

MM = Maureen McBeth

UM = Unidentified Male

MM: Thank you for joining us. My name is Maureen McBeth. I'm a physical therapist and I'm here today to talk about our understanding of Lymphedema, the Anatomy, the Pathophysiology and the Treatments that we have available. First I'd like to tell you a little bit about my disclosures. I'm excited that I'm involved in a lot of different areas, from education, with many different companies, for schools, training CLTs, and for the APTA, and I'm still a clinician, working most days in the clinic. I like to think I got my start back in my start back in my Frank Netter phase. I was ten years old and I drew this picture of the human skin. But there was something missing and I think we all know what that was. But with the lymphatics. So even in the best textbook I could find, the lymphatics were missing. It's not surprising that some of the thought leaders today, such as Dr. Rockson, have talked about that the lymphatic system has been the subject of passive neglect for centuries in medical development. And as we know, the population is large and historically underserved. So I thought I'd go back and look at the literature in my own lifetime. Here in 1966, you can see there were only 71 items if I search for lymphedema. And slowly but surely, by the time I finished PT school in 1996, there were 204 that year. The slope is pretty flat at this point, but all of a sudden, we start to see things take off. And so by 2017, we have close to 700 different articles about lymphedema and each year it continues to grow. Here were some of the really exciting articles that I found that made me think about some of the things we've already talked about. There was actually research that the worldwide healthcare shortage of lymphedema is documentable. So whether it's in the United States or anywhere, we don't have enough lymphedema therapists. And then there is basic research on things like estrogen receptor positive status and whether or not that protects against lymphedema. This is really exciting. And finally, one of the other articles I found was about looking at people who had secondary lymphedema after lymphadenectomy. But seeing if they also had underlying primary lymphedema. So, when we think about Dr. Rockson and his colleague Dr. Mortimer or in the United Kingdom, two of the thought leaders have said, "The lymphatic system is very important to all the diseases that we are dealing with in the 21st century, particularly cardiovascular disease, infection, immune system issues, cancer," and they really think obesity as well. So let's talk about the lymphatic system. This gets very exciting. When we look at that initial lymphatic collector and how intertwined it is with your systemic circulation, I like to show patients that this is where lymphedema really starts to develop. And the leading researchers have started to say it's an inflammatory reaction at this level that really starts the problem. But then as you see the collecting vessel and those lymphangions going into the lymph node, this is where we start to have pumping difficulties and something happens to that lymph pump and it doesn't work properly. So let's go back to physiology. And everyone remembers Starling's Principle from our training, but it's hard to imagine that he lived in the 1800's and it was roughly in the late 1890's that he came up with his rules of microvascular fluid exchange. And some of these are still held true today. The fact that the fluids and the proteins, those molecules and that colloid osmotic pressure, they kind of attract each other and what happens in that interstitial space, that still holds true. But what he thought about what happens on the venial side, in the veins, we've really shown that this is not, we don't have the reabsorption, so it's not true and these molecules don't get back in like we thought they did. So when we thought there was this 10 to 30 percent kind of interstitial fluid volume that the lymphatic system had to deal with, we really know that's not true at this point. So interestingly enough, Starling thought there was something else going on. He didn't have an electron microscope. When we talk about the

