

SRNA "Ask the Expert" Podcast Series  
Everything You Need to Know About Spasticity

The audio of this podcast is available at: <https://youtu.be/HBau0r9NCtg>

**GG deFiebre:** [00:00:00] Hello everyone, and welcome to the SRNA "Ask The Expert" Podcast Series. Today's podcast is entitled, Everything You Need to Know About Spasticity and How it's Treated. My name is GG deFiebre, and I will be moderating this podcast. SRNA or the Siegel Rare Neuroimmune Association is a nonprofit focused on support, education, and research of rare neuroimmune disorders. You can learn more about us on our website at [wearesrna.org](http://wearesrna.org). This podcast is being recorded and will be made available on the SRNA website and for download via iTunes. During the call, if you have any additional questions, you can send a message through the chat option available with GoToWebinar. Our 2020 Ask The Expert Podcast Series is sponsored in part by Alexion and Genentech. Alexion is a global biopharmaceutical company focused on serving patients with severe and rare disorders, through the innovation, development, and commercialization of life transforming therapeutic products. Their goal is to deliver medical breakthroughs where none currently exist, and they're committed to ensuring that patient perspective and community engagement is always at the forefront of their work.

[00:01:09] Also, founded more than 40 years ago, Genentech is a leading biotechnology company that discovers, develops, manufactures, commercializes medicines to treat patients with serious and life threatening medical conditions. The company, a member of the Roche group, has headquarters in South San Francisco, California. For additional information about the company, please visit [gene.com](http://gene.com). For today's podcast, we are pleased to be joined by Dr. Philippines Cabahug, and Dr. Jacqueline Nicholas. Dr. Cabahug earned her bachelor of science in physical therapy at the University of the Philippines in 1994, and her medical degree at St. Luke's WHQ Memorial, Philippines in 2000. She completed a physical medicine and rehabilitation residency at the Philippine General Hospital in 2005. She was awarded a UN Merck scholarship to pursue her postgraduate diploma in gerontology and geriatrics at the University of Malta in 2004. In 2009, she finished her internship in internal medicine at Atlantic Air Regional Medical Center in Atlantic City, New Jersey.

[00:02:11] She completed her second physical medicine and rehabilitation residency in 2012 at Johns Hopkins Hospital, and a fellowship in spinal cord injury medicine at Johns Hopkins Hospital in the Kennedy Krieger Institute in 2013. Upon completion of her fellowship, Dr. Cabahug joined the International Center for Spinal Cord Injury as a full time physician. She received her board certification in physical medicine and rehabilitation, and in spinal cord injury medicine in 2013. She's the director of the musculoskeletal ultrasound unit at her at Kennedy Krieger Institute. She runs two MSKUS clinics at Kennedy Krieger Institute, a musculoskeletal diagnostic clinic, and an ultrasound guided intrathecal pump access clinic. Dr. Cabahug is actively involved in medical education as a faculty clinical instructor with the department of physical medicine, and rehabilitation of the Johns Hopkins School of Medicine.

[00:03:02] Dr. Jacqueline Nicholas is a board certified clinical neuroimmunologist, specializing in multiple sclerosis and spasticity. She received her undergraduate degree from Miami University in Oxford, Ohio, and her medical degree from the University of Toledo, College of Medicine, in Toledo, Ohio. Dr. Nicholas moved to Pittsburgh, Pennsylvania to train at the University of Pittsburgh Medical Center, where she completed an internship in internal medicine, and a neurology residency, where she served as chief neurology resident. She continued her training at The Ohio State University Medical Center in Columbus, Ohio, where she completed a fellowship in clinical

neuroimmunology, multiple sclerosis, and spasticity. Additionally, Dr. Nicholas completed her master of public health degree at The Ohio State University, College of Public Health, to enhance the quality of her research studies to advance the state of care for her patients.

[00:03:51] Dr. Nicholas actively leads several clinical trials to help discover even more advanced treatments to help patients with MS and other neuroimmunological diseases. She's board certified by the American Board of Ps- Psychiatry and Neurology. She's a member of the American Academy of Neurology, The Consortium of Multiple Sclerosis Centers, and the National MS Society. Welcome, and thank you both so much for joining us today.

[00:04:13] **Dr. Jacqueline Nicholas:** [00:04:13] Thank you.

[00:04:14] **Dr. Philippines Cabahug:** [00:04:14] Thank you for having us, GG.

[00:04:17] **GG deFiebre:** [00:04:17] Thank you. Um, so, just to start, you know, just to kind of give an overview about what spasticity is and, and why it occurs, um, uh, Dr. Nicholas, would you mind just giving kind of an overview about, you know, what spasticity is, and what, uh, tone is.

[00:04:33] **Dr. Jacqueline Nicholas:** [00:04:33] Sure. So, spasticity is a common problem that can occur when somebody has any type of disease or damage in the brain or the spinal cord. So, you know, common reasons that we see this are things like transverse myelitis, or a stroke, or MS, um, cerebral palsy, there are lots of different causes. But, basically, um, spasticity is described as an increase in muscle, uh, tone with movement. So, if, um, somebody were to try to, um, quickly move their leg out, and they noticed that it was challenging, or was, um, was stiff, but if they slowly moved their leg and it didn't feel stiff, or they didn't have a catch when they were trying to move it, um, that's sort of the difference there with spasticity. There has to be some kind of component of movement, um, in which the tone increases. And so, tone is just sort of, um, the, the feeling of your muscles that you have, you know, whether it's at rest, or, um, when your physician is checking it, they might just slowly kind of move your muscles, and they can feel whether they feel tighter or, or looser, or whether your tone is normal, but that spasticity component, um, is really noticed more with action or movement. Um, but, uh, they often go hand in hand that somebody can, you know, have a problem with increased tone, as well as spasticity.

[00:06:01] **GG deFiebre:** [00:06:01] Great, thank you so much. Um, and Dr. Cabahug, do you have anything to add?

[00:06:07] **Dr. Philippines Cabahug:** [00:06:07] So, um, aside from the, um, increased tone and resistance to movement, um, when you have spasticity, you could, um, also experience the involuntary muscle spasms, and sometimes some of these spasms can be painful for some of our patients. Also, and I don't know if you've, um, some of the patients have experiences when they go to their doctors, and their doctors check their reflexes with a hammer, um, it seems to be very, very hyperactive. Um, one of my, oh, running jokes with my patients, uh, if I ask them if I have to step aside whenever I check the reflex underneath to avoid being hit by their legs kicking out. So, that was one of the things that you can see when you have spasticity.

