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**SPEAKER 1:** Myeloma patients before a transplant, on average they probably do about 12 for the pretty average patient. The debilitated patients can't do any. Some of the absolute rock stars that really have had no signs of disease can do probably 28 is the highest we've seen coming before transplant. So I just wanted to wake you up a little bit.

I was tired. I know this will wake you up. It'll prove my point that exercise actually improves fatigue, and helps you actually do stuff during the day, so multifaceted.

So I've been working at Roswell for six years, working mostly with hem/onc patients, primarily transplant patients. Now CAR T-cell patients, also. So what I'm going to do is I'm actually going to put a face to these warriors that we have. So I'm going to give you four examples. Pamela's a police officer, 32 years old. As she's standing there, she doesn't realize that at 32 years old she's going to be dealing with this the rest of her life.

Tom, the tennis player, he's 59 years old. He obviously has a very kyphotic back. He doesn't have a clue that it's compression fractures that's causing that. Linda, a librarian, she doesn't realize that she may be on dialysis because of her kidneys, and Alex the accountant doesn't realize that he's been declining and actually has a pathological fracture. So, just putting faces to this disease. This is my world on a daily basis, so I'm with these patients all the time learning about them and their life, and how it has changed.

So the difference between me and you is you guys actually have to tell them that they have multiple myeloma, and what they're thinking versus what they actually ask you guys is different than what they may ask us or may never ask anybody. So Pamela's thinking what does she need to do to stay strong for work, but she's really only asking when can she start her treatment. Tom's asking do I have to give up tennis, but he's asking you guys how bad is the chemo going to be. Linda is asking how she's going to tell her kid-- or thinking how she's going to tell her kids, but only asking what her options are.

And Alex is really thinking, what's the point of treatment? I'm already in a wheelchair, and I can barely do anything. But he's asking you guys how long will this give him to live. So at the initial diagnosis these patients have a disconnect, number one, of what they're saying versus what they're asking, but also what they're hearing from what you're telling them. So this is very overwhelming to them, they're sitting in the office, it's a rare disease, it's unexpected to them, and there's really no curative option at this time.

So it's a complete information overload. What happens? They get scared, and they don't move. Even if they were movers before, it's about 2/3 of people that are diagnosed with cancer literally at the time of diagnosis stop exercising from that point on. They don't know what's safe, they don't know what to do. So what's happening to these patients? Pamela is put on desk and light duty. She stops working out.

Tom stops playing tennis because he never asked if it was safe. Linda doesn't go out into the community and do activities out there because she doesn't know what germs might do to her, and Alex has his wife do even more for him. And this is at the time of diagnosis. Treatment hasn't started, and these effects are already happening. So, as we're well aware, osteoclast activity is increasing, osteoblast activity is decreasing. You have the effect of steroids on the bone, and you have the effect of fatigue.

So what's happening is these patients are moving even less than they were before, and their endurance is going down. Some of these patients are presenting with instability or fractures to begin with, and so they may need surgery or bracing before they even get through the door to me. So now I'm dealing with post-surgical pain, post-surgical restrictions, or even weakness that they get from being in a brace. In the golden days, bed rest was recommended as opposed to exercise.

As we've talked about, these patients are at a high risk for fracture. So, not knowing what to do, they didn't do anything. Now we're finding that exercise is actually beneficial, and if you look at the column on the left with bed rest you're really only making things worse for the patients. You're further decreasing their bone density, their muscle mass. You're increasing their fat tissue, you're putting them at a higher risk for DVTs, PEs, pneumonia alias, which ultimately all of this is potentially increasing the number of days that they have to be in the hospital.

You're increasing their cancer-related fatigue and depression, and overall decreasing their independence, and increasing their need for a caregiver. While on the other side of things exercise is actually improving every single one of those, and if done right is safe for these patients. The other interesting thing to see is talking about chemo completion rates. This actually improves with exercise. The patients are more compliant if they've been exercising. They're going to be more compliant with their medications, their treatments their regimen, but it's also putting them at a lower risk to have a decrease in performance status and have to put the chemo on hold, so that's a huge deal.

