Struggling with Central Sleep Apnea? TPNS May Be the Answer Transcript

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Intro and Guest Introduction

All right, gentlemen. Hey, it looks like we're, the three of us are back together again. So what is going on today? It's time for some pre-cals. Yeah, Jerry, we've got Dr.

Timothy Morgenthaler from Mayo Clinic coming on. He is the Timothy. Really such a pleasure. He's somebody that we've all, if we ever done a clinical presentation, we talked about him, especially around ASV and things like that.

So it's just a real pleasure to have someone, a key opinion leader like him on the show. that can really give us some good education. So I think it's going to be fun to hear about something we don't talk about.

That's central apnea. And for our listeners that are maybe new to sleep, that's an important thing to understand. It's so different from obstructive apneia.

Knowing him, we're going get a good lesson about that today. Excellent. Robert, any thoughts? Yeah, I'm excited. You know the central sleep apnea has always been a bit of a mystery and you know to have one of the.

The founders of of. Treatment of central Sleep Apnea involved in the program today is great and I think hearing him tell us about some of these more current treatment solutions and the right patient populations for those solutions is going to be amazing.

Alright. Let's go to the show there. if if Lights out.

How Dr. Morgenthaler Entered Sleep Medicine

Welcome everyone once again to another episode of Sleep Tech Talk, the sleep podcast with your hosts and friends, Emerson Kerr, Robert Miller, and me, Dr.

Gerald George Monikerode. Folks, it is another amazing episode that we have, but this is a very, very special episode. And I am just going to get right to it.

Emersion, what's going on today? Jerry, we've got a good friend with us, Dr. Timothy Morgenthaler from the Mayo Clinic. He is a professor of medicine in the division of pulmonary critical care and sleep medicine.

he served as the director of the Center for Sleep Medicine at the clinic from 2016 to 2024. A past president of The American Academy of Sleep medicine and has received the Academy's Nathaniel Kleitman Distinguished Service Award for contributions to the field of sleep Dr.

Morgenthaler also holds roles in healthcare quality leadership, currently serving as vice chair for quality at Mayo Clinic with a focus on global quality consulting.

Well, Dr Mordenthaler, it is an absolute pleasure to have you on Sleep Tech Talk. You know, one of the questions that we like to ask our guests, and it's always instructive, is how did you get into sleep medicine?

Because I know how it happened for us quite a journey, but our audience would love to know. Sure. Well, thanks a lot, Emerson, and it's good to see you again.

Yeah, I think I had a pretty special journey, i think. I went to medical school at Dartmouth Medical School longer ago than I'm going to share with the listeners.

But a very important thing happened there. At that time, we were one of only two medical schools in the country

that had an unit on sleep medicine. And it was taught by Dr.

Peter Howrey, a PhD sleep psychologist. And I thought it was fascinating. The whole concept, he was a great teacher and just thinking about physiology from the point of view of, oh, gee, we spend a third of our lives doing this thing called sleep, or at least we're supposed to be doing that.

And, you know, none of the other teachers at my medical school seem to mention much about it. And so I thought it was very interesting. Even back then, it interesting enough that I went and kind of lurked around the sleep lab for a night or two, which was a very primitive sleep That was it for a while.

I went to medical school on a Navy scholarship. But I thought I was going to head off into surgery at first. Went to a navy hospital, did a surgical internship, and then off to diving medical officer service.

Then eventually, I got back on track to go back to Mayo Clinic here for my internal medicine pulmonary critical care fellowship. And lo and behold, literally as I'm standing on the tarmac to get on a little hop plane that goes to Rochester, I look next to me and who is it?

It's Dr. Peter Howrie. So this has been like five, six years. And I said, what on earth are you doing? He says, well, now I am the head of the Sleep Center at Mayo Clinic and we're kind of working together with some people there to build sleep medicine.

As I went through my now medical and pulmonary and critical care I kept on coming back to sleep and stuck with that. I left Mayo Clinic, went into private practice in Nashville.

It was very important to me to develop my sleep medicine practice there, which really was a lot of fun and actually was so busy. kind of successful enough, I guess that I was asked to come back at Mayo in Rochester and sort of the rest is history.

I mean, that's where I stayed and built the best of my career and have had a lot of fun with some of best sleep medicine colleagues in the world. Well, it's an incredible group.

And I've been incredibly lucky to get to spend time with you and the team over the last decade. Speaking of last decades, you had and I had conversation a little over 10 years ago where we were talking about, you know, treatment for, central sleep disorders.

And, in 2006, You coined the term complex sleep apnea. So your history in that space is probably more extraordinary than most and with a lot of background, but For our listeners, I mean, there's different types of sleep disorder breathing, but a lot of people may not understand central sleep apnea.

Can you take us on a deep dive with that and give us some understanding around it and your history with it? Sure. So I mean, I think I would anticipate most of your listeners are familiar with the most common sleep-related breathing disorder out there, which is obstructive sleep apnea.

And very simplistically, at its base level, we know that as people fall asleep, a normal part of that experience is some relaxation of muscle tone.