Revised Starling Principles though, this was after we understood there's something called your glycocalyx in your body. And this is kind of a film that's inside of all your endothelial vessels. And it limits the amount of fluid that can go out or even get back into these blood capillaries. As a result, we really see this dwindling of filtration and we don't see reabsorption like we thought. So in essence, all fluid that gets out of our microvascular system gets into the lymphatic system. So all chronic edemas, any inadequacy of any type of swelling, really is a result of a problem with the lymphatic system, either failure or it's overwhelmed. And so any swelling is responsible for the lymphatic system failure and we have to accommodate for that. So let's talk about breast cancer-related lymphedema. It's been called "cancer's dirty little secret." The National Cancer Institute talks about how poorly understood, underestimated, lack of research and the treatments are not where we need them to be. The pain, the swelling, the potential for infections, can occur right after surgery, within months, years, and even decades after. So who really is at risk? Let's look at this year's results from the American Cancer Society. They estimate that 268,000 women will get breast cancer. The research says that approximately one out of five women will develop lymphedema and that's almost 54,000 new cases of lymphedema in this coming year alone. We have clinical practice guidelines. The APTA has issued these in 2017 and there is a growing body of evidence to support early intervention and surveillance. The NCCN Guidelines were established, and in 2018, they actually added a separate section for lymphedema treatment. And to summarize these, lymphedema education, including self-care management is very important, as is access to a certified lymphedema therapist and therapies for range-of-motion exercises. They have understood that lymphedema is chronic and progressive and they've shown that effective home-based self-care is very important for long-term results. They also highlight that early diagnosis is key. So if we think about those 54,000 women, we can capture them when they're in stage zero or stage one, where the symptoms are reversible as opposed to stage two or three where they could be less responsive to treatment. That would be integral in really providing the utmost care that our survivors need. Survivors need to know of the report of subtle swelling, of fullness, of tightness, of heaviness or pain in the treatment area that they have been treated for. So we when we diagnose lymphedema, we have to look at a few different things. We should be looking a perspective surveillance models and integrating them to get improved health outcomes. This has been well documented in a lot of the literature. And as clinicians who are dealing with this, we have to be aware and find those early symptoms and those early signs and facilitate rapid referrals. Many of us have to deal with waiting lists in our clinics, but this is not okay if it's a cancer-related lymphedema, especially when we start to risk stratify patients. Going back to Dr. Rockson, an important piece that was published in the "New England Journal of Medicine," meaning that's going to reach a lot of physicians that wouldn't read lymphedema journals for example, we pointed out that axillary lymph node dissection and the adjuvant radiation therapy are the major risk factors. So this is a good place to start if you want to set up a perspective surveillance model. This way diagnosis could not only be based on the risk status, but we could be looking for those physical findings that could show that a patient has early or subclinical symptoms. If we think about our stages and if we think about the burden that this disease has placed on women, finding patients in stage zero where they have that heaviness or tightness and some impaired mobility, or even a stage one where they start to show evidence of edema, this would be very critical in helping mitigate their issues on quality of life and also the physical and psychological burden. So we don't want patients to get to those stage two or stage three before we start to treat them. So going back to these risk stratifications, on the left-hand side you can see dissection of axillary nodes, radiation therapy and even taxane-based chemotherapy, along with a critical one that we're starting to understand, that a BMI greater than 30 is a major risk factor. We have some

other risk factors, such as positive node status, history of biopsies, radiotherapy and even postop complications and infections. I want to talk a little bit about the positive node status. A year ago, an interesting study, looking at the preoperative lymphedema risk factors for early-stage breast cancer, actually found that almost one out of five women had lymphedema as shown by bioimpedance spectroscopy prior to any treatment. And this was associated with their BMI being elevated and positive node status of eight or more positive nodes. So this really makes us think about when do we get patients in? do we just do it before surgery or do we actually do it before treatment? So the risk factors for chemotherapy, which is often given before any surgery, radiation which is usually after surgery, the axillary lymph node dissection and the positive node status, which would equate to an advanced disease stage, along with high BMI must be these risk factors that we go back to our clinics and say, "All these patients really need that perspective surveillance model." Because when we look at the five-year incidence and see how many people actually go on, you can see how the hierarchy, it starts with ??? lymph node biopsy around five percent, then you do an axillary node dissection, that's almost 16 percent. Once we add radiation therapy, you can see it's well over 25 percent. So this highlights that need for risk stratification. The timing is also interesting. Again, once you add radiation to it, the numbers increase and between 12 and 30 months postoperatively was sort of the peak of finding these symptoms in people. So we can't just see someone six months after or 12 months after. We need to follow people at least for three years for our perspective surveillance to really work and capture all these patients. So let's talk about treating lymphedema. How can we best select the lymphedema strategy? I really like to think about my plan of care and say, "What is going to help my patient?" This is a chronic, progressive disease, even when we catch it early. I've had many patients who have had a sports injury and their symptoms flare up. I need to have a plan. I need to know where my patient lives, how close are they to treatment? Even in the State of Maryland where I live, I have patients who have to travel two to three hours to come see me. Will they be able to adhere to therapy? It may not be just their ability, but also their desire. Do they have both and are those well matched? I need to look at that home care plan before I even treat them to know which tools are going to be essential for them to use and they'll have access to. And I have to do that the moment I see my patient walk in the door. So we know that complete decongestive therapy has great outcomes. Eighty percent of patients can maintain these benefits. It is our gold standard of care. We do have issues with lack of patient compliance and it's often a time and the ability to do the ongoing care that comes into play, particularly doing self MLD, which can put a lot of demand on a patient physically. So if we think about the treatment pathway and all these different arrows that should connect home phase to CDT to ongoing care that we follow up with them. One of the things that I found in my practice is there's often barriers. And so, whether it's in that initial diagnosis and that they actually don't do any home phase or they don't get to CDT before they've started their home phase or vice versa, I find that these often end up with failed treatment. So let's talk about what we can do for that. How does Tactile Medical help with this? They have clinically proven at-home options for our patients. We're going to focus on the cancer-related lymphedema here but regardless of what type of lymphedema they have, they provide that continuity of care that our patients need. They have excellent service and support and that's how we can get the outcomes. We can't do this alone and I'd like to talk a little bit about how they can also reduce cost and really give patients their lives back. This is what the devices look like. My patients' best cancer would be using the top device. You can see the truncal decompression, decongestion, excuse me, and the whole arm, they can comfortably do this in in their home. There's head and neck treatment and also lower extremity. But what I really like is that it's that gentle dynamic mechanism of action that's similar to my MLD and we'll

