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- Theresa Richard: [00:00:00](#) This is episode 97 of the Swallow Your Pride podcast and today's guest is Russ Campbell. He received his degree in physical therapy from Northwestern University in Chicago, Illinois in 1989. He is the co-developer of the Effective Swallowing Protocol (ESP) and CEO of Ampcare, an FDA-registered medical device and services company that develops innovative technologies designed to improve the quality of life in people with swallowing disorders. He has 30 years of experience in electrotherapy and has presented Ampcare's products in the U.S., Europe, Japan, and Hong Kong. Russ is responsible for the research and development of the company's products and the methodology as well as guiding the company's growth through partnerships with other health care providers.
- Theresa Richard: [00:00:39](#) And Russ has also been on, I believe episode 19. We would like for you all to know that, so go back and listen to that episode as well. But, I'm so excited to have Russ back. He's so knowledgeable. I always love when we can bring other professionals into our profession and we have so much in common, yet we're so different. So, I really, really, really appreciate his knowledge and wisdom here.
- Theresa Richard: [00:01:00](#) And if any of you are interested in the Ampcare ESP device, if you are interested in taking that training program, you can log onto their website and if you use promo code SYP, you can take their CEU course for \$100, their online course. A portion of that does, the proceeds do go back into keeping this podcast alive and well and running. So, yeah, if you are interested, I think that course is wonderful. It's an awesome review of even just cranial nerves. So, if you're looking for some more ASHA CEUs, that's register for a .8 advanced CEUs, I believe. So, head to their website and use promo code SYP to sign up for that.
- Theresa Richard: [00:01:41](#) After this episode, I am taking a two-week hiatus. We are taking the rest of July off, so I hope everyone is able to rest and recuperate, get some sun, get some sand this summer. We will be back in August for 100th episode and we will probably hit our millionth download at the same time, which is totally bananas. So, we've got a huge episode planned for our 100th episode. I'm so excited not to discount 98 and 99, because they will be phenomenal speakers as well, but August should be a big, big, awesome month for the Swallow Your Pride podcast. So, I can't wait and thank you all for your support. Hope you

love this interview with Russ and I hope you all are having a wonderful, enjoyable summer.

- Theresa Richard: [00:02:25](#) Welcome to the Swallow Your Pride Podcast. I'm your host, Theresa Richard. I'm a Board Certified Specialist in Swallowing and Swallowing Disorders, and I know firsthand how much confusing and conflicting information there is out there about how we assess and treat swallowing disorders. This podcast is all about bringing everyone together, getting on the same page, being open to new ideas, and using evidence-based treatment strategies for our patients with dysphagia. So, let's get into it.
- Theresa Richard: [00:02:56](#) Just a quick disclaimer that all statements and opinions expressed in this episode do not reflect on the organizations associated with the speakers and are their own opinions solely.
- Theresa Richard: [00:03:06](#) Hello there, and welcome back. Just have a big announcement for everybody. We are going to be opening the doors to the Med SLP Collective on July 12th. I'm so excited to finally be opening them. Thank you everybody who has been waiting so patiently. If you've been on the waiting list, you'll get an email right away. What is the Med SLP Collective, if you are not familiar with it? Well, it was actually designed for a very specific group of medical SLPs.
- Theresa Richard: [00:03:36](#) If you're feeling unfilled in your career as a medical SLP or perhaps a bit confused on how to move forward, if you're feeling completely overwhelmed, overworked, overstressed, misunderstood, underappreciated in your facility, if you feel like you're riding the therapy hamster wheel, unsure if you're even providing good care for your patients, if you are getting overwhelmed with how much medical SLP information was missing from your graduate education that you're now expected to know. Maybe you're feeling a little bit angry that you received the same training as clinicians who work with kindergartners and now you feel like you have huge gaps in what you need to know to treat these medical cases. Maybe you've been working in the field for a while. Are you feeling frustrated that there is no one single, centralized source to stay up-to-date on all the latest research and treatments that are coming out every year? Are you even sure that you're providing the right and best, most up-to-date treatment techniques for your patients?

- Theresa Richard: [00:04:28](#) Well, imagine if there was one place that you could go to receive all the support and resources to help you eliminate these feelings. Imagine how much time and frustration you would save if you had immediate access to one centralized location for blind peer-reviewed resources. Imagine if you had access to several clinical experts and university professors to help guide you in your clinical decision-making with personalized responses to your clinical cases. Do you think then your patients would receive higher quality care and make progress towards their goals? Do you think you would get more rewarded and recognized for this progress among your patients? Well, this is exactly why I created the Medical SLP Collective. It's a monthly membership program and vibrant community of fellow medical SLP clinicians and researchers, who are supporting each other to provide better care for their patients and therefore also advance their careers.
- Theresa Richard: [00:05:17](#) So, what do you get in the Collective? You get weekly done-for-you resources. Each week, you'll receive a new video created to help educate you all about all areas of medical SLP, including dysphagia, aphasia, motor speech disorders, voice disorders, NICU, Peds, and cognitive-communication. They'll also get information on how to advocate for your patients within the organizational bureaucracies that often make you feel like your patients don't matter to the doctors and nurses.
- Theresa Richard: [00:05:43](#) Each video also comes with a PDF handout that gives you links to all the resources and references you need to implement, and they can all be printed for convenience to take on the go. The resources never go away. The library just continues to grow so you will always have access to all the previous videos and handouts.
- Theresa Richard: [00:06:00](#) Also, of note, all resources are blind peer-reviewed. You deserve to have confidence in knowing that the materials you are using for your patients are the latest evidence-based and designed to save you from weeding through all the crap. We cover aphasia, dysphagia, dysarthria, voice, cognitive-communication, and NICU, just to name a few.
- Theresa Richard: [00:06:19](#) Additionally, each month we have two-hour live webinars that are offered for ASHA CEUs, delivered by some of the most foremost clinical experts and researchers in the field so you'll get a chance to vote on the most relevant topics to you each

month. Also, if you can't attend the webinars live, the recording is always put in our library. So if you join now or July 12th when we open, you have access to all of the previous past webinars that you can take for ASHA CEUs.

Theresa Richard: [00:06:48](#) Lastly, but I think most importantly, we have our private forum and Facebook group. So we have both the Facebook group and also a private forum that has its own app to ask all your clinical questions there. We have several, I believe 20 to 25 different clinicians and researchers, that act as moderators and mentors to ensure you receive personalized guidance, supported by the evidence, to help treat your patients as best as you can. Many of our members in the Collective say that the private forum and the Facebook group is worth the price of admission alone, as you get real life, front-line, in-the-trenches support from your fellow clinicians, for the researchers to back it up and a team of trained guides to answer your every question.

Theresa Richard: [00:07:27](#) So, again, medslpcollective.com. It is opening July 12th. It's a monthly membership site so if you join us and you decide it's not for you, no biggie. We also have a 7-Day money-back guarantee so again, if you jump in, download every single resource, watch every single webinar, and still decide you don't like it, you can get your money back. I do hope that you will see the value of what it is. It's a wonderful community. I could not be more proud of how it's turned out. Yeah. I really don't have anything to say other than I love it so much, and I really, truly hope you'll join us. That will be opening on July 12th.

Theresa Richard: [00:08:05](#) Hello, Russ.

Russ Campbell: [00:08:06](#) Theresa, how are you?

Theresa Richard: [00:08:08](#) I'm wonderful. How are you?

Russ Campbell: [00:08:11](#) Joyful, fantastic. Thank you.

Theresa Richard: [00:08:13](#) Yes, you're welcome. Well, thank you for squeezing us in on your super busy day. I know you're about to jet set to some other foreign country to talk all things dysphagia, so thank you for squeezing us in.

Russ Campbell: [00:08:26](#) My pleasure. I don't know if it's all things dysphagia. I'll certainly talk on-

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Theresa Richard: [00:08:30](#) A few things, amid one thing, dysphagia. Yes.