[00:06:52] **GG deFiebre:** [00:06:52] Okay, great. Thank you. And then, um, what causes spasticity in these rare neuroimmune conditions like transverse myelitis or neuromyelitis optica? Um, Dr. Nicholas?

[00:07:04]**Dr. Jacqueline Nicholas:** [00:07:04] Yeah. So, anytime there's any kind of damage in the brain itself, or within the spinal cord, we, um, can have some over excitation of our signaling in our nervous system. And so, of course, um, we're not supposed to have our muscles be so stiff that we can't move them, or so that they're painful, but, when we have that damage, the signals can get confused. So, oftentimes, when somebody ... We have muscles that are called agonist and antagonist, and muscles have opposite actions, but the problem is, is when somebody has spasticity, let's say that they're trying to flex their arm to show off their bicep, um, well, at the same time they're doing that, their triceps should relax, but those two muscles can actually fight each other when they're trying to move on. And so, um, that's, you know, really the underlying reason why we get spasticity, is this over excitation.

[00:08:01] So, everything that we try to do when we treat spasticity is try to calm that down. Um, and I think as we go through the talk tonight, we'll talk with you about, um, reasons why spasticity can be beneficial, and then, obviously, reasons why it can be, um, harmful or painful and annoying to people who have it.

[00:08:21]**GG deFiebre:** [00:08:21] Great, thank you. And then, why do some people, uh, with these conditions have spasticity while others don't? Uh, Dr. Cabahug?

[00:08:31]**Dr. Philippines Cabahug:** [00:08:31] It really depends on what is affected in their, um, uh, spinal cord or in their brain for that, uh, matter. Um, if, um ... When you say a person has an upper motor neuron lesion, that's when you have a spasticity, though that involves your brain and your spinal cord, but when it affects, um, the lower ... When it affects the part of your spinal cord, it mainly controls ... At least, is mainly responsible for motor control. That's when you usually have your f- um ... Whe- when you usually do not have spasticity, or you have flaccid legs. Um, again, it's, it's kind of like real estate, location, location, location, so, what part of your brain or spinal cord is injury determines ... Eh, it determines, in part, if you're going to develop spasticity or not, in a nutshell, basically.

[00:09:29]**GG deFiebre:** [00:09:29] Okay, great. Thank you. Um, and, Dr. Nicholas, do we know why someone might have, you know, severe spasticity, or someone else might just have mild spasticity?

[00:09:40]**Dr. Jacqueline Nicholas:** [00:09:40] Yeah, it's, um, you know, there's not a lot of clear information as to why that would happen, other than, again, you know, as we talked about in the last, um, when Dr. uh, Philippines was speaking, um, you know, it, depending on the severity of the injury, depending on the degree that the brain and the spinal cord has been affected, that spasticity can be more severe, um, versus more mild. And one of the things that I often see in my practice is that, you know, when somebody has that injury, or that inflammation that can occur in the spinal cord or the brain early on, um, sometimes the spasticity is more mild, and it's, um, and it's not quite as bothersome for somebody, but, as time goes on, that spasticity can increase and become very painful, and, um, really limit function and movement.

[00:10:30] And so, one of the things that, um, you know, is very important to understand if you have this, is that, doing, um, daily stretching exercises is incredibly important, even if somebody has mild spasticity, um, to try to maintain that range of motion, and to limit the worsening of it over time, because, obviously, we don't want some of these muscles to become so tight that, um, they don't move and then they develop contractures, or inability to, um, you know, move the limit all, or to

have a, a fist with their fingers flexing clenched and to be stuck that way. So, obviously, if it's more mild, sometimes things just like stretching or, um, you know, uh, oral pills might be very helpful to help to loosen it, and staying well hydrated, but if somebody has more severe, um, you know ... We'll talk tonight about all of the options for what we can do to help to reduce that.

[00:11:23]**GG deFiebre:** [00:11:23] Okay, great. Thank you. Um, and then, is there any benefit to spasticity, um Dr. Cabahug?

[00:11:33]**Dr. Philippines Cabahug:** [00:11:33] Um, yeah, so, I, I tell my patients that not all spasticity is bad. Um, in certain cases, we utilize spasticity to help trigger movement, or to help support the limbs. Um, for example, I have patients who use their tone, uh, to help them with their transfers, or to help them trigger to be able to stand. Uh, i- it's not ... If we, if you take away all tone, as a theoretical, you won't be able to stand. We need a little bit of tone in our lives. The problem with when you have spasticity, there is too much overactivity of your nervous system, there, there's too much tone. Um, so, when, when we treat our patients, we always go back to what our goal of treatment is; is it for pain relief, is it for, to enable somebody to do their activities of daily, daily living-daily living easier, um, is it to, eh, um, help them walk better? Once we've settled on that goal, then we can focus our treatment in addressing that.

[00:12:38] Um, if I just indiscriminately give you all medications to take away your spasticity, you would be even more unfunctional than having some spasticity. So, there is ... There always has to be a goal in mind, and a balance in treatment.

[00:12:58]**GG deFiebre:** [00:12:58] Great. Thank you. That makes sense. Uh, Dr. Nicholas, do you have anything to add?

[00:13:02]**Dr. Jacqueline Nicholas:** [00:13:02] Yeah. So, I think that was, that was really great. Um, one of the things that I sometimes tell my patients when they try to unders-, you know, think about that is, um, you know, think about if you had, if one of your legs, um, was weak, and you developed spasticity, and that leg's so stiff, um, if you take away all that tone, if your leg was kind of like a cooked spaghetti noodle, you wouldn't be able to stand up very well, or to, um, to get around. And so, um, you know, as the other physician is mentioning on the line, if, if we take that all away, then, um, we can take away a lot of function, but as oftentimes as we loosen, and if we slowly try to loosen that spasticity, working with physical therapy can be incredibly beneficial to try to improve function once we've loosened the muscles, um, a bit. And, sometimes we can slowly go back and forth to try to loosen and then strengthen depending on what um, the actual injury or underlying cause of the spasticity was.

[00:13:57]**GG deFiebre:** [00:13:57] Okay. Thank you. Um, and then, you know, what, what is uh ... So, you know, as part of spasticity, what is clonus, uh, Dr. Cabahug?