Understanding Central Sleep Apnea

Depending upon other physiologic characteristics, some people, as the airway muscles relax, the opening gets so narrow that there's really not the ability to have adequate airflow, and that can result in either respiratory-related arousals or hypopneas by all the many different definitions that exist right now, or the most easily identifiable thing, an obstructive apnea where there is virtually or zero airflow and the person is still trying very hard to make that breath happen.

We would all recognize that as an obstructive event. But we do have patients where, gee, the airway is adequately

open. That's not the problem, but the brain is not sending the signal to actually take a breath.

And that happens intermittently so that if you were just a casual observer and maybe not measuring the accompanying absence of efforts, you would say, Oh, I'm still seeing a pattern where they breathe for a while and then they stopped breathing and they brief for awhile and stop breathing.

But when we measure that using our different sleep tests, You can see that there's a difference in the central sleep apnea events there's inadequate effort to actually take the breath.

And so, similar to obstructive sleep apnea, central sleep Apnea is sort of defined by a high frequency of absence of effort, to take breaths repetitively.

We still kind of coined that as an apneal hypopnea index, where the apnias and maybe also the hypopenias are actually centrally motivated. then you end up with central sleep apnea.

The complex sleep Apnea or what we now call treatment emergent central Sleep Apneas really came about, you know, when I came to Mayo, Dr. Howard was still here.

John Shepard was here, was a great pioneer in sleep medicine. Dan Harold and Cam Harris, who many of you may know were here and I kept on seeing these patients who, we did a lot of split night studies and would see them at the front end of the night and that way they look like they have obstructive sleep apnea and by the end pap therapy, CPAP therapy.

They look like they have central sleep apnea. And my colleague, John Shepherd, who is very astute, said it goes away. I kind of believed him for a while, but eventually I got curious and I thought, I'm not sure it does go away because we were seeing patients coming back using their CPAT machine and they're still having apneas.

Well, what's that all about? So an enterprising fellow Vadim Kagramanov, and he volunteered to help me look at this. That was really where we came out with our first paper about what we then called the complex sleep apnea syndrome.

Actually, the title of the paper was, is it a syndrome? This was early stuff. We weren't really sure, but I think it seemed to have a lot of traction.

I thinks others had observed this and really wondered about it. There was a a work then over the next five to 10 years to sort out how big of a problem is this?

And more importantly, what should we do about it? That really got me interested in looking at adaptive servo ventilation, which my group here was privileged to do some of the studies that got the FDA clearance on the initial ResMed ASV device.

You know, to your point, there's been a lot of different treatment options around that. Robert, I know you were about to ask a question, probably the same one I was gonna ask.

And, you know when you begin to describe this, what are some of the treatment that physicians have at their disposal to treat central sleep apnea? Right.

So central sleep apnea in its purest form, we'll say, where literally there are no significant airway obstruction problems. Fundamentally, were trying to figure out how do we get the brain to either take a breath or at least get diaphrams to move to get a breathe.

And so, you know, early on, some of the efforts were around, well, maybe we thought some these central apneas were in some way related to what now we would say low arousal threshold.

And so some the effort were to give hypnotics to see if we could blunt that arouse threshold, and maybe there

would be few of those. There was some very, I'll call it very small, very soft data that maybe that was helpful in patients.

Then some early work by some really Bright people like Java Harry they said well what if we what, if, we use the offline as a respiratory stimulant maybe that would drive things and so they tried that and then there were people who are just trying CPAP and they found that you know G in a small percentage of patients.

Even just CPAP would seem to help.

Treatment Evolution and ASV

There was a lot of discussion about why might that be since most of us thought about CPAPP as sort of stinting the airway open, but it does do other things to the distribution of dead space and it those things, to regulation of CO2.

In a small portion of patients, CPapp is helpful alone, where a lot of the early developments went to as well. We have these things called non-invasive ventilators, where we can maybe provide a mechanical breath to the patient.

The earlier ones were trying to use BiPAP-ST, and that can be helpful sometimes. What caught my attention with the ASV, I remember when Teshler's paper first came out in the Blue Journal, it was about 2000 or 2001, And I thought, this is really cool because what it's doing is it is looking at the patient's breathing pattern and then instead of just blunt force, you shall take a breath, I'm going to give you a breathe with an ST type of thing, it was instead trying to nuance the timing of breathing And actually, what it was doing was it causing very sneakily a certain degree of hypoventilation so that the CO2 would rise, which would then stabilize breathing.

And it very much more effective in Shane Stokes' respiration central sleep apnea patients with heart failure. That was really what was first demonstrated.

I and my colleagues here, the thought, well, what about in these complex sleep apnea patients or patients who had central sleep Apnea from other causes.

And so that's really where we started looking at ASV as a means to treat these patients. It ultimately proved to be for many patients a very effective way to Treat central Sleep Apneas, even if they had some obstruction included, because with the EPAP or the the end expiratory pressure, you could stabilize the airway and then with the adaptive servomechanism driving breaths of various intensities, You could kind of take care of the fact that they weren't taking a breath.