Russ Campbell: [00:08:33](#) It's something I feel fairly skilled on, right?

Theresa Richard: [00:08:35](#) Yeah. Where are you going? I've heard a few people going to this conference.

Russ Campbell: [00:08:39](#) Yeah. It's the first Latin-America dysphagia conference in Buenos Aires, Argentina. So,-

Theresa Richard: [00:08:45](#) Oh, cool!

Russ Campbell: [00:08:46](#) ... we've been asked by a company called the [Hasen 00:08:48] to explain Ampcare's effect on swallowing protocol. While I'm there, Rick is at the International Society of Physical Rehabilitation Medicine and the Japanese Association of Rehab Medicine, JARM, in Kobe, Japan. So, we're going to get the north and south part of this-

Theresa Richard: [00:09:07](#) Crazy!

Russ Campbell: [00:09:07](#) ... world covered in the next week. So, it's been very-

Theresa Richard: [00:09:09](#) And you trusted him to go there by himself?

Russ Campbell: [00:09:13](#) I didn't! The only word he knows is kanpai, which is cheers so that's always-

Theresa Richard: [00:09:16](#) Yeah. Excellent. Excellent.

Russ Campbell: [00:09:17](#) ... nervous liking to be with him but I've seen some nice pictures already and Edo, the company that helps Ampcare distribute our products over there, has been very gracious and beautiful presentation and booth that Rick's been at. He's actually trained yesterday, so it's all good.

Theresa Richard: [00:09:35](#) Awesome! All right. Well, if people don't know who you are, I know who you are but if people don't know who you are, can you tell them a little bit about yourself?

Russ Campbell: [00:09:44](#) Sure. I guess for this presentation, all you really need to know is that I'm a practicing clinician. I've been a practicing clinician for 30 years. No, take that smile off your face right now, Theresa.

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Theresa Richard: [00:09:55](#) I can't take your glasses seriously.

Russ Campbell: [00:09:58](#) I got the Harry Caray glasses and the Harry Caray microphone so if I bust out, "Hey, let's get some runs," just settle back in.

Theresa Richard: [00:10:05](#) Yes. Please do. Yeah.

Russ Campbell: [00:10:07](#) So, yeah. I'm a practicing clinician, a physio, physical therapist by trade. I would say, for this presentation what you need to know about me is I have a real good handle on surface electrical stimulation and probably even a better understanding in how to use neuromuscular electrical stimulation. I'm backed by a profession or a discipline that has over 70 years of peer-reviewed research on how to use this modality. So, I think that's what's important here.

Russ Campbell: [00:10:36](#) Then, I would just say one other personal thing about me. I am a huge Chicago Cubs fan, if you haven't figured that out. That's for your little friend Tiffani with an I at the end of it. Tiffani Wallace, I do have my eye on you, because you and Rick have a tendency to mock me on social media about my Cubs, so watch it.

Theresa Richard: [00:10:53](#) Yeah. Yeah. I can't wait to screenshot this picture of you right now.

Russ Campbell: [00:11:02](#) Hey. I thought this was all audio podcast. What the ...

Theresa Richard: [00:11:02](#) It was until you wore those glasses.

Russ Campbell: [00:11:04](#) So, look. I hate to say it but when I turned 50. 49, I woke up, looked at my alarm clock. I couldn't read it.

Theresa Richard: [00:11:12](#) I knew where you were.

Russ Campbell: [00:11:14](#) I couldn't believe it. Then, I feel it takes 49 years for your eyes to go bad and then we go buy \$10 readers and try to live our life for the next I don't know. So, Lasix is down the corner for me, I think. Obviously now, since the comments.

Theresa Richard: [00:11:30](#) Right, right, right. They do make other ones that don't look like exact replicas of Harry Caray but I get where you were going with ...

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Theresa Richard: [00:11:40](#) So, All right. All right. Let's get on topic. So, what are we going to talk about today? I was just about to call you Rick. Russ! No!

Russ Campbell: [00:11:52](#) Oh, that was not ... That's over. Rick? There is a huge difference between me and Rick.

Theresa Richard: [00:11:53](#) Oh, there is a very big difference. There is, yes.

Russ Campbell: [00:11:56](#) All right. Let's get back to the ranch. Back to the ranch. I think, now last time, I picked the title and I kind of got my hand slapped for it so if you haven't changed my title, the title I think would be how neuromuscular electrical stim can impact swallowing kinematics and what systems can do it? There's a couple FDA systems out there that are cleared for the treatment of dysphagia. I think we should talk about some of the kinematics. Kinematics meaning the forces which can cause motion. What are these powered muscle stimulators doing? What does peer-reviewed research say they're doing and how can we apply that to dysphagia therapy as a clinician? Again, Rick, Ronda, and I are clinicians first. We developed this starting back in the early 90s and we really didn't bring it to market until 2013 until we knew what we had because we're clinicians first, right?

Theresa Richard: [00:12:48](#) Right.

Russ Campbell: [00:12:49](#) So, let's talk about the role of NMES as applied to patients with dysphagia. How does that sound?

Theresa Richard: [00:12:54](#) Sounds good.

Russ Campbell: [00:12:55](#) All right. So, let's rock with it. So, I think the last time we spoke, we talked about muscle fiber types and recruitment philosophies. I explained how neuromuscular electrical stimulation results in a training effect that preferentially trains the fast twitch Type 2 muscle fibers. If you're not aware of that, maybe after this podcast, go back and look at episode 19 or listen to it but this is not just Russ saying it. This is science saying it. I listed nine articles that I put in my top 10 that, to me, improve not just strength, power, endurance, but also helps recover a sensory and motor control of muscle tissues. So, I've given you nine references and I also have a 10th one in this podcast that we'll go over that really talks how NMES can certainly improve the recovery of sensory afferent pathways to

the brain and motor efferent pathways from the peripheral nerve to the muscle that can certainly improve strength as well as endurance.

Russ Campbell: [00:14:04](#) My opinion is, if you can speed up your strength, you'll speed up your timing, your initiation so it'll affect both the sensory component of swallowing as well as the motor.

Russ Campbell: [00:14:14](#) So, let's get into it. I think the reason why we brought up this topic was at trade shows or conventions when we'd see one another, we would talk about this a little bit and lately what's really kind of scared me a lot at these trade shows is therapists would walk by our booth and they would see us. I would try to ask them, "Do they treat patients with dysphagia?" They would look at me and say, "Ah, we're trained in NMES." That scares me. When your discipline says you've been trained in NMES, I get a little worried.

Russ Campbell: [00:14:44](#) So, for those that were willing to have a little dialogue, I asked them, "So, can you tell me how you're doing in NMES, are using NMES?" And they would basically tell me brand names. Well, brand names doesn't really tell me how you're using NMES. When you leave our course, again, you're trained on a specific set of parameters, but NMES goes way beyond our parameters or any other FDA-cleared parameters for the treatment of dysphagia. There's billions of other parameters and we'll touch on that at the end of this podcast. We're not going to belabor that, but I just want to let you know what the meaning is of NMES and that we are basically using electricity to stimulate a peripheral nerve, anything outside your brain and spinal cord, we're stimulating that peripheral nerve to correspond with a target muscle, a specific muscle or a group of muscles to elicit a sustained contraction - movement, elicit a force that will cause motion. That's what we're looking to do.

Russ Campbell: [00:15:46](#) What I said back in episode 19 is when you put these electrodes on the body, the electrodes don't know the difference between a Type 1 or a Type 2 muscle fiber but the nerves, the largest motor nerves, they have a thinner sheath because, as I said, they're stuffed thick and when you stuff a nerve with too much stuff, the sheath thins out. It's like a casing to a bratwurst or a polish sausage. Up in Chicago, we eat a lot of sausage, so that sheath gets thinner and they're adverse to respond to electrical stim.