It's also decreasing the number of days in the hospital. So as a PT, there's a lot of things that I'm considering before I do anything with these patients. We're doing a thorough chart review, we're looking at the reports of the imaging, the actual imaging, if they've had surgery we're looking at the reports. We're reaching out to the orthopedics or the referring physician to see what restrictions they want to place on the patient before we start moving them. We look at vitals, we're looking at different things before and during exercise, and their response following exercise, so it's not like we just look at what they were in the clinic with you guys and say, OK, they're good to go.

This is something we're actively measuring, and we've found a lot of different things that maybe I haven't even done a single thing with them, like put a pulse ox on their finger. And at 76%, I grab another one. At 76%, patient's not short of breath, color, rapid, and they had significantly progressed disease. So things that we're finding are things that because we're checking things we're actually noticing before other people. There aren't really too many things that scare us in terms of platelets and hemoglobin, because we're exposed to this on a daily basis working in an oncology hospital.

I've worked with patients while they're getting platelet transfusions, I've worked with patients while they're getting red blood cell transfusions. You've just got to be safe with what you're doing, you've got to think about what you're doing. So there's really no cutoff levels. If there's a huge drop one from one day to the next on the inpatient side of things, then yes I'm a little concerned about a GI bleed or a significantly higher risk of bleeding. But those are things that were trending just like the physicians and APPs are trending as well, and we're looking at major comorbidities.

So their ability to heal in general, and recover from exercise and treatment in general. So this is why PT is essential. As opposed to just sending these patients out and saying, oh, yeah, you have a personal trainer, you're like, go work with them. Personal trainer is not going to be exposed to this information, and especially in the community around here even sending them to some of the outside providers that have no knowledge of multiple myeloma you're putting them at a risk of being in a germ clinic with a practitioner that doesn't necessarily know the risks of the bony disease.

So what I did was there's very limited research on multiple myeloma, so I looked at the research in osteoporosis as well. It's not the same, but it's at least similar from our aspect of being at a higher fracture risk. So just reviewing what's out there in terms of what's good and what's bad, I just want to review muscles. So every muscle has three different types of fibers-- your 2A, your 2B, and your type 1 fibers. So there's strength, power, and endurance.

Each of these things is in different proportions depending on what muscle it is, and what the point of that muscle is. Your type 2B fibers, which is right in the middle of the screen, are the muscle fibers that are most affected sarcopenia, being in a hospital for a prolonged period of time of activity, and also steroids. So these are the muscles that we tend to focus on the most. Those sit to stands you just did work that type of muscle fiber the most, so these are things that we're keeping in mind working with these patients.

For these patients also prone to more of a kyphotic forward flex posture, we're working on endurance and posture. Strength is obviously very important as well. All of these can be done with resistive training, and resistive training does increase muscle density. Not necessarily as much as weight bearing exercise, but it pulls at the bone and increases bone strength. So the osteoporosis research right now is recommending multi-component exercise programs. So it's functional tasks, climbing stairs and holding objects, walking across the street with groceries.

These are things that patients can see as actually going to improve their ability to do something day to day. There's GBFT, which is gait, balance, and functional tasks. As you can see, this is going to improve balance, walking on uneven surfaces, change of direction, change of speed. These types of things are going to help decrease falls. If the patients aren't falling, their risk of fracturing is even lower.

Tai Chi is pretty hot in the literature right now on decreasing falls and improving patient confidence, so there have been actually plenty of articles that recommend Tai Chi as a safe way to exercise and to improve bone density. There's not much in the oncology world in terms of exercise and multiple myeloma, but in general the oncology research is in favor of exercise. So the two quotes I'll leave you with is that exercise can make a difference, and it's essential to start exercise as soon as possible after the first consultation.

Overall, similar things that I quote on the bed rest versus exercise slide. You're going to increase quality of life, you're going to increase bone mineral density, which in these patients is obviously very important. Same with strength and chemo completion rate I think are the top things to talk about. You're decreasing the length of stay in the hospital, or the ICU if they get put up there, and again decreasing the stress on the caregiver and increasing the patient's ability to do more for themselves.

So overall, what the research is showing is that prescribed or supervised exercise is safe. Telling these patients to just go do whatever you want is probably not the best, but if nothing else any exercise is better than none. More exercise is better than less. The research studies are not showing that it's increasing or exacerbating symptoms if done in a prescribed and safe manner. Exercise does improve cancer-related fatigue. There are plenty of limitations on the current research.

