one of the most challenging things for a nursing care team, and it's the-- The gold standard for someone with a spinal cord injury for bladder management is intermittent cathing, and unfortunately the anatomy or the individual patient we have to look at first, and oftentimes it's just not as-- you're not able to be as hygienic because it's hard to access those areas and clean them appropriately for intermittent cathing and having bacteria grow in that area.

So Foley's or suprapubic catheters are often things that are considered to maintain bladder for our bariatric population. And just kind of again, the hygiene for males and females in that area is hard to manage. You have little room to roll. A little space to clean. Their legs might be edematous and they're hard to hold out and manage.

Bowel management. Oftentimes we like bowel training to happen upright. Everyone kind of sits up to go to the bathroom. So laying down in bed doesn't help with gravity and moving forward. However, they might not fit on a shower chair. It might not be safe. So working on doing BT and side lying or in whatever position might be manageable for them. And so their caregiver, their selves, or nursing can access those regions.

Kind of already covered a lot of it by saying that, lot of physical barriers. Again for bowel training, access to the rectum in order to do digital stimulation. Space limitations for rolling, sometimes they take up the whole bed so you can't really roll. Kind of problem solving that through. And just the hygiene limitations because of sweating and bowel and access to the physical barriers.

Briefly go through this, a lot of this I talked about already. Just overarching barriers with this population making it a bit challenging are the physical barriers, the availability of equipment. There are just not that many shower chairs, not that many toilet chairs that are even in rotation to be used for this population. So doing a lot of research. Patient and health care professional safety, time considerations. It takes a lot of time to care for these patients. It takes two to three people to get them up. Sometimes two to three people aren't available in the time that you need.

OT and nursing collaboration for self care. Sometimes you know, we'll talk to the nursing on the team, hey, I'm going to schedule them for an ADL. It's going to take two hours, but maybe you know you could lend me your PCT for an hour, and I can help you with-- I can clean them after they cath. And just having that communication. Staffing availability, therapy scheduling. It's often not realistic to schedule them for a 7:00 AM ADL because it takes a lot of time to get them ready for their day. And then with this population, the other medical considerations that come along.

So thinking about any co-morbidity that comes with obesity are some of the things that we're dealing with, and now with a spinal cord injury. So these patients may be diabetic, and they have pressure ulcers, or they're already more prone to pressure ulcers, and now they have a spinal cord injury. We all know another increased risk for skin breakdown. So being mindful of are they coming in with pressure ulcers, knowing where they are, knowing where they're at, and how can we help them prevent getting more, and help them heal the ones they might have?

Orthopedic. So these patients might have already had overuse injuries or a lot of weight on their joints just from carrying weight, and now they have more loading due to weak or inefficient muscles on those same joints, so preventing more hip or knee injury while they're here and working out. Cardiovascular disease. Typically with spinal cord injury population, their blood pressures are initially quite low. So they might be dealing with some low in the morning and then when they're working out, they might spike pretty high or have other cardiac things and heart rates that we need to be mindful of during exercise and rehab.

Edema, lymphedema. Again just increasing the weight of these patients and making it sometimes even more challenging to lift or move them being mindful of what you may need to stay safe. And diet and protein requirements. Anyone with a spinal cord injury, anyone with a surgery, or healing, we know that the protein needs are high, and we're encouraging them to take in protein. But we're also trying to help them kind of develop healthy habits and not encourage excessive caloric intake. So our dietary staff is very diligent on coming in early and giving our patients education on supplements and calorie intake and work close with our physicians to help with that.

So some of the things that we've kind of figured out at our units that work and our tips for some care with these patients are don't be afraid to try to work for the patient. If you've done slide board transfers, and you think about that head hips relationship that we drive home for everybody. It's not always going to work. And oftentimes they know, they're like hey, look, this is how I've been moving for years. And it's sort of that trusting them like, OK you're right. Let's give it a whirl. And oftentimes they know how to move their body, so letting them see what works for them.

Trying nursing blocks and schedule adaptations. So if a patient or if a nurse wants to perform a bath on this patient, they might block out on the schedule from 8 to 10, and we know from therapy perspective, we should not schedule therapy at that time. And then we won't be running into each other and getting frustrated because we're missing minutes and nursing needs to bathe the patient, so it just kind of makes things work better from a team perspective. Everyone being a part of skin care and moisture management. Educating the patient or what they can do to help keep their skin safe, and using adaptive equipment if it's available and appropriate.