- Russ Campbell: [00:16:24](#) So, although the body feels the sensory tingling first, the next nerve it stimulates is the largest motor neuron which goes to the Type 2B or Type 2 muscle fibers. That's that preferential training that you get with NMES that I don't have to fatigue my Type 1s first. I can go right with NMES, elicit a motion movement sustained contraction and get my Type 2 muscle fibers to work.
- Russ Campbell: [00:16:52](#) I should not, I've given you references. There's nine there. There's entire book, chapters, I'm showing you a six-inch, three-ring binder that I have that has all the research that I believe is substantiated the benefits of NMES. So, hopefully that's not anything that we need to go over as much but what I really think we need to talk about is how NMES can impact swallowing kinematics and then what FDA-cleared systems can do it. What do we know they can do?
- Russ Campbell: [00:17:26](#) My mom would laugh. I'd never call me an expert but I feel, because I've developed one of these FDA-cleared systems, that I can certainly talk about mine. I've learned enough about other FDA-cleared systems that I can certainly talk about the research on them, so let's get into that.
- Theresa Richard: [00:17:42](#) All right.
- Russ Campbell: [00:17:44](#) So, in this show notes, these podcast notes, everything that I'm saying is in there. I've given you pictures. I've backed it up by research, reference articles, and then I backed it up with links because some people see or understand by vision, some by hearing/auditory, and then others by sight, so we're going to give you every kinesthetic awareness that I can to help you understand what we're doing.
- Russ Campbell: [00:18:13](#) So, let me first explain what we do and the kinematics behind ESP, the Effective Swallowing Protocol. Ampcare's Effective Swallowing Protocol is FDA-cleared for the treatment of dysphagia and that we can show you under FEES, under fluoro, that we can move the hyolaryngeal complex in a forward, upward direction similar to that of the Mendelsohn. Now, I just said the hyolaryngeal complex. I'm not saying the whole Mendelsohn. I'm not incorporating the swallow yet but we can just put this on you. I can stimulate your suprahyoid musculature, specifically the anterior digastric, mylohyoid,

possibly get as deep as the geniohyoid and move your hyolaryngeal complex forward and up.

- Russ Campbell: [00:19:03](#) And I'm going to tell you this. If you can get the hyoid to move, you're doing some really good things. Some people have a different opinion of it. I'm going to tell you the hyoid's a bully. If you get that hyoid to move, you're going to get a ton of kinematic effect, what we call anatomical inference, that will affect things all the way down to the PES/UES. I'm going to prove it to you on FEES. I've got a great FEES video and I've got a great fluoro video that will prove that we can make some changes there.
- Russ Campbell: [00:19:33](#) So, what happens? What is anatomical inference? So, you brought up my, I would say business partner, but I call him a friend, lightly, Rick. If you, me, and let's say, one of your good friends Mrs. Gurita because I don't get to see her much, were tied together by a rope. Me first, you in the middle, Gurita behind and Rick yanked that rope, we would all move, right?
- Theresa Richard: [00:19:59](#) Yes.
- Russ Campbell: [00:19:59](#) Now, muscles aren't like ropes. Muscles, tendons, ligaments, they're more elastic, especially the muscles and tendons. So, if Rick had this big, thick rubber band and I was tied to it first, you were behind me second, and Gurita was third and Rick took off, I would get yanked the most because I'm the closest to Rick. You get yanked the second most and Gurita would drag along with us. Does that make sense?
- Theresa Richard: [00:20:25](#) Yes.
- Russ Campbell: [00:20:25](#) That's anatomical inference. So, guess what happens when Ampcare moves the hyoid and larynx, because your tongue, which sits atop your hyoid, attaches to the hyoid via the hyoglossus, I move your hyoid forward and upward. The tongue base has got to go with it because it's just attached. Your epiglottis sits inside your hyoid. The epiglottis is a cartilage. I can't stimulate the epiglottis but because your epiglottis attaches to your hyoid via a hyoepiglottic ligament and your epiglottis attaches to your thyroid via a thyroepiglottic ligament, when I move your thyrohyoid, your epiglottis has got to invert. It's no difference if you stand up on your table and I grab your

feet and I yank them forward and upward, which way is Theresa going?

Theresa Richard: [00:21:17](#) The other way.

Russ Campbell: [00:21:17](#) Timber, baby. You're going down. It's over.

Russ Campbell: [00:21:20](#) So, don't think we're getting all the movement. Don't think that we're stimulating the epiglottis. Just know by kinematics motion of the hyoid and larynx, these things start to move. I've got some beautiful pictures that show you that at rest and with patients receiving ESP and it's not just Russ doing it. It's the same people doing it, different people doing it in Japan and the UK and the pictures are in there, in those show notes.

Russ Campbell: [00:21:48](#) So, let's go on. After the epiglottis starts to retrovert, as I pull the hyoid and larynx forward and upward, remember, that patient isn't swallowing. They don't know what's going on. They're just getting sensory and motor stim through the suprahyoidal musculature, but if I move the hyoid and larynx and the pharynx stays because they haven't swallowed, this is what gets really interesting, you start to shallow the vallecula as the epiglottis retroverts. You start to shallow the pyriforms as we create a stretch through the laryngeal and pharyngeal regions and you actually stretch open their laryngeal vestibule. Now, to a dysphagia clinician, they're going to go, "What is this PT talking about? I'm trying to close the airway and this guy is opening it." I'm going to tell you-

Theresa Richard: [00:22:40](#) What a wackadoo!

Russ Campbell: [00:22:41](#) Spot on. Now, let's understand kinematics. I'm opening the airway because when you swallow, what are you going to do? You're going to close it.

Theresa Richard: [00:22:53](#) Close it.

Russ Campbell: [00:22:53](#) You got it. Spot on. You're going to shut it down. So, what Ampcare does is by moving the hyoid and larynx in the proper direction, being facilitatory to those structures, we create a resistance to the laryngeal vestibule. We now have data that shows we can speed up laryngeal vestibule closure times and I'll get to that. If you can speed up laryngeal vestibule closure

reaction times, there's less chance for food and liquid to run down it. Does that make sense?

Theresa Richard: [00:23:21](#) Yes, it does.

Russ Campbell: [00:23:21](#) All right. Fantastic. So, please, if you don't believe me, again, don't just listen to Russ. My mother would never say that. Check out the science of this and then check out the links. I've got a nice link under FEES of a patient receiving ESP under FEES and you're going to see not only the airway being stretched open, you're going to see the PES/UES start to open. Why? Based on anatomical inference, there is scientific evidence that supports the correlation of the anterior motion of the hyoid as well combined with the elevation of the larynx does what to your PES/UES?

Theresa Richard: [00:23:59](#) Opens it.

Russ Campbell: [00:23:59](#) Starts to open it. So when you watch that FEES video, you really hone in on that PES/UES. You're going to see that that PES/UES starts to open. It's semantics to me. I don't care if you want to call it that we pull it open mechanically or it's inhibited and it relaxes open. It's a semantic thing. I'm hearing this at the training. Instead of semantics, you should be going, "Wow! If we can do that, that's a good thing for rehab!" Don't worry about the semantics. But I'll leave that up to your speech and language discipline to figure out the semantics.

Russ Campbell: [00:24:35](#) All right. So that's the beauty of ESP. So, moving onto that next page, you'll see a picture that comes out of this book. This book was published in Japan. It's in Japanese, obviously. Some text was written by Dr. Matsumoto at Hiroshima Rehabilitation Hospital in Kagoshima Prefecture. What he came out to do is he wanted to say, "Is what Russ saying true? If we stimulate using the Ampcare E Series electrodes and powered muscle stimulator, could we get the hyoid and larynx to move in the right direction?"

Russ Campbell: [00:25:06](#) Not only are you going to see that but he's also got the still picture at rest and the picture with just ESP moving the structures, you're going to see the tongue base retract. You're going to see the epiglottis start to invert. You're going to see the laryngeal vestibule stretching open and the PES/UES opening. He's actually dotted this on a still shot of fluoro. It's published in

this book. It was published back in 2016. So, what I want you to make sure that you understand is that it's not all about ... It's not even a little bit about ... It's a little bit about the NMES but it's about the act of exercising with this on.