talk about that more in a minute. But it's easy to put on, it's almost like putting clothing on, like a jacket for the upper extremity or like a pair of pants for the lower extremity. And it can be used in all different aspects of cancer-related lymphedema. So how does the Flexitouch Plus mechanism of action work? Well it's very similar to our MLD that we all utilize, where we have that working phase and that resting phase. It's this mild dynamic pressure that comes in these one to three-second intervals. And as you can see, it's going to put the stretch on those initial collectors and get that fluid into the lymphatic system. If you go and look at near-infrared imaging, which is absolutely fascinating, and the fluorescent lymphangiography, we can actually watch the lymph fluid move while we're doing treatment. And this is very exciting. You can go to You Tube and watch many of these videos. So let's go into the clinical efficacy. Flexitouch has actually shown incredible cost savings in both the cancer and the non-cancer related cohorts. Let's break this down to how we think they get that cost savings. One of the most important ones is the prevention of cellulitis in reduction. These numbers are really staggering if you think about it. 79 and 75 percent reduction in infections. To me, this is one of the most important things, 'cause we know, cellulitis is one of the most dangerous things for our patients. It's actually the only reason that lymphedema can become life-threatening. So to get these reductions is absolutely important because it's also one of the most expensive things to treat if the patient gets into the hospital. But look at how we can also decrease their need for OT and PT services. This is expensive for our patients. If we can reduce the amount of time they have to come to my clinic, that's a win for my patient. Reduced outpatient visits and look at this reduction of hospitalizations. Again, this is one of the leading cost factors that our patients have to deal with. So how does it improve the quality of life? These are amazing patient satisfaction numbers. Not only to say that 90 percent are satisfied with this, but it's not just about how it helps their lymphedema, it's actually about how it actually helps their mental health. So this is that quality of life we're trying to get our patients to, and when I can have a patient still use something 96 percent of the time, those are very important statistics to me. And 95 percent of the patients talk about that they were able to maintain or reduce their lymph volumes that we achieved during intensive phase. So this has a great impact on their overall health. Let's talk about how the Flexitouch compares to manual lymph drainage. When our patients try to do this on their own, they honestly say, "I'm not very good at it." And when I ask them, "Do you really do it as long as I tell you to do it?" They're like, "No, I really don't." and they're almost embarrassed about that and they wonder why they don't get the same results. So this was an interesting study where they did a crossover, meaning each group did the same treatment and had a little washout phase in between. And so in the first slide, what we're talking about here is the actual volume reduction that they achieved. With self MLD no one got volume reduction, but with the Flexitouch they did. They almost got 200 mls of volume reduction. So then, when they looked at what that meant for weight loss, and mind you this is in kilograms here, so 2.3 kilograms is a big weight loss for a patient in a two-week period. And with self MLD, they actually gained a little weight, almost a pound. And you can see what happened when they actually utilized the Flexitouch. My patients really liked this, especially my breast cancer patients because they often picked up a lot of weight during treatment. A lot of this is water weight, that the diuretic effect of doing lymphatic drainage really helps and they see the results when they're doing the Flexitouch. So how did it compare to a simple device? Remember, a simple device is one that may end at the end of the extremity, so it won't go and do any truncal decongestion beforehand. And you can see again the patients with the simple device, they didn't lose any edema, the patients using the Flexitouch did, and what is the local tissue water change? Well there's actually a device that can measure local water and with the Flexitouch, we can actually show that the water moved out of that area. But with the simple pneumatic

compression device, it did not. So we see the effectiveness not only of the advanced pneumatic compression compared to self MLD but also compared to a simple pneumatic compression device. So really, what this comes down to in the end, is for anything to be effective in the home, it has to be well tolerated. Our patients have to make it become a part of their daily life and daily care. It's really a gift that they're giving themselves. And that way, with this optimistic view, they can see these benefits and gain benefits. So that question that I ask myself the moment a patient walks in, will they get improved clinical outcomes? Will this Flexitouch system translate into improved quality of life? I think I've been able to see this over and over again with my patients. And I hope that you take a look at it and say, "What can I do to start off my patient on the right foot? Not wait until they get worse and my treatment didn't work or the six months of home care didn't work." I'd really like to introduce this in the very beginning, say to my patients, "Hey, I think I have a tool that's going to help you and do the work that we're going to do together and when you transfer to your home care, it's going to be something that you'll find lasting benefit. So, thank you so much and if you have any questions, we'll be taking those in a few moments. Thank you.