Any questions so far? I'm just going to go through some of the equipment that's helpful. Long-handled sponges. This helps improve access to peri care, buttocks, and lower extremities. Works the same for them as it does for anyone else you might be introducing this to. Toileting aids. Oftentimes just body habitus is an issue. And so helping them work on peri care or bowel management with the toileting aids. I always recommended too for everyone to use baby wipes with these, just think it helps with thoroughness.

Suppository inserters. So for bowel training, if they need to use a suppository and again need a little bit more of a reach using this tool. They all also have cuffs on them if you have limited hand fine motor coordination. Again the dig sticks to help. If someone is able to reach for the digital portion. Leg lifters. If patients are able to even assist you by taking off some of the load by using a leg lifter is helpful or repositioning themselves in bed. Transfer handles and push up blocks help with the body habitus limitations if they are trying to push up and clear just gives them a little bit more of a boost.

Transfer boards and Beasy boards are other ways of kind of helping a patient get from one surface to the other. One thing that we do want to mention with Beasy boards and bariatric slide boards, the Beasy boards can go up to 400 pounds and bariatric slide boards are 600 pounds. They-- with any increase in durability there's a little bit increase in thickness. So it's already tough to kind of lean these patients and move them to get the boards underneath. So now we have a little bit more of a thickness that we're trying to get stabilized under them. But it is a good transfer tool if you can make it work.

And the hover mats. This is a piece of equipment that comes deflated. You can roll it stick it under a patient like you would a Hoyer lift or to clean somebody up. Roll them another way, flatten it out, and this inflates. So this is kind of a good way to do a supine to supine transfer if you don't have Hoyer lifts, track lifts, or just another means of getting a patient to a different surface. It has strapping too, so you're not just kind of floating on that. There's safety harnesses. And this is the Guldman lift that I talked about before with the body weight support that people use for gait training or just a little extra safety measure for mobility. All right so I pass the mic back to Joe. Any questions so far?

**JOSEPH  
EVERHART:**

The last portion of this presentation we just want to talk a little bit about equipment options and just some of the equipment that's out there. Just so everybody's kind of aware what the options are. So, when you're looking at the equipment, you need to kind of consider the immediate needs, and that's what we rely a lot on like a rental company. For example, Sizewise is the one that we use in this facility the most. There are other rental companies out there. But this is one I'm just most familiar with. So they'll actually rent the equipment on an as-needed, short-term basis for the patients while they're in a hospital or rehab setting or even a skilled nursing setting.

They have things like a bariatric manual wheelchair. They have these shuttle chairs, which I'll show you pictures of. A bariatric commode or shower chair, and also the patient lifts. Different styles of them. There's the ones that we type of typically think of like the Hoyer lift that widens out and picks the person up. They also have these large ones that are almost like a frame that you kind of build around the bed. You can slide the patient to and from, if you're in a facility or a setting where you don't have a lift or a bariatric lift installed.

And then you also consider long-term needs. So this is where we rely on an equipment vendor. For example, like in this area, there's Blackburn's, New Motion, and National Seating Mobility, Progressive Mobility, there's a whole bunch. I can't list them all but again. So, that's where you're going to rely on these companies for their long-term and custom needs. So do they need a custom manual wheelchair? But there's barriers with the manual wheelchairs which I'll talk about in a little bit. Custom power chairs, you know are they going to need a bariatric bedside commode or shower chair for home? And also, are they going to need a bariatric hospital bed?

So this is the shuttle chair. I'm going to see this. Talk about with this. So basically, what it does is it lays flat just like you're seeing there. It is padded. It's just like a foam pad with like a vinyl surface so you can wipe it. It's not-- there's nothing special about the foam or anything. So it's not like pressure relieving, so you do have to kind of consider that if you need to put another type of cushion or some kind of soft surface on top of it. But they do work pretty well. It's power operated to lay flat. It is manually pushed. I think they do the heavier weight capacity one actually has-- it can be power driven I think. They have the handles there to pull and push with.

The weight capacity. There's a series A, which is this one that you see. And there's also a series B. The series A has a 650 pound capacity and a width of 25 inches. And then they also have a series B which is 1,000 pound capacity, and it's 31 inches wide. The downfall with these is that they're 19 inches deep. OK? And anybody who's familiar with some wheelchairs sees that 19 inches is not a lot in the scheme of someone who's a large person. So you have this huge width of this chair but you don't have very much depth. So that's sort of one negative about this type of equipment, but they do work fairly well when they're needed.