Russ Campbell: [00:25:48](#)

I think you've had some great people on this podcast over the episodes that you always have to combine this with an exercise. What we feel the best exercise for swallowing is to swallow. So why? We're going to pull their hyoid and larynx forward and upward so even that patient that can't even initiate it, we're going to get them going in the right direction. Then, we're going to allow you, the clinician, to use your skills. Anything that you can do to help them to elicit. A cold, wet spoon to get a little autonomic reaction, although someone's putting a spoon in my mouth, a little condensation, if they have good oral hygiene and you want to use a water protocol, then I'm fine with that. Sometimes, we'll use lemon glycerin because we know that can help speed up the swallow. Maybe even a little coconut oil but no food bolus. Here's why. This is one thing I hate when I'm at trade shows. "Oh, we don't use Ampcare because you can't feed them with it on." Well, why can't you feed them with it on?

Theresa Richard: [00:26:45](#)

Oh, Jesus! Yeah.

Russ Campbell: [00:26:46](#)

If you don't know what we're doing, you know why we don't feed them with it on. If I am changing swallow physiology, I'm going to pull your hyoid and larynx up and hold it for five seconds. That's what I'm going to do. I don't want you complicating it with a bolus. I don't want you throwing something down there that could go down the wrong pipe because they're not swallowing all under their control. We've had some key opinion leaders. We've had some clinicians going down, using our protocol and they said, "Hey, Russ. We just want to know." They're curious. I said, "I don't care. You can do it, but I'm going to tell you, we'll never train it that way." They do it on healthy normals. Guess what. For the most part, everything goes down the right pipe, but my problem is you're not treating healthy normals. You're treating weak, deconditioned, stroke, diabetic, peripheral neurological diseases, progressive neurological diseases.

Russ Campbell: [00:27:41](#)

So, one of the big differences between us and the other technologies is no bolus during the on times. Now, we're going to give you 25 seconds, 20 seconds, 15 seconds as the patient's

progressing through our protocol of rest time. During those rest times, whatever they're safe on. No one can swallow 60 to 72, up to 90 times without becoming parched if we don't prime the pump, so by all means, during the off times, whenever they're safe, cheers. Does that make sense?

Theresa Richard: [00:28:12](#) Yes.

Russ Campbell: [00:28:13](#) With ESP, we always pair it with a swallow during the stimulation on times because we're recruiting the Type 2Bs, we're working them harder and better than they ever had before. Then, we're creating a perturbation to the laryngeal vestibule. This word, your listeners should be really aware of. This has been a word that's been around for a while. It's been in our discipline for a while. It's coming into your discipline. A perturbation is what we call, it's a change. It's a deviation. We talk about it. Normal swallowing airways should close. What does Ampcare do? We perturbate your laryngeal vestibule. We pull it open. Facilitatory to the hyoid and larynx but perturbate, change the airway. Why? Because if we pull you open, you've got to swallow harder to close it. I wanted a tool for you all that you didn't have to say in front of your patient, "Hey, can you swallow hard for me? Hey, was that hard enough?" "I don't know. I don't how to swallow hard." Well, guess what? Ampcare's going to do that for you. We perturbate the laryngeal vestibule requiring the swallowing mechanism to overcome this perturbation to create this faster kinematics.

Russ Campbell: [00:29:20](#) So, let me give you the research. It just came out in 2018. I think you're aware of it. It was done by Dr. Watts at TCU and just because of the sake of all these research articles that we'll be talking about, I'm going to give you the name of the first researcher. Just do me a favor and download the show notes because every researcher on these articles is vital to the research, so you know who was a part of it, but Dr. Watts at TCU in 2018 said, "All right, Russ. If you truly believe it, we now have software out there that can measure spatial and temporal measurements," right?

Theresa Richard: [00:29:53](#) Awesome.

Russ Campbell: [00:29:53](#) There's Swallowtail. There's TIMS Review system. There's [Dip Pro 00:29:59] systems. There's lot of systems now where you can put these up on your objective test and measure either

spatial (distance) or temporal (time). So, we know the laryngeal vestibule, there's a wide range but it closes in anywhere from 380 milliseconds up to 1,100 milliseconds depending on the person, their height, what they're swallowing. Is it cold? Is it hot? Are they sitting? Are they standing? Is it given to them a spoon, a cup, a liquid? So, there's a wide variation. So, as much as I'd love to give you range of motions that we have in PT, that this is only 180 degrees of shoulder flexion, your ranges of motion through a kinematic standpoint are very large. Just because of the mechanics of the swallowing, how unique it is. So, does that make sense?

Theresa Richard: [00:30:48](#) Yeah.

Russ Campbell: [00:30:48](#) Well, what Dr. Watts said was, "Let's just take some people. Let's have them swallow three times. I'll put them under some temporal measurement system and we'll measure their speed of airway closure. And then we'll have them do ESP 10 times. We'll stretch them open. They swallow. Stretch them open. They swallow. And then, we'll measure that airway closure. And then we won't do ESP, and then we'll have them swallow again and see if there's a change. So, by perturbing that airway, will we see a change?"

Russ Campbell: [00:31:19](#) I told him, "Without a doubt, there will be a change." Here's why I said it. I didn't need the research but guess what? Your field does and I get it. I get the key opinion leaders. They're all on me. Show me the data. But let me just say this. You know I'm leaving for Argentina in an hour or a couple hours. I've got a suitcase right here. It's packed with 50 pounds. I tell you, Theresa, lift that suitcase up and put it on this table. You're a young, healthy individual not practicing for 30 plus years like myself, you can lift this up, put it on the table. You might struggle because you didn't realize it was 50 pounds but because you're young, healthy individual, you adjusted, you accommodated and you got it up here on the table. I tell you to do that nine more times. Every time you get better. Why? You bend at your knees. You bend at your hips. You tighten your core. You pull it in close because you motor learn motor plan that Russ can't pack for three days without piling in 50 pounds of crap in his suitcase.

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Russ Campbell: [00:32:22](#) So, you get there. The 11th time I tell you to lift that suitcase up, but I took everything out of the suitcase but I didn't tell you, Theresa. Do you overshoot the table or do you undershoot it?

Theresa Richard: [00:32:33](#) You way overshoot it.

Russ Campbell: [00:32:35](#) How did you know that? Where's your peer-reviewed research that tells you that you knew you were going to overshoot that table? Because that's what everybody's been asking me, sister.

Theresa Richard: [00:32:49](#) Mm-hmm (affirmative). I don't know. Common sense?

Russ Campbell: [00:32:52](#) Okay. Ah! God bless you. It is ... Can you imagine? Using common sense? Oh, my gosh! It's called a postulate. A postulate is accepting proof without evidence. It's-

Theresa Richard: [00:33:06](#) Interesting.

Russ Campbell: [00:33:06](#) ... common sense. It's self-evident based on reasoning. Good judgment, sister! Oh, my gosh! If we could just use that. So, just realize, it's accepted to be true without proof. You knew it. Everyone at our core says it, but now I got to prove it to you.

Russ Campbell: [00:33:24](#) So I told Dr. Watts, "Game on. Let's do it." So, he had them swallow three times and measured it. They averaged around 380 milliseconds. Remember, a swallow happens in about a second so they would just swallow. He would measure. And he tells you how he measures. You can see how that airway closure completely obliterates that wide out under FEES. You know, at least under a certain objective test, you can see that airway completely shut down.