[00:14:10]**Dr. Philippines Cabahug:** [00:14:10] So, for me, the best, uh, the best, uh, way I would, um, describe clonus is when you s- um, when you stretch a tendon and you have this repetitive movements. Um, when I gave the lecture the last time, I think it had a video of what clonus is. So, when you ... When we stretch your ankle, like we try to bring your ankle up, what happens is, is that we trigger a reflex, but because of the injury to your, um, central nervous system, it just goes on and on and on. Um, and that clonus, it ... Sometimes it just lasts for a few seconds, and then it goes

away, and other people it is sustained. Um, the clonus can in- infer those who still have the ability to walk, the clonus can ... If it, if the clonus is in the ankle, it can interfere with the safety and walking, because, imagine if you're walking and your ankles are flopping around, that's not safe.

[00:15:09] Some people have, um, severe spasticity that sometimes I see the clonus even in their wrists and in their fingers. So, basically, it's like a ... I- i- it is a, uh, um, a manifestation of spasticity, a hyper active reflex, it's, to simply put it. So ...

[00:15:28]**GG deFiebre:** [00:15:28] Great. Thank you. Um, now, we got a question about, you know, why when someone is first diagnosed, for example, with uh, transverse myelitis, or something like acute flaccid myelitis, um, that they o-, you know, often appear flaccid at the beginning, or, you know, around their onset, um, but then go on later to develop spasticity. Uh, Dr. Nicholas?

[00:15:49]**Dr. Jacqueline Nicholas:** [00:15:49] Yeah. So, when somebody has an initial injury to the brain or the spinal cord, um, we often see, um, uh, if there's weakness at, or complete weakness. We can see that the tone is completely decreased, and that's called, um, being flaccid, um, where, again, it, the limb can just feel sort of like a cooked spaghetti noodle. Um, and that's, that's very common initially after spinal cord injury, or, [inaudible 00:16:16] um, some severe, uh, transverse myelitis, and a mild, um, stroke. And, it's almost like, uh, the nervous system, there's an acute shock where there's no ability for any signals to be traveling, um, to allow you to move that limb. And so, the tone can be very, very decreased.

[00:16:34] And then, over time, as, um, you know, the swelling goes down, or there is potentially some repair, um, those signals can be mixed up, because the damage, um, that occurred is still there. And so, um, slowly, people can start to velop, develop spasticity following that initial injury, but that's actually the classic, um, teaching in medical school for our students, um, that we see when somebody develops weakness from a brain or a spinal cord lesion, or, uh, damage of any cause that, um, in the very early stage, it, we see a decreased tone, but then, over time, we see that, um, increase as there is some repair, or time, or, it, the, um, connections that are trying to be rebuilt.

[00:17:22]**GG deFiebre:** [00:17:22] Okay, great. Thank you. And then, you know, how long does it typically take after the sort of initial period for spasticity to d- develop if it's going to happen, Dr. Nicholas?

[00:17:33]**Dr. Jacqueline Nicholas:** [00:17:33] Yeah. So, it really depends. Um, so, you know, some people will actually develop it, um, within the first couple of, uh, weeks to months, and then some people will develop it, um, as time goes on. It, um, it really depends on the individual, but we can, you know, we can see it early, and, um, when we start to see that, we need to take action and start with those regular stretching exercises, oftentimes incorporating, um, pills, uh, that can help to reduce the muscle, uh, stiffness and spasms. And, um, you know, if that's not beneficial enough, then there may be botulinum toxin injections that are done, and then, for more severe spasticity, there are certainly more advanced causes like intrathecal baclofen pumps, but, um, you know, I have seen it happen to patients even within, um, a couple of weeks.

[00:18:26]**GG deFiebre:** [00:18:26] Mmm. Okay, great. Thank you. And then, um, why is it that someone might have spasticity only in their lower limbs, but not in their upper limbs, uh, Dr. Cabahug?

[00:18:40]**Dr. Philippines Cabahug:** [00:18:40] Uh, again, it goes to, um, how, where in your central nervous system have you, eh, it been affected, how, and how, uh, significant, um, has the, has your spinal cord been involved, basically. As I said earlier, it's, it's, it's a just a matter of I- um, where your lesions are when you had your TM.

[00:19:04]**GG deFiebre:** [00:19:04] Okay. Thank you. Um, and then moving on just to, uh, I- I- talk about kind of the, the treatment options that are available, and to go through kind of what's used at first, and then, you know, things that might be used later if those, uh, first line treatments don't work, um, you know, ho- how is spasticity generally treated, um, you know, in, in the, in the first place, uh, Dr. Nicholas?

[00:19:27]**Dr. Jacqueline Nicholas:** [00:19:27] Yeah. So, there are lots of options, and, um, you know, when, uh, when we see individuals who have spasticity, um, you know, each individual can be different. And so, um, you know, if somebody has more mild spasticity, um, early on, then, um, recommendations are going to include, you know, stretching, staying well hydrated, working with physical therapy, and, oftentimes, incorporating oral medication. So, one of the most common medications that we use for spasticity is something called baclofen, um, which can help to relax the muscles, but one of the challenges is, is that it can often make you feel very sleepy. And, as I'm sure you've experienced, if you've had transverse myelitis, or, um, any other neuroinflammatory disease, um, you've probably noticed that you feel sleepy already, because you're working so much harder to do the things that you used to do prior to that damage. And so, one of the challenges that we sometimes run into with those oral medications is that, although we could increase, and increase, and increase the medication to where it finally makes an impact, some people say, "Hey, I'm so tired, and I feel really confused, um, by taking this medicine.", and so, that can definitely affect quality of life.

[00:20:40] And so, um if somebody isn't benefiting enough from the oral medication, or they're having those side effects of feeling like they're having some memory problems, or feeling too sleepy, then, um, that would be the point where we would think of, um, more, uh, secondary options. So, if somebody has what we call focal spasticity, so let's say the spasticity is localized more to, um, a few muscles, or maybe one or two limbs, um, then we would first consider, uh, botulinum toxin injections. And so, Botox is a medicine that, um, interferes, uh, between the communication between the nerve and the muscle, and so, when you have spasticity, you have too much communication between, um, your nerve and your muscle junction. And so, um, the Botox, um, would be given by a spasticity specialist who, um, is able to find you know, the exact muscles that are causing that severe stiffness, um, and, uh, clean off the area of your skin, take a tiny needle, and put it into that muscle.

[00:21:47] Oftentimes, we use something called an EMG, um, or an electromyography, um, to help us make sure that we're in the right muscle, and we can actually hear the spastic muscles to know that we're in the best part of the muscle. And then, that Botox can be injected into a couple o' places in each of the muscles that are stiff, and actually help to, um, decrease that overcommunication so that they become looser. And when we get Botox, um, generally, the benefits of the Botox, it takes about 10 days or so for the full effect to be noticed, and then it should last for about three months. Um, so, when we give Botox, um, it can't be given any more frequently than every three months, um, and so, when people get that, we also incorporate stretching exercises, and, oftentimes,

physical therapy, because, if you get Botox and you're not doing the stretches, you're not going to see as much of a benefit.