**AUDIENCE:** Can you discuss when they're used versus like a wheelchair? Lying flat.

**JOSEPH EVERHART:** Yeah, so it's nice to be able to lie the person flat for like those supine to supine transfers if that's the best way to get them in and out of bed. I'll show you the next-- that's kind of your option for the manual chair, for a really heavy duty, bariatric, manual chair. So that's not always appropriate for a lot of people. You know someone has like a tetraplegic injury or even a paraplegic injury that may not be appropriate, and you've still got to put a cushion on there.

There's not a lot of adjustability. In fact, there's none. You know the back height's only so high. You can't put additional backs and things on there. That's just not a very conducive chair, but in a pinch it works. If it's the only thing you have to get your patient up and you need to rent that equipment, at least you can get them up and out of bed, but very quickly we have to work on getting a better long term solution.

Again that's why sometimes the shuttle chair is a little bit better option, because there is more padding to it. You can lay them flat. It tilts up and down, and actually assists them into a standing position if they're able to stand. You can do a little bit more with it than you came with this.

**AUDIENCE:** Have you ever gotten anybody a shuttle chair for home?

**JOSEPH EVERHART:** No. They're mostly like a facility-based chair. They're not really covered for home, as far as I know. And the weight capacity of this is 750 pounds, and the seat ranges from 20 to 30 inches wide, and the seat depth is actually 20 to 22. So now with this you're getting actually a little more seat depth, which is necessary for extremely large individuals. The downfall now though is, you know when we're measuring with wheelchairs, we always tell people, if you have a seat width of, let's say, 20 inches, you want to add about eight to nine inches for the overall with the chair. That's just a ballpark figure. But so with a 20 inch wheelchair seat width, you're going to have about a 28 or 29 inch overall width of the chair.

So now you think 30 inch wide wheelchair, you're looking at 38, 39 inches and that's where you're going to have some doorway issues. OK. This is a bariatric walker. So they do have heavy duty walkers out there that are more like the aluminum folding walkers that we're all used to in these settings, but this one actually has a higher weight capacity. It's 750 pounds. It is height adjustable to a pretty wide range of heights, and it's got 27 inches in between the supports. So it is actually pretty wide. It is heavy. It's pretty solid metal. It's not lightweight aluminum. But again a good option for those people who are ambulatory and who need a large device like this.

This is a drop arm commode, so the arms on each side can be lowered and dropped down. It has a-- the 24 inch wide version this chair goes up to 600 pounds, and they actually have a 36 inch wide version that goes up to 1,000 pounds. But again, we need to think about space considerations. So whether it's in the actual setting, you know in the inpatient setting or versus at home, is this going to fit in those areas? It's nice to have that ability to go that wide and that heavy, but the fit is always going to be the issue with this type of equipment.

This is a bariatric shower commode chair. 750 pound capacity and 20 to 30 inch width options and a 20 inch depth. This doesn't tilt back, so it's not like a tilt-in-space shower chair. So if you have someone with impaired trunk balance who needs that option to be able to tilt back, this is not going to work. And in fact, there aren't really tilt-in-space shower chairs that go much higher than that 300 to 350 range. I'm not even sure how high they go, but they don't go into these ranges of 750, 600 pounds. So if you are going to use something like this, you might have to come up with some kind of other strapping for trunk support.

This is a bariatric tub transfer bench. So similar to the transfer benches that you see used for like a shower or a tub shower combo, thank you my OT friend over there. This has a 600 pound capacity. And this is the bariatric lift. It comes in a 600 pound or 1,000 pound models with heavy duty slings and slings of various shapes and sizes as well, depending on your needs. It is power operated, so it's not a manual pump and it is a little bit bigger and heavier than your average like hydraulic Hoyer lift.

So next, if we're getting into the custom powered chair realm, this is the-- Permobil is the brand and this M300 Corpus HD, this is their heavy-duty version of their power chair. So the standard power chairs, at least the ones by Permobil, go up to about 300 pounds with seat functions and what the base can handle. This one goes up to 450 pounds. So this is the HD. They've just kind of bulked it up and made it a little bit stronger and sturdier.

The base width is actually only 26 inches wide, so it fits fairly well as far as the base goes. The problem is now, if you do have a heavy duty person that you're trying to fit in there, you're probably going to have a wider seat. You're probably going to have a wider back and wider space between the arms, so the space issue doesn't really come from the base width, it's from the armrests and the whole chair itself. The furthest outside points of the chair have trouble fitting.

So now this will get you up to 450 pounds, like I said, with all the seat functions and everything on it. But once you go much higher than 450 pounds, it becomes an issue. Similarly, this is the Quantum brand of an HD chair. So they have the Quantum Q6 Edge which goes up to 300 pounds standard, and then they also have an HD version, which goes up to 450 pounds.