Russ Campbell: [00:33:53](#) So, he was able to review it. He sees three dry swallows at 380 milliseconds. Then he does 10 ESP swallows and because they were starting further apart, we thought it would take longer but it actually went to 309 milliseconds. It got faster. And Rick talks about this research I think with you on episode 60, so if you want to hear a lot more about that research, check out podcast 60 or read this article. I've got it in your show notes. It's written there. It's on our website. All of our research is on our website. We put it under research, [ampcarellc.com/research](http://ampcarellc.com/research). That link is listed on your show notes. But the bottom line is we did that 10 times and then we took it away. When we take it away, that's like taking the 50 pounds out of the suitcase. Then Dr. Watts

saw how fast the airway closed and it went to 233 milliseconds. After just 10 stimulations, it went 39% faster. That's kinematic data that you can start to hang your hat on and something you can say, "Hey, health care, insurance companies, this is why we're doing it. I've got data and I've got pictures and I've got video links under FEES and fluoro and I even give you a patient link where it shows a grab."

Russ Campbell: [00:35:15](#) This is another thing I get a little worried about with the profession. I hear everyone saying, "Oh, I turned it up to this grab." I don't see a grab. I don't see a tug. When you look at what happens with ESP on that link with the patient, you're going to see a grab. You see a grab so well that what I hear when people finally are willing to spend a little time and talk to me about this, they go, "Wow! That's a lot. I don't think my patients can tolerate it." I go, "Whoa! What do you think you ... " To move a hyoid and larynx, you have to get a lot of movement. This structure is not just right under your skin. I got to go through skin. I got to go through adipose tissue, fat cells. I got to go through 300 lymph nodes. So, current gets absorbed in that superficial tissue before it gets to you.

Russ Campbell: [00:36:10](#) So, you're going to see platysma fire. If you're not seeing platysma fire, you're not even getting deep. So if you can't see it, it ain't happening. And that's the thing that kills me.

Russ Campbell: [00:36:21](#) These other companies will talk about getting that motor contraction. The patient will feel a grab. If you don't see it, you're not getting the Type 2 muscle fibers. And if the patients telling you they're feeling it and you can't see it, you're relying on your patient and good luck treating your patients reliably. You got to see it. Fair?

Theresa Richard: [00:36:40](#) Yup.

Russ Campbell: [00:36:41](#) All right. So, that's Dr. Watt's research.

Theresa Richard: [00:36:43](#) Well, tell me. Was Dr. Watt's research on ... What population was that done on?

Russ Campbell: [00:36:47](#) Fantastic. It was healthy normals. I want to say, majority, it was women, ages between 20 and 40. I don't have the article right in front of me but it's on the website. The whole thing written there. Check it out.

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- Theresa Richard: [00:37:02](#) Why didn't you pick another population?
- Russ Campbell: [00:37:05](#) Listen. I know we can do it. I need to get it out there. It's easier, faster, less IRB trouble to go through healthy normals than it is to find me my Parkinson's or my strokes or anything else right now.
- Russ Campbell: [00:37:21](#) So, look. I told you. You knew the answer. You knew it was a postulate. You knew it was self-evident. All I'm doing is trying to get the data out there as fast as I can for you.
- Russ Campbell: [00:37:30](#) Now, good question and way to play devil's advocate but I'm going to tell you this, we've got research from 2018 that's also on here from Sheffield University, Sheffield Teaching Hospital in England by Dr. Lisa Sproson and there's other people involved in that. So, look at the article. It's published in 2018 that are using this on stroke patients and had such good success on strokes, all the things that we do in the UK, we are doing audit tools on, so we're getting data on strokes. We're getting data on head and neck cancer. We're getting data on Parkinson's, Alzheimer's. We're getting data on all these patients and, of course, what was shown in the research under Sproson, about 75% had a diet upgrade on Functional Oral Intake Scale and 100% of them had improvement on their SWAL-QOLs. Now, we're going to go back with these audit tools. There's another 20 more that have been added this year in 2018-2019. That data's been submitted and they're not just strokes. There's these other diagnoses. And we'll get the results on them, but I'm going to tell you, it's better than traditional exercise. Winner, winner, chicken dinner, with NMES is what I'm going to tell you.
- Theresa Richard: [00:38:46](#) I'm just really disappointed that Dr. Watts wouldn't share his Parkinson's population with you.
- Russ Campbell: [00:38:51](#) It's coming. Listen, the gentleman that's on the Dr. Watts article, the other one. I want to make sure I get his name right. I think it's Matthew Dumican I think, and he's a PhD student. So, Matthew's obviously been trained in ESP. He will be hopefully working. That will probably be his PhD is progressing it from there.
- Theresa Richard: [00:39:12](#) Cool!

- Russ Campbell: [00:39:12](#) But look, like any research and I praise anyone who is willing to do research with us. We've gone to these trade shows for over 10 years. The thing that really burns me is when key opinion leaders, I love it when they come into the audience and see these companies that are helping provide some revenue to put on these conferences. I just want a little dialogue because these guys ... Dr. Watts was one I didn't have to go chase after. He came to me, wanted to know what we were doing. He said, "Before I do this on patients, it makes sense, you have to prove it to me on healthy normals before I'm going to put it on a patient." So, I said, "Bring it on. It's a postulate. We are perturbing the laryngeal vestibule. Here it is," and I'm not a gambling man.
- Theresa Richard: [00:39:56](#) Mission accomplished, yeah.
- Russ Campbell: [00:39:58](#) But yeah, move on. And they're showing it in the UK and we're showing it in Japan as well.
- Russ Campbell: [00:40:03](#) So, that's enough about me. The link on all the research from Lise Sproson and Dr. Watts is at that [swallowtherapy.com/research](http://swallowtherapy.com/research). That's all on your show notes. Go check it out.
- Russ Campbell: [00:40:18](#) So, now, let's talk about one of the other and the oldest FDA-cleared treatment for dysphagia and I think a lot of us have heard about VitalStim. So, look, I hate to say it but this research was published 12 and 13 years ago. It's kinematics data. I don't think it's really gotten its due. I think people have blown it off a little bit, but I do believe it's got some good information in it. I will play devil's advocate to both of it on both sides because I've seen how VitalStim has responded to this research. I met Marcy Freed back in 1995, the developer of VitalStim and I talked to her about it. Now, I'm seeing some blog sites that are going out about VitalStim and I hear what they're saying about it.
- Russ Campbell: [00:41:06](#) But let's talk about the research. The first research article we'll talk about was by Dr. Humbert. It was in 2006. It's The Effect of Surface Electrical Stimulation on Hyolaryngeal Movement in Healthy Normals at Rest and During Swallowing.
- Russ Campbell: [00:41:21](#) And then we'll talk about another article that was by Dr. Ludlow in 2007, The Effects of Surface Electrical Stimulation on Both

Rest and During Swallowing in Chronic Dysphagia Patients. So, again, you've got the healthy normals and then the patients.

Russ Campbell: [00:41:35](#) But the bottom line is that they showed with this product, they could elicit motor. They could elicit movement but it said using VitalStim over the laryngeal and submental region because you're putting electrodes above and below the hyoid that it showed the lower the hyoid and larynx, reducing airway protection and placing some healthy volunteers in the 2006 study as well as patients in the 2007 study at increased risk of aspiration.

Russ Campbell: [00:42:06](#) Now, don't have to believe me. Read the articles and look at the link. It's not my link, so I can't give it to you for free, but there's a link called The Hope is in the Science. You can pay, I think, a minimum fee. It talks about it and it shows under fluoro what was happening when you administer a bolus with this product.

Russ Campbell: [00:42:24](#) Now, the good news is that, hey, we elicited movement. Now, the bad news is hey, we thought it was supposed to go up but it went down. I'm going to tell you, as a physio or a PT, if I play tug of war with electrical stim, two electrodes in any configuration, up, down, crisscross, doesn't matter, two above, two below and I play tug of war, it's pretty easy to know who wins. The biggest, longest, strongest and gravity-assisted. So, if I put two above and two below and I crank it up, it's coming down in my opinion. I don't care if you crank it up and do it the way they did it in the research to a maximum contraction or you do what now VitalStim is recommending a submaximal contraction. The bigger, longer, stronger muscles will win and they're gravity-assisted and it pulls it down. Does that make sense?