[00:22:43] Now, if somebody doesn't have focal spasticity, meaning, just limited to a few certain muscles, or maybe, um, a couple of limbs, and it's more extensive, so let's say that the spasticity is pretty severe in both the legs, or it's very severe in multiple muscles of all the extremities, or maybe it's also in your, in your trunk or your back, um, you know, then we might consider, uh, something called an intrathecal baclofen, which is, which means liquid baclofen that's administered to the spinal fluid. And so, um, typically, when we're thinking about that as an option, um, what we will do is, uh, what's called a baclofen test dose. And so, in my clinic, if we're thinking about that, somebody would come into the clinic, and we would actually, um, do a spinal tap, um, so where a tiny needle is, um, taken into the low back to give some numbing medicine, and then we take a spinal needle and go through that numb area, and once we reach the spinal fluid, then I actually give, um, some of that liquid baclofen, and then, um, the individual is able to hang out in the clinic, um, for the rest of the day, and myself along with my physical therapists will go in and we will move their muscles, and, um, if they walk, we will ask them to walk and evaluate them to see if they had any loosening or not of their severe stiffness.

[00:24:07] And if they, um, did have any loosening of that stiffness, then we know that i- that baclofen administered to the spinal fluid is an option for them. Now, of course, anybody that's ever had a spinal tap is not going to want to have repeat spinal taps every day, and unfortunately, when we do this test dose, that baclofen injected only lasts for, um, that, that day, and it, then it starts to wear off. And so, um, there's a device called a baclofen pump, which sort of looks like a hockey puck, um, that can be placed into the low belly. Um, typically, there are other placements, but, typically, surgeons like to place them in the lower portion of the abdomen, and then there's a tiny little tube that, this is all internal, um, that would be placed in directly into the spinal fluid. So they typically make a tiny incision in the low belly, and then a tiny incision in the low back, and connect that tubing, and then the, um, the hockey puck device, the baclofen pump that's full of baclofen. And so, it has a computer chip that allows, um, uh, your doctor to actually program a dose of how much baclofen you should receive, and that baclofen is given continuously, um, at a, at a rate into the spinal fluid.

[00:25:23] And so, sometimes people will say, you know, "Well, this is great, I have this pump, but, I noticed that I have really severe spasticity every morning when I get up." And so, we can actually ask somebody, you know, "What time do you usually get up?", and we might be able to, um, program, you know, a slightly higher dose, um, so that they will feel more loose in the morning when they have that severe spasticity, but then can receive a lower amount, um, throughout the rest of the day when maybe it's not as severe. So, it is a really neat device. It's not something that we jump to for everybody, but if somebody has really severe spasticity, that would be, um, one of our, uh, uh, desirable options. It does require a lot of commitment and follow up, um, for the individual who has the spasticity and their family, because we want to make sure to keep them safe, and make sure that they don't run out of baclofen, because if they didn't come back to follow up with it, that could be, um, life threatening to withdraw from the baclofen.

[00:26:23] And then there are other options, um, you know, if spasticity is more severe, um, like, uh, you know, surgical, um, tendon release, or even something called phenol injections, but those are more rarely used.

[00:26:37]**GG deFiebre:** [00:26:37] Okay, great. Thank you. I think those are, are really good overview of, you know, the different options and how one can, might progress from, from one of the kind of first line treatments to something like the baclofen pump if needed. Um, we also did get a question about an SDR, selective dorsal rhizotomy, um, and whether that's an approved or recommended treatment for children with TM or other rare neuroimmune disorders, Dr. Nicholas?

[00:27:04]**Dr. Jacqueline Nicholas:** [00:27:04] Yeah. So, um, that's, uh, I might relay that question to our other speaker, because I don't, uh, take care of a lot of children with spasticity, and it's not something that I've actually ever referred anyone for.

[00:27:18]**Dr. Philippines Cabahug:** [00:27:18] So, when you do a, a dorsal rhizotomy, it, it is really more an invasive procedure; you're intentionally damaging, um, where the nerve enters and attaches to the spinal cord in order to decrease spasticity. It isn't, it is not, um ... Again, it is permanent, it is invasive, but I have taken care of children um, who, uh, have had severe spasticity, not necessarily related to transverse myelitis, but to, due to cerebral palsy. Um, years afterwards, even though they say this procedure is invasive and permanent, some of them developed spasticity again over time, and we really don't have a explanation for that, but as a rule, um, you have to have a really very good criteria to, um, to be able to undergo this procedure. Not all, not all institutions, uh, do this procedure, so you have to go to a university hospital, or any big, or any of the big hospitals, uh, with neurosurgeons who are, um, adept in doing this.

[00:28:32] Um, um, honestly, during my time here in the States, I have, um, uh, only taken a few of these kids who've had dorsal rhizotomy, and these were done like 10, 20 years ago. So that's one thing. Um, the ... One of the things I wanted to point out is, um, if it is just the case of severe spasticity, um, that has been refractory, inca- ... It's ... I call this treatment as part of my bag of last resorts. You've basically failed oral therapy, you've, uh, failed physical therapy, conservative baclofen pump, um, and this is going to be, um, one of those, um, last, um, uh, last treatment resorts to, to do. Um, that being said, y- you have to really fit into this good criteria, because, you, we are damaging a part of your central nervous system. You are cutting the dorsal or the nerve roots that enter your spinal cord from the back. The nerve roots that enter your spinal cord from the back are the ones that carry the sensory sensation, um, which is part of the reflex arc which is hyperactive when you have spasticity.

[00:29:44] So, the theory is, if you do this, then we, you basically take out the input carrying, uh, information to your spinal cord, but then again, it has to be uh, a very clear criteria, and not everyone will meet that criteria.

[00:30:00]**GG deFiebre:** [00:30:00] Okay. Thank you so much. Um, and then, uh, how would you treat spasticity at someone where there's varying degrees of spasticity, and, you know, one limb versus another, uh, Dr. Nicholas?