First off, there's barely any studies out there in the multiple myeloma world, and of the studies that are out there the exercise actually there's no consistency of what type of exercise they're doing, how long they're doing it for, how long the follow up is. So it's hard to compare one study to the next. What's also really important in the world of PT and in your world is educating these patients. They don't know anything.

When I see them for their first appointment and I say, did you used to exercise? And they say yes, and I say are you exercising, and they say no, I go, why? I didn't know if I could. So talking to them about if they've had compression fractures or are at risk for compression fractures. As was mentioned earlier, flexion and rotation put the most stress on the vertebral bodies, so you're telling the patients to try and avoid those positions.

What does this mean to them? Absolutely nothing. You have to put real world tasks to it, so if you drop something on the floor you're not going to bend over and pick it up. You have to squat down. Completely changes the spine. It's still the same task. There's other ways to do things.

If you combine flexion and rotation, that's even worse. So what does that mean? Things like golfing, tennis, serving. Those are really probably the worst things that they can do, and you add the repetitive movement to it. Even worse. So it's not that they can't be doing these things. It's let strengthen you up, let's make sure your imaging looks OK, and let's get you back to it safely, instead of just saying keep doing everything, or let's think about what we're doing.

The safety of exercise is something that I also talk to patients about in terms of that the exercise groups in the studies show improvement over the control groups. Minimal adverse events were reported during these research studies, and as long as it's individualized even better. Then I also talk about potential injuries related to a fall, and how to prevent falls, and then the biggest thing I talk about is what they can do.

So repetitive weight bearing exercise is the best thing you can do to improve bone strength. What does that mean? Walking. Putting them on a walking program, saying get out and walk every single day. I don't care if it's five minutes, I don't care if it's 30 minutes. Let's get a start somewhere. If you can make it a habit, you're more likely to continue doing it. Resistive training does increase bone density as well.

So I talk about all of that. So going back to our patients, again, I'm telling Pamela in different ways that she can work out that are safe, what she can be doing at her job that is or is not safe. I'm talking to Tom about why serving might be pretty stressful on his spine, but maybe he can keep playing as long as he is OK with not serving and just doing forehand, backhand, and playing around that way.

With Linda, she's also a postmenopausal, so she's at higher risk for osteoporosis on top of her multiple myeloma. So what does that mean for her bones? So trying to get her on a walking program, and continuing to be active, and then I'm talking to Alex about doing more for himself. Doesn't matter how long it takes him to get dressed. If he can do it on his own, he can do it on his own. If he's continuously having his wife do it, it's that much less activity that he is getting.

So here at Roswell-- I'll just briefly touch on it-- it's very much a team approach. We're talking to the doctors, we're talking to the APTs. We rely on everyone around us to do what's best for the patients. We do check all the patients before a transplant or before CAR T-cell therapy. Usually we see them twice for an evaluation. If they need rehab beforehand, we're providing outpatient PTs to get them strong enough to tolerate the process. All of the transplant and cellular therapy patients in the hospital are consulted for physical therapy and occupational therapy.

In terms of the lymphoma service, multiple myeloma patients it's sort of an as needed type service, and we're really just identifying and treating. With the CAR T-cell patients, myself and the other PT have been finding the neurotoxic symptoms sometimes a day earlier, sometimes hours earlier than the nurses or practitioners. So we're passing on those findings just because we're consistent with the patients. We know them, we know their personalities, so those little personality changes that are occurring, motor planning changes, ability to follow directions. Sometimes we're actually catching those earlier, and then I know multiple PTs here at Roswell have actually identified fractures or acute neurological events.

Stop treating the patients, talking to the practitioners, and saying, hey, something's going on. You guys need to do imaging, figure out what's going on. So beyond just the norm, we are finding some of these other events. Post treatment. We're also treating these patients if they got weak or deconditioned in the hospital, and, like I said, in the hospital we're just trying to improve what's going on. If they need adaptive equipment or assistive devices to help them be more independent, we're also providing them with those things.

Bracing, we're either talking to the APTs or physicians, or talking to a brace company to get them fitted for what's appropriate. We're also starting to do research hopefully in the next month or two. It's going to be a safety and feasibility study with patients that have multiple myeloma, and getting them into a resistive exercise program. So very exciting to see what comes of that. Hopefully we're ready to start that up.

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