Theresa Richard: [00:43:13](#) Capisce.

Russ Campbell: [00:43:13](#) Okay. Very good. So, check out the links. Check out the research and go to that.

Russ Campbell: [00:43:18](#) Now, to play devil's advocate to this research, I have heard but hearing isn't substantial enough. So, recently, there's a blog that was out. It's called the VitalStim, the first a little VitalStim 101. It's a blog that was out on a couple of these other logs that are out there on social media. What this VitalStim trainer said was that the research utilizing a maximum contraction is not therapeutic and that they recommend a submaximum

contraction. So, now the question is well, what's maximum and what's submax? So, we've heard that, hey, turn it up to max and then turn it down a little bit so it's not maximal. Now, this is where you get-

- Theresa Richard: [00:44:03](#) Sounds pretty approximate. Yeah.
- Russ Campbell: [00:44:04](#) ... conflicting data. Yeah. It gets conflicting.
- Russ Campbell: [00:44:08](#) Now, in the research, in the 2007 article, Dr. Humbert says they used a maximum contraction to tolerance for each placement that the subject reported to a grabbing sensation that was instructed in the training manual from the VitalStim therapy. I will tell you, in the early days and even when I talked to Marcy Freed in 1995, they went to max.
- Russ Campbell: [00:44:32](#) So, whether you believe that or you believe the submax rule, it doesn't matter to me because I'm going to prove to you in parameters that it isn't motor. It's not motor for long and you need to understand parameters. The thing that always concerns me in these articles, electrical stim, neuromuscular electrical stim is the most research modality in your field, but no one cares about parameters. So, it doesn't matter how much research it is if everyone's using different rules and there are rules to follow. There's entire textbooks, three-ring binders that are out there with NMES and no one's following them. But that's how we based ESP is on these rules.
- Russ Campbell: [00:45:13](#) So, let's just go a little bit further. So, the bottom line is the two research articles from the key opinion leaders I've talked about, they showed movement and showed the movement going down. I think the devil's advocate side of me and what VitalStim saying is, "Hey, we didn't say to use max," but the inventor did way back in 2001 or at least in 1995 when I met her. Now, you're saying in blogs it's submaximal contraction.
- Russ Campbell: [00:45:40](#) I'm going to tell you, in the research on neuromuscular electrical stim and for those people not seeing this on this podcast, I'm holding books, three-ring binders up to Theresa. It says these contractions should be two motor and should be at least fair plus. We have a manual muscle test grading scale that we use and anything above a three is range of motion against gravity and what they're saying this muscle contraction should be is at least a three plus. Most NMES should be three plus. What does

that mean? Contraction against gravity to create motion, a kinematics effect.

Russ Campbell: [00:46:20](#) So, look. If you're goal is to create motion, Dr. Hubert and Dr. Ludlow proved it, pulled it down. VitalStim says submax does something, too, but we're not sure. I don't see any literature saying that it pulled it up. Now, I give these researchers some credit because the research with lanessa Humbert in 2006, she not only used four different VitalStim placements, she did six others. She tried to put all four of their electrodes up under the chin and she found no appreciable elevation. The only technology out there that is FDA-cleared that has shown under peer-reviewed research fluoro and FEES to move the hyoid and larynx has been Ampcare in a forward, upward direction. Remember what I said. Here's another thing that starts to worry me. What does NMES do? It increases strength. Why do I want to strengthen my infrahyoids?

Russ Campbell: [00:47:14](#) Now, people will say, "Well, I want to pull the hyoid down, Russ, because when I pull the hyoid down and swallow, I perturbate them and then they got to swallow harder to bring it up." Yeah, but you also strengthen every time you stimulate those infrahyoids, you strengthen them. So, now you start to create a dyskinesia. Every time you swallow, your hyoid's got to go down first. And if you want to know what happens when your hyoid go down first, check out the link that's listed there. And then add a bolus and make it more complicated, more conflicting, so there's a lot to be said there. We haven't even gotten to the parameters, which is going to make it even more interesting.

Theresa Richard: [00:47:50](#) Sounds like a motor learning disaster.

Russ Campbell: [00:47:53](#) Well, that's my concern. What have we been doing? So, you're going to learn something today here. Hopefully, you're sticking with me on this. Not just you, but your listeners. I can get a little animated but I'm passionate about what I do and I won't hold that against me.

Theresa Richard: [00:48:09](#) I'd like to take a second to thank our wonderful sponsors, NDOHD and I know I talked in the beginning about getting ready for our 100th episode and they are putting together an awesome package for listeners of Swallow Your Pride for the 100th episode that you can register to win. So, thank you, NDO for all that you guys do. This is totally unscripted and not what

I'm supposed to say here but I'm going to say it anyways. You guys are awesome. I appreciate everything you do and for keeping this podcast going, being the number one supporter and okay, what do I have to say about NDOHD? They provide a true high definition FEES imaging system with HD image display and capture, crisp color image, unsurpassed digital clarity, HD image with better resolution than legacy systems and you can view details of patient anatomy with double the resolution of standard definition video. They provide easy-to-operate equipment with fully automated archiving with zero down time and a fully-customizable FEES report template is provided. So, go to [www.ndohd.com/contact](http://www.ndohd.com/contact). That's [www.ndohd.com/contact](http://www.ndohd.com/contact) to discuss your specific FEES systems requirements, pricing. Also, request a live product demonstration.

Russ Campbell: [00:49:18](#) So, can we move on? Are we good?

Theresa Richard: [00:49:20](#) Sure.

Russ Campbell: [00:49:20](#) Can I talk about parameters now?

Theresa Richard: [00:49:22](#) Please do.

Russ Campbell: [00:49:23](#) So, objective now is to understand the principles of NMES and understand that the general principles of NMES is to elicit movement, to get that motor contraction. And again, it's never about a brand name. It's about what we're able to do. So, let's talk about parameters because I've heard this at major trade shows. Major ones. "Russ, parameters don't matter." And they absolutely do. I can't stress that enough, so the duty cycles a very important parameter. Your duty cycle's the relationship of on time to off time of the electrical stim. It's not your treatment time. Treatment time for ESP is only 30 minutes. Treatment time for VitalStim, and I list eSWALLOW here because they're very similar, the waveforms are slightly off but from the general standing, eSWALLOW's a knockoff of VitalStim to give you a cheaper option that you can try to use this with. So, let's just talk about these two products because it's just these three products that have been FDA-cleared for pharyngeal contraction.

Russ Campbell: [00:50:25](#) So, the duty cycle for Ampcare is only five seconds of on time, 25 seconds of off. Why? We want them to swallow in that five

seconds. Why? We want to work on timing, initiation, control, and strength. Then, we want them to do what? Rest and recoup. This is a five-second contraction. Your muscle has to contract, rest, and recoup. The VitalStim duty cycle is 59 seconds of on time. Let me say this again. 59 seconds of on time, one second of off time.

Theresa Richard: [00:50:56](#) But I don't care about the parameters and I don't do it that way.

Russ Campbell: [00:51:00](#) That's what gets me that crazy.

Theresa Richard: [00:51:04](#) I know.

Russ Campbell: [00:51:05](#) It gets me that crazy.

Theresa Richard: [00:51:05](#) I know. I know.

Russ Campbell: [00:51:05](#) People are saying, "Oh, it doesn't matter."

Theresa Richard: [00:51:06](#) I know.

Russ Campbell: [00:51:07](#) Let me ask you this. This is what I want you to do. For those people who hopefully look at the link of that patient receiving or that therapist getting motor contraction. Imagine if that was on for 59 seconds. Let me just go back a little bit. You're putting it on one of the most rich and diverse sensory systems. Reed Miller, there are billions with a B sensory stimulation receptors. Sensory receptors, billions that line your tongue, your mouth, your throat, your anterior neck. It's one of the most rich and diverse sensory systems here in the body. You know why most people say electrical stimulation on the neck hurts? Because you're trying to elicit a submaximal contraction for 59 seconds out of every minute for 60 minutes. It just can't be done. Don't believe what Russ says. It's science. It's called metabolic fatigue. Your muscles will build up lactic acid. Don't believe me? Go run a marathon. Go run 21, 26.3 and then tell me how you feel the next day, because you just contracted your muscles as long as it took to run a marathon.