[00:30:14]**Dr. Jacqueline Nicholas:** [00:30:14] Yeah. So, that's a pretty common scenario, that, um, somebody may have, you know, more severe spasticity in one limb versus another. And, I would

approach that, um, in the same way that we talked about, um, earlier, about how we think about spasticity treatment. So, again, if somebody has, you know, maybe a more mild spasticity, let's say that they have spasticity in their arm and their leg, and maybe the leg spasticity is more mild, but the arm spasticity is more severe, um, sometimes that individual, um, may benefit enough from a very low dose of oral, uh, pills, uh, for spasticity. I know I mentioned baclofen earlier being a common one. There's certainly many other options. Um, uh, Tizanidine is another common one that we use. Um, but if they benefited enough from a, a low dose of that for the leg, um, then, uh, I may ... Let's say that they had more severe spasticity in their arm, then, I may just do, um, Botox in the muscles in the arm that's affected, but not, um, need to really do that in the leg, because they're benefiting enough either from, you know, lifestyle modifications, like, um, really good regular stretching and exercise program, um, or, you know, just a low dose of an oral antispasmodic.

[00:31:34] Um, but really, you know, we approach each patient ... Each patient, um, that I see is different in their goals, and their degree of spasticity, and, um, how much pain they experience from it, or how much their function is affected. So, a lot of times, um, you know, we will combine, uh, treatment options for spasticity. So, there are some people who may have really severe spasticity, um, in their, you know, let's say it's their legs and their arms, and, I know we talked about how we, you know, sort of reserve, uh, baclofen pump with the baclofen into the spinal fluid for more severe spasticity, sometimes people will get something like a baclofen pump, and that will, um, benefit them significantly, um, but as, um, was mentioned earlier, if we, um, do that, sometimes that, uh, the legs can ... We can alleviate the spasticity in the legs, but they can start to become too weak if we keep increasing that dose of the baclofen, when we're trying to get it to affect the arm as well, because it often helps best for the legs, and it can help for the arms, but, sometimes if we keep increasing that dose, we could make it too weak in legs where somebody loses the ability to walk, um, uh, to try to help their arm.

[00:32:50] So, we obviously don't want to do that if somebody is able to walk, and we want to use that beneficial spasticity as was mentioned earlier. So, we might, um, use, you know a slightly lower dose, so that we're giving good benefit to the legs, but then come back in and use something like Botox injections for the arm. So, there's all kinds of combinations that can be done, um, and the bottom line is, we don't want to overdo it to alleviate the spasticity, so much that it makes someone weak, but to alleviate it enough that it provides comfort, but still allows for function if function is possible.

[00:33:24]**GG deFiebre:** [00:33:24] Right. Thank you. Um, we got an, a question where the, this person had been diagnosed, uh, 13 months ago with transverse myelitis, um, but their spasticity has been progressively getting worse in intensity and area, and now the whole, their whole leg and mid back to their toes are affected. Um, why does the spasticity increase, uh, when the inflammation gets better in the spine, and, you know, will this keep progressing to the point that they potentially lose mobility of their leg? Uh, Dr. Cabahug?

[00:33:53]**Dr. Philippines Cabahug:** [00:33:53] Yeah. So, um, going, uh, going back to, um, one of the questions earlier, um, about when spasticity emerges, so usually within like eh, and then it could be variable, but as a rule, it, it, it first starts to occur within a few weeks to six months to a year. Um, over time, the spasticity normally increases and then it plateaus. There are many theories why, um, i- why your spasticity increases over time. Uh, it could be because, um, uh, as parts of the, the

central nervous system attempt to regenerate, but this, this attempt to regenerate is not always perfect. I tell my patients, um, "The receptors in your central nervous system become hyperactive because they've been cut off of, of the normal flow of information, and your central nervous system as a, as a, as a result becomes hyperactive, because your receptors, um, are too sensitive." Um, that could happen over time, sometimes specific nerve roots, when they branch out and try to grow out, uh, they're not always, uh, doing the correct ... They're not always relaying or processing the information correctly.

[00:35:04] Um, but then, as I ... Going back to my first statement, as a rule, your spasticity can increase over time, but our expectation is that, if you do not have anything acutely inflammatory, or you're not sick going on, it should plateau. Spasticity is not always necessarily bad. Um, as I mentioned earlier, it can help you with your function. I like calling this as one of my early warning devices. Um, if you are sick, like if you have a UTI, or it could something be as stupid as a, an ingrown toenail, it can cause your body to become, um, to be too hyperactive, or to increase your tone. That's what I mean by, um, spasticity being an early warning device; it can let you know that something is going on. Um, usually, in the, um, people that I see, the individuals I see who've had, um, some spine, have non traumatic spinal cord, um, disease or dysfunction, and not just friends from transverse myelitis, if their tone has been stable over time, and it is increasing, and it's increasing from their baseline, it tells me to look for something.

[00:36:14] Could be as simple as a UTI, they could be backed up [inaudible 00:36:17] and constipation, they could have a fracture that they weren't aware of, or it could be something else, and that's what I have to rule out for. I think one of the tips that I would tell our listeners is, you have to know your body very well. If this is more than what your use [inaudible 00:36:33] is, then please go and, um, consult with your physician and have yourself examined. That's all.

[00:36:41] **GG deFiebre:** [00:36:41] Okay. Thank you. And is there a period of time where, where the spasticity should kind of plateau, um, you know, after maybe, there is none?

[00:36:49] **Dr. Philippines Cabahug:** [00:36:49] Yeah, usually after a year or so. And again, it depends, um, but in, in, what I usually see, again, within that first year it starts, um, uh, i- i- i- it, it goes up, it round of, and after a year or so, it should plateau over time. I'm not sure about Dr. Nicholas, what's your experience?

[00:37:07] **Dr. Jacqueline Nicholas:** [00:37:07] Yeah. No, I would tend to agree with you that I generally see the most of what we're going to see at one year. Um, sometimes, you know, if somebody's not able to have that regular stretching, we can see it increase with time, but I completely agree that oftentimes when we're seeing that increased spasticity, it's because of some annoying stimulus on the body, like an infection, or some other issue.

[00:37:32] **GG deFiebre:** [00:37:32] Okay. Thank you. Um, and then, so the question ... So, this, uh, person was hoping to get their baclofen pump removed, uh, and it helps their spasticity a, a lot better. They're on a very low dosage now, only 20 micrograms, and are able to manage their spasticity as is. Uh, the neurosurgeon who will be removing it said that they normally keep the catheter in place, because removing it can cause leakage of the spinal fluid. Is this a common practice when someone gets their, uh, pump removed, uh, Dr, Nicholas?