So these are going to be for your patients with both paraplegia or tetraplegia who need multiple seat functions, who can't propel an optimally configured manual wheelchair. That's what really qualifies people for power is that they can't propel an optimally configured manual chair, and they also have need for multiple seat functions. So not just tilt, but they need to be able to have a need for multiple seat functions, both tilt, recline, and elevating legs, that kind of thing.

But again, all of these in this group of-- in this class of chair kind of stop at that 450 pound range. There's really not that much out there that's available besides those. There are heavy duty-- heavier duty power chairs. Like this is a Quantum 1450. This has a 600 pound limit. It's tilt only. So if you're getting multiple seat functions, you kind of have to cap off at 450. But if you can-- this actuator can actually handle 600 pounds, just for the tilt function.

But you're going to be kind of static on the backrest angle. So the backrest angle can be set and adjusted, but it's not power driven. OK. Now this one's going to have a little bit wider base, plus it's more of a front wheel drive configuration. So what happens with that is the back end swings a little bit more. So it does have a little bit bigger turning radius. It's also wider too, because they're having the increased weight capacity. So it's actually 29 inch wide base. So you're getting a little bit bigger base, and then again the real width of the chair comes from the seating and how big you have to make the seat.

So this is an example of an ultra lightweight wheelchair it would be K5 or ultra light weight class. This is the preferred type of manual wheelchair to give a person who's going to use a wheelchair for long-term mobility needs. They're lightweight, they have an adjustable axle, and they're very customizable. The problem with this is this is a folding frame chair, so it actually folds up in half, but it comes 300 pound weight limit standard, and even if you do a heavy duty upgrade it only goes up to 350 pounds, and that heavy duty upgrade actually adds weight to the chair because you reinforce the axle and some of the folding mechanisms. And now you've taken this nice, lightweight, well-engineered chair and added weight to it.

OK. You're going to kind of see that theme very commonly throughout all of these K5 chairs, these ultra lightweight chairs. There's the TiLite Aero T. It's a dual T frame. It's a rigid frame chair, so it doesn't fold in half this way. The wheels come off and it folds down, the backwards folds down into almost like an L shape, and then that's how it's transported. You know this is a very preferred style of chair for someone who's going to be using a chair long term.

They're very lightweight, very strong. But again, standard is 265 pound weight capacity. So you're not even getting into the bariatric population at this point. This might even just be a large person who can't even qualify for this chair based on their weight. 265 is a lot, but it's not that much if you're talking about just a large frame male. Maybe 265 pounds without even being considered obese. You can do, again that heavy duty upgrade up to 350 pounds, but again now we're going to start adding weight to this nice, lightweight chair.

And this chair is an Invacare A-4. This Invacare chair comes standard at 300 pounds. It's one of few rigid frame chairs that have a 300 pound capacity. Most of them are in that 250 to 265 pound range standard, and you can also heavy duty upgrade this one. But again it only goes to like 350 pounds. So as you can see, doing a customized, ultralight wheelchair for someone who is bariatric is nearly impossible to find something that's customizable and has a high weight capacity. So what we often end up having to do is go with power wheelchairs.

Also too, if you think about someone with a really large, large hips and wide body, even if you have this nice lightweight chair, is it really that efficient or even healthy for them to be propelling a chair that's like this? Even if it's well configured, it's going to still be too wide and just too difficult. Plus now you have this heavy person who's trying to propel over different surfaces, up hills, things like that. It may just not be realistic and power is often what we have to go with.

And again, this is just like a heavy duty chair. So it's not the Sizewise chair. It's not the extreme, heavy-duty, large bariatric chair, but it is a heavy-duty chair. It has a 450 pound capacity. But now we're out of that class of customized ultralight. It's not going to have an adjustable axle. It's not going to have all the different customized settings to it. But again, this may be your only option if a person can't use a power wheelchair and doesn't have the space for that. This may be your option if you have someone who's over 350 pounds and can't use the other types of manual wheelchairs.

As you can see, there's a lot of barriers with equipment. There's a lot to think about. You know, there's the equipment availability, there's everything else. So you know with equipment availability, first of all, you need to know what your options are. As you can see, you have to know the weight capacities, the sizing options of all of this equipment. Also just seeing what's out there. Like there's not a ton of these chairs because it is kind of specialized equipment. It's not like the vendors and everybody just has them readily available. So you may have to really start working on this pretty early on.