Russ Campbell: [00:52:14](#) Now, imagine doing these small Band-Aid thin muscles for 59 seconds out of a minute. It just can't happen and therefore the nerve accommodates. What is accommodation? I put on a watch and a ring and maybe a bracelet when I wake up in the morning. Soon as I get in my car and just got to drive to work,

I'm worried about what? Cars, sirens, listen to my radio, Swallow Your Pride podcast. I got other things going on. My nerves accommodate. They get used to it and I don't feel them anymore. I don't feel my ring because the nerve desensitizes. Accommodation is a phenomenon where the nerve fiber, which has been subjected to a constant stim, the weight of this watch or this bracelet is now not excitable under the same constant level of stim because the body just got used to it. You don't notice your wedding ring on right now, because you got used to it when you put it on. Right?

Russ Campbell: [00:53:07](#) Okay. So, here's the problem. Nerves only follow the all-or-none principle. Either you get that nerve to fire or you don't. A nerve is like a light switch. You either turn it on and the lights are on or you turn it off. It's called the all-or-none principle. It's in textbooks and I even listed the main book that we use and, again, I'm not listing all the authors of it but the first one is Dr. Lucinda Baker. She's a PT by trade, PhD. I use their book when it was on the third edition. Again, it's on the fourth edition, 20, 30 years later, again, to show you my age, but I would get it. If you want to learn about electrical stim, you don't just learn it from one or two or three companies that teach you a set of parameters. You want to learn about electrical stim? There is a lot more parameters out there so that references is in there as well.

Russ Campbell: [00:54:01](#) So, it's never been an eye-opener to me but it might be an eye-opener to your medical SLPs that are using neuromuscular electrical stim or think they're using neuromuscular electrical stim. The duty cycle for VitalStim has to be eventually sensory. It's a sensory stimulation because you cannot sustain motor for 59 seconds.

Russ Campbell: [00:54:22](#) Now, to Dr. Humbert's point, Dr. Ludlow's point and to maybe VitalStim's point, they're able to show movement, but their movement wasn't up. It was down and that should make sense to you, too. Then, you're starting to complicate things with boluses. So, all that has to be in considered because I don't think this is ... This research has been out here for 12 to 13 years. It's never gotten it's due and I can't thank you enough for putting this platform out so we can get it out there.

Theresa Richard: [00:54:51](#) Welcome, my friend.

- Russ Campbell: [00:54:52](#) So, remember, bottom line is if you want to do sensory stim, you can use it. 59 seconds of on time because eventually they have to accommodate because if they don't and it stays motor on for greater than 5, 10, 15 seconds, what do you think that patient's going to do? They're either going to yell at you and tell you to turn that thing down or they're going to yank it off because they just can't tolerate a duty cycle that's 59 seconds of on time.
- Russ Campbell: [00:55:17](#) So, now, let's go out and start off and do a VitalStim Plus and start throwing out even more parameters to make this even more confusing. So, look. No one can do what Ampcare can do. Watch what we do. If you want to do it, use it. If not, you want to do something else, learn about it, go do it.
- Russ Campbell: [00:55:35](#) So, let's talk about another set of parameters because it ain't over. It's called the pulse rate or your frequency. Ampcare uses 30 Hz. What's a pulse rate? Again, in episode 16 or whatever I did, 19?
- Theresa Richard: [00:55:48](#) 19.
- Russ Campbell: [00:55:48](#) I tried to talk about parameters and the frequency is the rate of electrical pulses. Now, we can use anywhere up to one pulse per second to 150 pulses per second. How do you know what to use? You go back to that book that Lucinda Baker was a part of, Neuro Muscular Electrical Stimulation: A Practical Guide and you start looking at what these muscles need. And 30 pulses per second or 30 Hz is what is considered enough to get a tetanizing contraction.
- Russ Campbell: [00:56:18](#) Now, on PT, I might use 80, 100 on a big quad, a big shoulder muscle, a glut, but for these Band-Aid thin muscles, 30 is enough, so Ampcare chose 30 Hz, not just because of Dr. Lucinda Baker and this book but because we also know there's research out there by [Luchie 00:56:37] that says the firing rates of the larynx when you talk is around 20 to 50 Hz, averages around 30, so we use 30 Hz because if we can get it to match, it might be more comfortable. VitalStim use 80 Hz.
- Russ Campbell: [00:56:52](#) Now, you can ask VitalStim trainers what they think. I asked Marcy Freed in 1995, "Hey, Marcy. Why did you choose 80?" Because we were still developing. Rick, Ronda, and I started developing this in 1994. We thought Marcy had it figured out.

We went up to Marcy. I went up to Marcy. Talked to her. She said, "Russ, I want 80 Hz, because I want a maximum contract." "Okay. Thank you very much." We've got data that supports, Peer-reviewed research that they were told maximum contraction at some point and now it's changed to submax.

Russ Campbell: [00:57:24](#) To me, what submax is, I would assume it's just your turning the current down a little bit. The higher the current goes, the more motor neurons you have a chance to attract. The lower the current goes down, the less, but the nerve will only fire or it won't so you have to turn it up to motor to get it and then how long do you sustain it depends on the patient's tolerance, accommodation, their adaptability or you've got to turn it down.

Russ Campbell: [00:57:51](#) So, that's why we chose 30 versus 80. Again, back to the research. Then, I'd also say the phase duration. This is important, guys. Every pulse stays pulsed for a length of time. These pulses are 30 pulses in a second for Ampcare. So, for every pulse, it's measured in microseconds for the phase duration. The width of how long that pulse holds itself.

Russ Campbell: [00:58:18](#) So, I like to think of the phase duration or this pulse as being a tap. I'm going to give a current, a beat of electrical current and how long is it going to stay there? We only allow it to stay there for 50 microseconds on ESP 1. Why? Because we know a low phase duration with a high intensity is more comfortable than a high phase duration with a low intensity. You don't have to believe Russ. Science says it and it's called the strength duration curve or the intensity duration curve. It's been out in our field for over 70 years and it should have been used on small muscle groups because when you use a large phase duration like VitalStim, 300 microseconds with the low intensity on the strength duration curve, that can get painful a whole lot quicker than a low phase duration with a high intensity that Ampcare uses.

Russ Campbell: [00:59:17](#) You can get motor either way, y'all. Ampcare choose to use 100 milliamps at 50 phase duration. VitalStim chooses to use 25 milliamps at 300 phase duration. I don't care if you drink your water bottle up and down or sideways. Either way, there's a same amount of water in this bottle but holding it up and down the way Ampcare uses it, it's going to be much more comfortable than these other parameters based on the strength

duration curve, not based on what Russ says. Just based on the data that's out there. So, just realize that.

Russ Campbell: [00:59:51](#) It's not just one thing. People think, "Oh, it's just one thing." No. It's the duty cycle. It's the pulse rate. It's the phase duration. Oh, and it's the electrode size. Ampcare uses two pie-shaped electrodes, large ones. Why? They're pie shaped to fit underneath the mandible because we don't want you putting the electrodes over the mandible because you've got periodontal receptors that will rattle their teeth. Not many of us want our teeth rattled like we're feeling when we're at the dentist. Nothing against dentists, but we just want to make sure that we don't rattle their teeth, so we put pie shaped pieces to stimulate just the suprahyoids versus small round electrodes that don't fit that area as well. Again, we're only using two versus the other technology's four.