- UM: Hello everyone, and on behalf of Tactile Medical, thank you so much for taking the time out of your day to join us on this webcast. Maureen, thank you so much for your passion and energy around this subject; it's truly inspiring and we really need more advocates like you for the patients out there that we're all collectively trying to serve. So thank you so much for sharing with us. And for everyone out there, as we're waiting for questions to come in, if we don't have time to get to individual questions in the room or additional questions come up in between now and later, please share those with your product specialist from Tactile Medical so that we can follow up with you via email through Maureen. So it looks like we have a question from the online widget. So Maureen, did you mean eight or more nodes affected with cancer or eight or more nodes removed?
- MM: So that was eight or more nodes that were actually affected and that was the article, it was from a group in Turkey and Dr. Rockson referenced that in, it was a really nice article in "The New England Journal of Medicine," which again, as I mentioned, it's great because that gets wide readership. And so I believe it was that there were eight or more nodes that were affected for people that had the axillary node dissection and it was about one out of five women in their particular study who had positive L-Dex scores at the time of diagnosis.
- UM: Great, thank you for answering that question. Another question here from the online Q & A widget, you mentioned a recent article about underlying primary lymphedema. Can you talk more about the findings in this study?
- MM: Yes, thanks Dan. So that's a great question and it's been one that's been on the radar of researchers for a couple years now. So a group of, I think it was in Belgium, that had looked at, it was a retrospective analysis with patients who had treatment for lower extremity lymphedema and had obviously had gynecological or urogenital cancer. So there were men and women. I don't think there were many patients in the study; it was around 33, 34 patients. And what they did was look at their lymphoscintigraphies and what the researchers found was hey, these lymphoscintigraphies don't look normal to begin with. They had evidence that normally would be seen only with people with primary lymphedema. And so their analysis, though limited in scope, suggests that potentially this lymphedema may not be related to the cancer treatment itself but actually to an underlying primary that was probably latent and potentially

got triggered by the treatment. So it's really a secondary on top of a primary. And that article is also available for free on Pub net.

UM: Alright, thank you Maureen for that answer. I think that that study in particular is fascinating as you think about the rates of primary lymphedema, we're used to hearing about in some of the traditional literature versus research like that that's making us think that primary lymphedema is in fact a lot more common and perhaps underlying and latent. One thing for everyone calling in that I wanted to mention, Maureen has graciously outlined a few of the articles that she's shared throughout her webcast and we'd like to make those available as they are available free online. So if you do have interest in accessing any of those articles, your Tactile Medical product specialist can provide those to you as well. So as you're answering the last question, another question came in from the Q & A widget and for those of you out there, if you would be so kind to identify yourself and where you're practicing, that's very helpful for the audience. But this one came in, Maureen, how do you recommend therapists work with oncologists and surgeon to improve early detection and surveillance protocols and how have you handled this in your area practically?

MM: Well that's a big question, kind of has two parts to it. So I always go back to the research and we've had now a long history of research suggesting that surveillance, starting back in 2008 with Nicole Stout's groundbreaking article. It really looked at early intervention as a thing. And with some, the advent of some even larger evidence in a trial called "The Prevent Trial" and that's prevent just like it sounds, if you search Prevents Lymphedema, you'll find the interim results on that. And that was a large multi-center study that was done in the U.S. and abroad, I believe in Australia. Vanderbilt was one of the institutions and they're showing really strong promise that with technology like the L-DEX that with the bioimpedance spectroscopy, we can actually find people with lymphedema sooner, treat them sooner, so we're treating them with a much less burden. And when we combine that with the economic impact that we're starting to see for the patients with cancer treatment, a recent study by Dean Edell??? had looked at the impact, and again this was small, they only sampled 129 patients in the New Jersey, Pennsylvania area, but they found that their out-of-pocket costs if they had lymphedema were 112 percent higher than other breast cancer patients. And that's really where I talked to my doctors in the team and said, "Hey, this just doesn't affect us and the insurance industry and the hospitals. But these patients, if they go on to develop chronic longstanding lymphedema, are going to face significant financial challenges, psychological challenges, physical challenges." And I think that started to get to them and with that I've often gone on to say to my doctors that look we know it's probably not your fault, it's not just your surgical intervention and that harkens back to the study we already talked about. And there was one I didn't mention, but there was a study of women with breast cancer who had lymphedema, when again they looked at the functionality of their lymphatics in their leg and said, "Hey, these people already have abnormal lymphatic function." So between the emerging understanding of that people who are developing this possibly have like an underlying genetic phenotype that is putting them at risk for developing it, it's not just what we're doing to the lymphatic system, but it's that whole interaction with the person. And I think relieving that burden on the medical and surgical team and saying we now have to really pay attention to this, 'cause we're going to be the ones on the front lines who can see something, I think they're responding to that. And that's where it kind of segways into what I talked about in the presentation about making sure I'm getting my patients all the tools as early as I can to treat this potentially lifelong, very complicated disease.