[00:38:01]**Dr. Jacqueline Nicholas:** [00:38:01] Yeah. So, I think that, that would definitely be a concern. It's, um, obviously, if a catheter is, um, i- is in place, it has needle hole in the, um, the sack that, uh, keeps your spinal fluid there surrounding the spinal cord. And so, removing that could certainly, um, temporarily cause a spinal, uh, fluid leak. Um, I would say that I've seen, um, both scenarios, so I've seen some surgeon, um, remove the catheter along with the pump, and those patients, um, in my experience, have been fine, but I have seen some neurosurgeons, um, leave that catheter just because of that concern, but I think that would probably be something that's best discuss with your particular surgeon, and better understanding that percentage risk of that, um, with removing that.

[00:38:54]**GG deFiebre:** [00:38:54] Uh, thank you. Um, and then, uh, one of those who said that they'd heard about epidural stimulators helping restore function in people with spinal cord injuries. Um, has any this kind of new research that's been coming out have shown that they might help with spasticity as well, uh, Dr. Cabahug?

[00:39:14]**Dr. Philippines Cabahug:** [00:39:14] Um, I am currently not aware of, uh, anything related directly to spasticity, even in terms of epidural stimulators. I know that there are use of stimulators in terms of improving function, um, walking, uh, stimulate the bladder to contract. Um, honestly, I, I haven't heard of epidural stimulators for the spasticity, um, but other things that I am ... Other experimental and research modalities that are being used right now, that I'm aware of, are using transcranial magnetic stimulation, um, but then again, this is ... I have to stress, this is a research, and it's not going to be covered by insurance if, um, somebody tries to get that done. It's quite expensive from what I've heard.

[00:40:04]**GG deFiebre:** [00:40:04] Okay. Thank you. And Dr, Nicholas, you, you did talk a little bit about Botox being used, uh, you know, if someone has kind of spasticity in one specific area, or specific areas in their body, um, if someone is going to get a, you know, Botox, you know, every three months, for example, for years and years, um, does, does everyone develop antibodies to Botox, making it less effective, or is this something that, um ... Is this a treatment that someone can get for years and years and years, and not have any issue with it not working anymore?

[00:40:36]**Dr. Jacqueline Nicholas:** [00:40:36] Yeah. So that's a great question. Um, so, it's definitely possible, um, to develop antibodies to, um, the Botox, um, but, it is not extremely common. So, you know, I take care of many patients who've had the same type of botulinum toxin that we've used for years, and, they've done fine, and, you know, we inject it every, you know, three to four months, um, and based on, you know, how long they received the benefit, and they've done very, very well. Um, but there certainly is, uh, you know, there are some times the occasional individuals who, you know, really seem to be achieving great benefit with the Botox injections, and then we start to notice that they're not getting as much benefit, or they're feeling still very spastic despite the injections that they had received benefit over time. And so, the good thing is, if that happens, we can always switch to another formulation of the toxin, and that often resolves the issue.

[00:41:32] So, there are, um, you know, several different types of botulinum toxin that can be used, and, um, you know, I haven't had anybody who has had an issue where they've become immune to all types.

[00:41:46]**GG deFiebre:** [00:41:46] Great. Thank you. Um, and then, uh, Dr. Cabahug, has, uh ... Do you have experience using, um, you know, not the epidural stimulation, but electrical stimulation on, you know, the s- the muscle, you know, via the skin, uh, being used to treat spasticity at all?

[00:42:02]**Dr. Philippines Cabahug:** [00:42:02] Yeah. So, actually, that's also part of our therapy program. So, you could use functional electrical stimulation in your spastic muscles. It does offer some short term effect, um, in, in relieving and decreasing the spasticity, and actually, this is very helpful, especially while you're, if you're doing this, um, during your therapy sessions, because, if we could get your tone to relax, then we could also be able to work, uh ... You could also be able to work better with your physical therapy, and, and doing the things you, you need to practice on, or work on when you're in your therapy session. So, yes, there is the use of electrical stimulation, um, to decrease your spasticity. Um, still, up to this time, they're still debating on how much, how long, how strength, the frequency, um, but that's something for, uh, more for scientific physical therapies, um, discussion, but it is, um, it is something that we do use for spasticity management, and I really find that as a helpful, um, uh, modality when our patients are in therapy.

[00:43:06]**GG deFiebre:** [00:43:06] Got it. Thank you. Um, and then, uh, Dr. Nicholas, how does, how were, or does spasticity change the muscle, or bone, or ligament, uh, or, you know, other structures over time, you know if someone is experiencing spasticity?

[00:43:20]**Dr. Jacqueline Nicholas:** [00:43:20] Sure. So, with spasticity over time, um, if that muscle is, um, so tight, um, as that it, it can't be activated or used, um, sometimes that muscle can atrophy over time, or start to shrink. Um, the other thing that we can see is, um, actually our, um, our bone strength relies on us being able to, um, you know, move our muscles. Um, that pulling of the muscle on the bones actually helps to maintain that bone strength over time. And so, um, if somebody is no longer able to move that limb, or, um, do activities, or even bear weight on that limb, then we can often find that the bones will become more thin over time, and certainly, individuals with spasticity are more at risk with time for, um, osteopenia, thinning of the bones, or osteoporosis. And so, that's definitely something that we have to think about and be mindful of.

[00:44:20] Um, the other thing is that if spasticity is not, um, treated with a lot of the options that we've discussed tonight, and it's severe, it can definitely cause those ligaments to shorten, um, or become tight, and people can develop contractures, where they're basically fused, um, and, um, then somebody can no longer, you know, really move that limb. And so, um, that's what we're trying to prevent with all of these things, because if it became to that severe point, really, the only thing that could be done would be, um, like a surgical, um, tendon release. Um, so these are more, um, long term effects, but with, you know, good spasticity care, depending on what's appropriate, and stretching, and physical therapy, we can often help to minimize these problems over time.

[00:45:12]**GG deFiebre:** [00:45:12] Great, thank you. Um, and we just got a few questions, specifically, about acupuncture, and whether acupuncture has been, uh, shown to be effective at all, uh, with, to treat spasticity. Uh, Dr, Cabahug, do you have any experience, uh, with this?

[00:45:27]**Dr. Philippines Cabahug:** [00:45:27] So, um, in, in using acupuncture, so we have to ... It depends on what type of acupuncture really. There's the, um, the traditional Eastern acupuncture, um, and then there's elector acupuncture. Um, it is an agile, but there's not necessarily any good evidence that it helps with spasticity. Now, if you're talking about something like electroacupuncture

or dry needling, it can, um, clinically help, again, it depends, help decrease the tone, but again, there's ... Uh, so far, there really hasn't been that good of an evidence regarding, um, uh, use of acupuncture, dry needling, electroacupuncture.