Russ Campbell: [01:00:39](#) So, let me just say this. This is another reason why we're more comfortable and everything Rick, Ronda, and I did was basing it on comfort because we knew if it wasn't comfortable, we couldn't elicit motor. We couldn't get the hyoid and larynx to move. So, if I put two electrodes on you, a small round one on your forearm and a large pie-shaped one and I drive 100 milliamps of current through your arm, which electrode do you think you're going to feel first? Current's going through both. They're on the same channel. It's going through both. Which electrode so you think you're going to feel the current under the most? The small round one or the large big one?

Theresa Richard: [01:01:14](#) The big one.

Russ Campbell: [01:01:15](#) Okay. That's what most people would think because it's larger but guess what. 100 milliamps has got to be under what? A smaller surface area so if I try to drive 100 milliamps under that small surface area, that's going to get hotter and tighter. That's why I put in this show notes, again, not based on what Russ says. Here is a dispersion plate. A dispersion plate's what measures the amount of current going through the electrode. When we drove 100 milliamps through a pie-shaped, larger Ampcare electrode versus a small round electrode, the current got so intense under a smaller surface area, it has the ability to get a little warm or hot and that might be enough for a patient to tap the brakes and not get motor.

- Russ Campbell: [01:02:02](#) Electrode placement is like real estate, y'all. It's about location, location, location. So, if you don't have the right placement, you don't have the right size, you don't have the right parameters, you're subjecting your patients to potentially more pain and less range of motion.
- Russ Campbell: [01:02:20](#) It's all so important. Rick says and Ronda say it, "Which is the one?" I go, "It's all of it. It's every bit, every bit of it." Someone said to me, "Oh, Russ. When they see our parameters, they go, '100 milliamps? I'd never do that.' Do you know what 25 milliamps does when I use this other product? That's too much." That's because their phase duration's 300 and it's on for 59 seconds. Use 100 milliamps. If the patient can tolerate it and they will, eventually some of them will, if you use only five seconds of on time and you use a small phase duration, 50 microseconds. You'll get that nice, beautiful contraction that you see on that patient on the link. Is that good?
- Theresa Richard: [01:03:05](#) Sounds good.
- Russ Campbell: [01:03:06](#) All right. Last thing. One thing. Can I go one more?
- Theresa Richard: [01:03:08](#) Yes.
- Russ Campbell: [01:03:09](#) All right. So, there's been this big issue now because other systems, whether they're FDA cleared or not, are using electrical stim with EMG and everyone's asking me, "Russ, why aren't you using EMG?" Again, EMG has been in our field for a long time. We started using it easily 40, some of us almost 50 years ago. Now, as a PT, I'm going to tell you. If I'm going to put it on my arm, if I'm going to put it on my leg, those muscles underneath the skin, underneath adipose tissue maybe lymph nodes, is that muscle. So, again, what are we doing? We're measuring activity. That's it. Activity. And I think a nice analogy is I might have some children in a room and I tell them to do an activity like cleaning it but as soon as I shut that door, I don't know what's going on in that room. And that's the way you got to use EMG. You have to understand that if you place these electrodes in a little different spot, you're going to get a lot more different electrical current. It's going to give you a different idea. It's going to give you a different activity.
- Russ Campbell: [01:04:13](#) Here's the problem with putting it on the neck and it's not Russ again. I gave you ... There's one article and it's, again, just the

first name. This is Zola. It was in 2015. There's another one that that researcher was involved in with some other research, research that kind of support it. The swallowing muscles are deep. Under my neck, I have a platysma. I also have a sternocleidomastoid and I can put that surface EMG on my neck and I can just tighten my platysma. I can just push out my lower lip and I can tighten my mentalis and I can get that EMG to fire and I never used a swallowing muscle.

Russ Campbell: [01:04:54](#)

So, what this research basically said is, "Hey, you can't just trust EMG," and when they compared EMG to an objective test and they wanted to see if what was showing on EMG is what accurately was incurring on these objective tests, they found they were less than 40% accurate. In this day of specificity, where everyone's like, "Oh, we want to be specific to be doing this exercise or that exercise," to tell me you are doing that exercise without paring it under FEES or fluoro first, if you want pharyngeal squeeze, put that endoscopy in my throat, put my SEMG on, prove to me under FEES that I'm getting pharyngeal contraction, find out what that looks like on my EMG screen and repeat it. but if you were not repeating it or you move those electrodes or you're not using new electrodes, you're going to get a different reading and I'm going to tell you, it's been in my field just as long as it's been in yours. You go around and ask my physios how much we use it and we can use it at least right over the muscle that it's intended to be used for. You got to go through two to three layers so you don't really know what's going on.

Russ Campbell: [01:06:08](#)

So, when people ask me what are we doing for biofeedback on that RPD. Just like you're doing other ways, we love air. We love the dynamometer for grip strength. OTs want to test grip strength. They squeeze pressure, force on that RPD, that Restorative Posture Device, you're going to have an air bladder on that chin pad and you're going to push down into it. Now, you're going to be able to measure neck strength. That is much more accurate than surface electromyography.

Russ Campbell: [01:06:37](#)

So that's all I want to say on that unless you have more. Two quick things, promise. On the show notes, ESP follows the guidelines and the rules of neural muscle electrical stim, electrode therapy and exercise physiology. When a patient starts swallowing consistently, only one contraction every 30 seconds, five on, 25 off, that's two contractions a minute for 30

minutes. That's 60 effortful swallow stimulations. When they achieve 80%, which is about 48 out of 60, we allow you to lower their duty cycle from five to 25 to five to 20, and if they achieve 80% of that, they go to five to 15. Why? Because if I can't, five on, 15 off is one contraction every 20 seconds. Three contractions per minute times 30 minutes is 90 stimulations. So, we progress them from 60 to 72 to 90 stimulations based on swallowing accuracy. That's how you use NMES as exercise physiologists. If you want to increase strength, you either have to increase what? Weight and I can't add more weight. They can only take so much NMES so the next thing I do is add what? Repetitions.

Russ Campbell: [01:07:54](#) So, we understand the rules of frequency. We understand the rules of the strength duration curve for phase duration, that intensity and phase duration matter. We understand duty cycle and metabolic fatigue and we understand the rules of plasticity. Check out [Kline 01:08:09]. I give you the keys to neural plasticity and the ESP principles to plasticity on the show notes, and, again, to return to that comment, to the SLP that tells me 'I'm trained in NMES', look at the last thing on this notes. It's a chart that shows you can use up to 4,000 pulses per second. You can use up to 150 Hz. You don't know all these parameters are capable of doing. Learn as much as you can about NMES. It's in your field to stay. It's never coming out. It does too much and when you realize it and this group of key opinion leaders can come together and figure it out and I'm open to talk to any of them, we will do better and this will be a standard of care.

Russ Campbell: [01:08:54](#) Bottom line, last page, these are the three FDA-cleared units that have gone through the FDA to get clearance for marketing for the treatment of dysphagia for pharyngeal contraction. I said they all create movement. They all create contraction. One, Ampcare takes it in a forward upward position. The other peer-reviewed data says the other two take it in the opposite direction. You decide, give you plenty of links, passionately, calmly, I'm going to take a deep breath and say, "God bless you. Save travels to everyone, and go Cubs."

Theresa Richard: [01:09:31](#) Thank you, Harry Carey.

Russ Campbell: [01:09:32](#) Thank you very much. Let's get some runs. Go Cubs.

Theresa Richard: [01:09:37](#) Thank you, my friend.

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Theresa Richard: [01:09:39](#) So, if you would love to hear more of these episodes and get some easily digestible bites of swallowing knowledge, then please leave a review on iTunes or pledge a small amount on [patreon.com/swallowyourpride](https://patreon.com/swallowyourpride) because that is what keeps these episodes coming. Also, don't forget to subscribe, share with your closest colleagues and show notes will always be available to download over on [swallowyourpridepodcast.com](https://swallowyourpridepodcast.com), where you can also be notified of the latest podcast episodes. Also credit to Stephanie Jacobson for her incredible editing skills and thank you so much to all of you for listening.