- UM: Yeah, and I think that that perspective on this is really refreshing Maureen and I think it's very practical to basically acknowledge the life-saving work that the oncologists and breast surgeons are performing, but take the blame out of the equation when it comes to the complication of lymphedema. And I really appreciate your perspective there, that it's about empowering patients, getting them identified and treated so that it doesn't become an ongoing tax on their quality of life, and not only that, but the economic burden to the entire system. So really great perspective there. An additional question came in through the online widget while you were speaking. What are your thoughts on physicians referring to a company like Tactile at the same time that they refer to you in therapy?
- MM: So you know, obviously it depends on where the patient's at. For a lot of the reasons I talked before, even in Maryland, geographically I have a patient right now who is driving two-and-a-half hours to get to my next appointment that's right after this webinar. And in her case, she lives so far away from the hospital where she's being treated and where she sees me, that I remember when she was first getting treated, I actually talked to the doctor and said, "Let's get her hooked up with this device, I think she's going to need it." She had a long road ahead of her with complicated reconstruction and so I don't have a problem with that. And I think what we have to do is say hey, it's a tool. And so, let's say my patient is struggling through some early problems, has some truncal lymphedema, is in the stages of still getting treatment and they may still have more reconstruction, I don't know how I could help them without having something like this. So I'm all for kind of that early collaborative approach between the physicians. and for many of the therapists who work in areas where they, patients have to kind of travel far or they have long waiting lists, I was talking to a colleague the other day who can't get people in for about one to two months. So if the patient can get started with some treatment and have some understanding by the time they get to you, hopefully again, it's one more tool for them so that they have that self-management. Because that's really what makes our treatment work, is engaging the patient and they need tools to be able to do that.
- UM: Again Maureen, I think your perspective here is just really refreshing and practical. I like the way you talk about empowering patients to take care of themselves at home. So a follow-up question just from us here in the room, you've talked about patient challenges with self MLD, can you talk a little bit about your patients' compliance and I know you want them to do that at home, but if you were to survey your patients, how often are they able to even perform that activity?
- MM: That's always been a tough one. Even some of my best patients; I have a patient, she had to cancel today actually, she's a physician, very busy, and when she came in recently she said, "Maureen, I just can't keep up with this." And it's just too hard because it's an active treatment to herself. And so she actually combines using her Flexitouch with that need to unplug and relax at the end of, she's a busy physician, works in a pediatric ER. And to be able to go home and have something that is not only providing part of the treatment that she needs, because she really struggles after a long shift with her arm swelling. So she can come home and do this and she said it's actually also the time when she either listens to like a book on tape or some meditation thing. So I think, I again try to utilize and fit it into the patient's life so that it's something that's almost refreshing to them, because doing self-MLD is not. And even though I still have them do sort of an opening sequence, up at their supraclavicular fossa and perhaps a little bit of work on their abdomen, once that's done, they can sit back and relax and let the Flexitouch do the work.

UM: Thank you Maureen and an interesting perspective again. And so we do not have any additional questions coming in through the phone or the online widget at this point in time, so we'd like to conclude today's webinar. Thank you again to everyone across the country who's taken the time out of your day to join us. We really appreciate your attendance. If you do have questions that come up after the fact, please again get those to your Tactile product specialist so that we can get them to Maureen and circle back with you over email for an answer to your question. And again, if you do have interest in receiving any of the articles that Maureen so thoughtfully highlighted for us, we are able to provide those to you. Just please express your interest to your product specialist and they will be able to get you those. So thank you again everyone, really appreciate it, have a fantastic rest of your day.