As we saw with all those examples, the weight capacity is a huge issue. There's just not that many chairs that have a high weight capacity without compromising the size and everything else of it. And then there's just the size of the equipment. Wheelchair widths with doorways. Like I said, even a 20 inch wide chair can be as wide as 29 inches, like a 20 inch wide seat on the chair could be 29 inches overall. And some people's bathroom doors are 25 inches, 27 inches. Now you start getting into even the more heavy duty versions of chairs, and you're just not going to fit.

So, many things you consider too. If you're using a bariatric bed and a bariatric lift and a sling, all that stuff is larger equipment, so you actually have poor height clearance. We've actually run into that even in our setting with bariatric equipment that is supposed to be correct. With that large sling, that large individual, the height, you know the lift only going so high, and the bed only going so low, sometimes you can't get their butt over it. We've actually got people out of bed and not been able to get them back into bed without figuring out something else. So, something to consider when you're considering equipment for people. You really have to try it. Don't just say, oh you know there's a lift out there. We'll order that, and that's it. No, you have to try it and make sure it's all going to be compatible. Because it's not.

And then also, are you doing rental versus purchase? Are you renting this equipment for these people, or are you going to have it purchased through their insurance? Is it something they need long term for permanent use versus temporary use? And coverage is an issue. We've actually had a patient come through in the last couple of years, and we ran into all kinds of issues with insurance coverage for this guy's equipment. They just don't want to cover it because it's so expensive. It's so specialized. They want to do more rental. They don't want to do custom. It's a big issue.

And just some home modification considerations that people don't always think about is obviously door widths. We had an individual go home, and his son was pretty handy. And they actually cut a hole in the one wall and almost made like a sliding, like barn type door for him to go through, to come in through the garage that way. We had people who have had to take out windows and go in and out of their house that way. The ramps. You have to consider the width of the ramp and also the weight capacity of the ramp. Some ramps only can handle 800 pounds. But if you take a 500 pound person sitting in a 500 pound power chair, that's 1,000 pounds. You're already over that weight limit, so you might have to get reinforced and heavy duty ramping.

Also the width. You have a power chair with a 29 inch base width. Some ramps only about 29, 30 inches. So you only got a little bit. You know, a half inch on each side of error to make when you're going up that ramp. Again location of all the stuff. So you're going to have a bariatric bed, a bariatric lift, a commode, a wheelchair plus a person, plus someone assisting. Where's all this going to go? You know not everybody has this large room in their house that they can put all that in. OK?

Structural integrity of the house. This is something a lot of people don't think about. Can the floors handle this load? In fact, a lot of vendors won't provide the equipment unless a structural engineer has gone to that house and assessed, can the floors handle that. Because again, you have 500 pound person, 500 pound chair, 500 pound bed, 200 pound lifts. You know, it adds up. You can have 2000 pounds sitting in one room really quickly. So they actually will require a structural engineer to go and check the house.

And just some other considerations, getting away from the equipment a little bit, is just is there a need for a nutritional consultation? A bariatric consultation? Maybe this person is ready and appropriate or will be later at some time point to go through some type of surgery to help with this situation. Also psychology, do they need to be on board? And orthopedic considerations. You know, like Mallory mentioned. Are their previous joint issues due to being heavy for so long? Do we need to get any orthopedic team involved?

And just to kind of summarize and give you some keys to success that you really have to identify equipment needs early on. Obviously we threw a lot at everybody today as far as what's available and how it all can handle and sizing and capacity everything. You can see there's a lot to decide on. You can't wait till a week before discharge. And the second this person gets here, you're going to have to be on the phone making calls and trying to figure out what they're going to need. You've got to identify those home environment barriers early on. Work closely with the family to figure out what kind of home mods do we need to make? Where they're going to be staying? Who's going to be assisting? All that kind of stuff. You know, identify those rehab barriers and nursing care needs early on.

Like Mallory said, taking that team approach, figuring out what equipment, adaptive equipment, scheduling things, all that stuff. And again, just kind of summarizing our evidence is aim high, but recognize it's going to take time and resources to achieve those outcomes. So again, these individuals can achieve very similar outcomes to patients who are not bariatric, but it's just going to take longer. And like we said, that meticulous documentation is important to show their progress because some of those outcomes like the FIM are not going to reflect that. And like we also saw from some of the research is that some patients are going to require an increased burden of care. So make sure you're planning for discharge appropriately and training family members and preparing for that. Here are the references from some of those research articles that I cited and all the pictures came from these websites.