[00:46:11]**GG deFiebre:** [00:46:11] [inaudible 00:46:14]. Thank you. And then, uh, as a follow up, uh, to what we were talking about, about, um, spasticity kind of changing over time, um, we got a question from someone listening, uh, you know, at the moment, saying, "Can you speak to those of us who have TM and mild spasticity in their legs only, and a slow steady recovery? Does spasticity also diminish over time for those of us that are recovering, and will medications interfere with potential improvement? Uh, Dr. Nicholas?

[00:46:41]**Dr. Jacqueline Nicholas:** [00:46:41] Yeah. So, spasticity can definitely change over time. And so, um, you know, there are some individuals who initially have, um, you know, spasticity following an acute neurologic, uh, event, like a transverse myelitis or a stroke, where they do need some of these more advanced treatments like botulinum toxin injections, but with, um, you know, great, uh, work in terms of, you know, doing the regular stretching exercises, and working with physical therapy. Sometimes we do see that people can, um, you know, slowly decrease the amount of, um, either Botox injections that they need, or oral antispasmodics, um, uh, and sometimes, in, in some cases, um, that require that anymore. I would say, most the time when it becomes so severe that somebody needs those injections, or, um, something more advanced, that would be, um, more uncommon, but the place where I see that the most common would be in somebody who's had, uh, an acute stroke.

[00:47:39] Um, the, um, certainly if somebody is, uh, treating your spasticity, um, and, um, treating it to the point where the muscles are so loose, that, um, somebody is, uh, just too weak to even be able to, to work with therapy, or to allow those muscles to function, that could interfere, but that's why, um, spasticity experts are really working to control that spasticity to agree, a degree to which you're having some comfort, and some, uh, loosening, so that you can then work with those rehab specialists to be able to try to regain some function. So, I think, unless somebody was completely knocking out your muscle function with, you know, too much Botox, or too high of a dose of intrathecal baclofen, um, I think that it would be very unlikely that they would be inhibiting, um, your ability to have some recovery.

[00:48:39]**GG deFiebre:** [00:48:39] Okay. Thank you. Um, we got another question from someone who's diagnosed about 16 years ago. Um, the issue that they have most is, at night or at bedtime, uh, or even after they've fallen asleep, their legs will twitch or spasm, either waking them or keeping them from getting a good quality sleep and rest. Um, how or what can I do to address this? I do not take anything prescribed for this. Would like to know what options are out there, so that they could, you know, talk with their provider about this? Uh, Dr. Cabahug?

[00:49:06]**Dr. Philippines Cabahug:** [00:49:06] Thank you. Um, so, usually with, um, my patients, I review their medications. Um, one option would be uh, a low dose of, um ... And i- if, if, if it's the, if it's a matter of waking up in the middle of the night, we could do just a low dose of oral baclofen, which I find it's, uh, relatively sa- ... It is safe to say, for my patients to try. Um, Dr. Nicholas, what about you? What ... Do you prescribe anything else?

[00:49:39]**Dr. Jacqueline Nicholas:** [00:49:39] Yeah. So, I agree with you, if, um ... You know, it sounds like this individual who has, um, the challenges mostly at night, who doesn't take anything, oftentimes, actually, dosing any kind of oral muscle relaxer at nighttime, to help to try to reduce that, can be really beneficial. So, baclofen is typically my first line to use for that. Um, if somebody felt like, um, that wasn't helpful at the low dose that was started, you know, we certainly could increase that up over time. The beauty of taking it at night is that, you know, the main side effect of baclofen is that it's going to make you sleepy, so, the great thing is, if you're taking it at night, and we slowly increase that over time to control the symptoms, then, um, somebody shouldn't be feeling too tired in the morning. Sometimes there are some individuals who don't respond as well to baclofen for whatever reason, and so, I do have patients that I use tizanidine on, um, and that muscle relaxer, um, can work very well for them.

[00:50:39] So, you know, I think this type of, um, spasticity is very, very common, um, or where people will have some of these jerking movements, or tightness, or pain at night. It's probably one of the most common times that I hear my patients say they have the issue, and it usually does work really well to use one of these oral muscle relaxers.

[00:50:57]**GG deFiebre:** [00:50:57] Okay. Thank you. Um, uh, this other ... Uh, we've got another question, um, from someone listening who said that they have had NMLSD since 1993. Uh, they're 72 years old, and take baclofen four times a day. They stretch every day, but their walking ability is decreasing. Um, as someone ... Like this might be a candidate for a Botox injections, uh, Dr. Cabahug?

[00:51:22]**Dr. Philippines Cabahug:** [00:51:22] Um, if it ... Potentially, but, I think the best thing is to, uh, not seeing the patient. I think we should evaluate the patient, check the strength, balance, see what else is going on. Um, I would ... Again, perhaps, he, he just needs a, a, a course of aggressive, or, or focused physical therapy, um, to address any issues, because, um, we are dealing ... He said, you said he's 72 years old, right?

[00:51:51]**GG deFiebre:** [00:51:51] Yes.

[00:51:52]**Dr. Philippines Cabahug:** [00:51:52] Is that correct? So, I, I, I'm not pulling the age card, I'm just being realistic here. Everyone, everyone's bodies changes over time. As you grow older, we get slower, um, eyesight is difficult, balance is, is getting impaired. So, as a physician, I need to take that into consideration. I'm not blaming everything on your spinal cord injury. I like to see people as a whole, and when we evaluate, evaluate your strength, your reflexes, your, your tone, your balance, we check their range of motion, um, and then, based on, on, on that evaluation, and on your medicines, and what you're taking, what you have not taken, then, um, we could make a more appropriate decision to see if you would benefit, um, from Botox. I'm ... That's, that's when they're gonna be the ... That's how I would approach it. It, it, you know ... Botox is, um, is, it may be totally appropriate for it, in this scenario, but, um, you really have to be evaluated properly first, or con- ... Yeah.

[00:52:52]**GG deFiebre:** [00:52:52] Great, thank you. Um, and then, going back to, you know, the idea of spasticity changing over time, um, is it possible for spasticity to go away completely after one of these, um, diagnoses? Dr. Nicholas?

[00:53:07]**Dr. Jacqueline Nicholas:** [00:53:07] Yeah. So, um, you know, it just really depends on the severity of it. So, I think if somebody has such severe spasticity that, you know, your elbows flex, and stuck to your, um, chest when you're trying to walk, or just at all times, even when seated, um, and your leg is stiff, and you've had this spasticity for years, that would be a scenario where, unfortunately, I would not expect, um, that individual to be without spasticity, um, in their lifetime. But certainly, early on, um, you know, when we talked about how spasticity can ha-, can be of varying degrees, I do see people who have very mild spasticity, and then, over time again, with incorporating physical therapy and rehabilitation, um, and sometimes just low doses of oral medications, can do really well, and not have any issues. So, it is, um, very dependent on the degree of spasticity, but with more mild degrees, I have seen it, um, improve and resolve.

[00:54:08]**GG deFiebre:** [00:54:08] Okay, thank you. Um, and then, um, we did get asked what, you know, mentioned kind of a low dose of baclofen, um, what the, you know, potential dosages are for oral baclofen, if this is kind of one of the main therapies that are, are used, uh, Dr. Cabahug?

[00:54:22]**Dr. Philippines Cabahug:** [00:54:22] Yeah. So, your baclofen, the lowest doses, so, it can come in at 10 milligram or a five milligram tablet. Um, if, if they, if the pharmacy doesn't have a five milligram tablet, yeah, but 10 milligram tablet can be scored and cut into half. Uh, if you look for FDA, the maximum total daily dose is eight ... Uh, total daily dose, it is 80 milligrams. Sometimes I have people who are at 100 milligrams. I would usually start at a 10 milligram tablet, and then, depending on the person's age, and other, you know, if he has other comorbidities, or if the patient is anxious about starting on the medication, I would usually start at 10 or, or five milligrams, um, three times a day. I usually give my first dose at night, and I ask the patients to let me know how they feel in the morning, if they have any increased sedation, drowsiness, if they feel foggy, if they can't function. Um, I, in my practice, I'm probably a little bit more conservative, um, when I start these medications, um, I have the luxury of s- of, of seeing my patients, uh, more frequently over a period of time, and, and this is something ...

[00:55:34] Medications like baclofen, I would prefer, especially if they're older, um, individuals. I would start at a low dose, and go slow, and titrating upwards, monitoring for side effects. That's one of the rules that, um, um, w- we as physicians would follow. I'm sure Dr. um, Nicholas does, uh, the same thing. Um, so, usually we would start three times a day. The s- the, the smallest, the, the least tablets are the five milligrams or 10 milligrams, most pharmacies would carry a 10 milligram tablet, then you have a 20 milligram tablets. And, we would do it three times a day, I would normally start at, at night, check for any side effects, see if they can, if they can still function in the morning. So ...

[00:56:21]**GG deFiebre:** [00:56:21] Great, thank you. And, as we're, you know, getting to the end of our time, I just wanted to open it up and see if there were, was anything, you know, um, either of you wanted to, to chat about that we didn't have a chance to talk about, you know, in, in relation to spasticity and these conditions. Uh, Dr. Nicholas?

[00:56:37]**Dr. Jacqueline Nicholas:** [00:56:37] Yeah. So I think the most important thing is, if you have spasticity and it's not being addressed, please bring it up with your physician. This is something that can significantly affect quality of life, and to be honest, as doctors, a lot of times, um, we're not even trained on all the options to treat it. So, I'm a neurologist by training, and then, um, did, uh, neuroimmunology fellowship, and then later a spasticity fellowship, because, I was so frustrated by the lack of, um, training that I had and being able to help my patients who had severe spasticity,

because most neurologists only learn about the oral pills. Um, some of them have the skills to do Botox injections, but they often don't know about the advanced options or where people can go to receive these options. So, if you are, you know, not getting care for your spasticity, or, you feel like, um, it's not being adequately addressed, you know, I really urge you to advocate for yourself, and talk to your doctor about it.

[00:57:36] Um, you can look at resources through the SRNA, um, and they can help to connect you to experts, um, like, uh, Dr. Cabahug, or myself, um, or anyone, really, across the country who can help you, and there's so much that can be done for it. So, please don't lose hope, and, um, definitely continue to do the stretching exercises and physical therapy as your doctor recommends.

[00:58:02]**GG deFiebre:** [00:58:02] Great. Thank you. And, Dr. Cabahug, do you have anything else to add?

[00:58:05]**Dr. Philippines Cabahug:** [00:58:05] Yeah, um, just to, um, uh, j- just to, um, emphasize the, the point that Dr. Nicholas had brought up earlier; again, it is very important that you, uh, that, um, individuals advocate for themselves, and don't be afraid to talk to your doctors, um, especially if they have spasticity. I mentioned earlier, um, in the podcast that, um, we have to have a specific goal, uh, and that goal is ... And, and, uh, treatment of people with, um, spasticity, it's very individualized, I find, I found over the years. I have patients who actually like that sensation of spasticity, because it makes them feel that they have something out there, and they don't want me to take it away. I have patients who, soon as the spasticity is so severe that we really need to step in and do something about it. I think the important thing is, um, to, um, set a, a goal, and to make the discussion of spasticity as part of your regular healthcare checkup with your physician.

[00:59:11] If you have spasticity, um, and my patients, every year, we talk about, has it been stable, is it getting worse, is it helpful for you, has it become disruptive? We review your medications, we review the- if you need to come back to therapy. Um, also one of the things, we, we don't have time to talk about this, but, um, any of our female listeners out there who are of childbearing age, and who are thinking of having children are on any of these oral medications, please, please discuss this, um, with your doctors even before you'd get pregnant, because some of these medications can, um, affect your unborn fetus, and can even be transposed into breast milk. So, um, if ever that, um, if, if ever any of our female listeners reached that point that they want to consider having a child, please mention this to your physician, and we can make a plan. It's very important, um, to find the right physician who is, um, comfortable, um, in treating spasticity.

[01:00:21] And as Dr. Nicholas says, like, um, take advantage of the SRNA website, because, um, we, they have the resources and, uh, listing of physicians who are experts in managing spasticity. I think that's pretty much it from my side, unless there any more further questions.

[01:00:41]**GG deFiebre:** [01:00:41] Great. No, that's, that's great. Thank you both so much for taking the time this evening to chat with us about spasticity. Um, you know, I think we, we got through a lot of the questions. Um, so yeah, thank you so much, again, for, for participating. We really appreciate it.

[01:00:56]**Dr. Philippines Cabahug:** [01:00:56] Thank you for having us.

[01:01:09]**Dr. Jacqueline Nicholas:** [01:01:09] Thank you. Thanks for having us.