So Dr. Morgenthaler, thank you for walking us through the sort of the evolution of central sleep apnea treatments. I always refer to it, I know we've used the terminology complex sleep Apnea, but I also call it complicated sleep APnea because sometimes the treatment solutions and even the combination of therapies relative to treatment can be a very specific adventure for every patient that you have to treat.

But there are some surgical solutions now for central sleep apnea. Can you tell us a little bit about those? Well, I think you're probably talking about TPNS therapy.

Yes. So TPMS, right now there's only one of these on the market. The brand name is Remedy. You know, it was originally from It's now Zoll owns the company that produces this, Respicardia.

TPNS is the generic term, it's Transvenous Phrenic Nerve Stimulation. Mechanically what this is, It looks very much like a pacemaker with a lead. Initially when it came out it had two leads, I think now it just has the pacemaker itself as one of the leads.

Then the other lead is actually It's put in transvenously, just like as if you would put it in a pacemaker, usually into one of the subclavian veins. And then preferentially, they try to position the end of that electrical lead so that it's in close proximity to one or the other of phrenic nerves.

Now, the phrynic nerves travel right along the outside of the mediastinum on either side. So one of best places to place that electrode is in the left pericardiofrenic vein, which really runs very close to the lefthrenoc nerve.

If for anatomical reasons, the cardiologist or the proceduralist can't really get the lead there, you can put it in anominate vein on the right, and it coils and still will gain some proximity to the right phrenic nerve.

Once you have this device inserted, the way I like to explain it to patients is it's like a pacemaker for the diaphragms. it will periodically provide an electrical pulse that is of sufficient strength to cause the diaphragm on that side to contract.

Basically, unlike noninvasive positive pressure ventilation, which is providing a breath by increasing the driving pressure, this is a more natural way in some regards because it's using negative inspiratory pressure to draw that breath.

So that's the essence of the device. Now, it's put in typically by a cardiologist who's been trained in this procedure. It's very, you know, here, and I think most places that are doing this pacemakers and AICDs.

The techniques are very similar. I'm not a cardiologist, so I am not trying to, in any way, diminish the skill of the people who place these. But very interestingly, the safety profile is very similarly to pacemaker's in terms of procedural complications and so forth.

So it's overall a pretty safe procedure to have this placed. Unlike PAP therapies that really only work when you choose to wear it, these devices, the programming of the current versions of these goes something like this.

You have to interact with the patient and say, well, what is the sleep schedule that you want to follow? Now notice I'm asking a patient to a sleep scheduled, which right away is a little different than all the other therapies, but I am asking them, during which time you want your therapy to work.

And so typically I'll just make it up. The patient will say, well, I like to be asleep by around 11. I'd like be up at six. OK, that's seven hours. So what I do is I first program the device to say don't turn on unless we're in between those two hours.

So during the day, it's not going to be turning on. It's just they're going be walking around with a thing that nobody can see because it just like a pacemaker.

But at night, if we are in the window, now we need a couple other things to happen. We want them actually lying down. So the device has a method of measuring what we call pitch.

And so most patients, maybe most of our listeners here sleep in a level bed. Some of out cardiac patients may have the head of the bed elevated a little bit, or if you have some back pain or something.

Phrenic Nerve Stimulation and Device Basics

But you can program in what is the right pitch condition before this device would turn on. So we've got a sleep window and we got to position. Now there's one other thing.

There are things that we do in bed besides sleeping, so we might not want it to come on when we're doing some of these other things. The listeners can use their imagination, but it has an activity sensor that would tell us if they're still, it's in the sleep window and they are in a right position.

And if those conditions are met, then assuming all the electronics are fine, then the device will say, okay, I'm going to turn on after a certain delay time.

And so it will come on. We're programming the devices to more or less match the patient's ventilation respiratory rate. So we typically program it at a respiratory rates that's similar to what we think their sleep respiratory radar be.

and it's going to come on and deliver those breaths. Usually the plan is that the patient would be asleep, the device would working. Now, of course, some guys and many women have to get up and go to the bathroom at night, and that's expected.

But remember, if the person gets up from the bed or they're moving or repositioning, that'll shut the devices off for a period of time. It's again going wait until all those conditions are met.

Am I in the sleep window? Are they in their right position? Okay, after a little delay, we'll start working. And that's kind of the basic essence of a device.

Did that answer your question? Yes, those are perfect. You know, I think one of things that, so it seems like there has to be a really specific criteria from a patient perspective for the TPNS.

if if Right. So this is really getting interesting because as your listeners are no doubt aware, there's also hypoglossal nerve stimulation for obstructive sleep apnea.

I was just going to ask that, Doug. What's the difference between for us non-initiated between Inspire and this and who can use this? Right. And it's a very critical and good question.

So very briefly, hypoglossal nerve stimulation is really stimulating the nerve. It's put in in much the same way, but not by a cardiologist, put it in by typically an ENT or a sleep surgeon.

Again, though, it looks like a pacemaker device. it has a sensing capability to sense when respirations are occurring. And it basically is looking for, hey, when respiration starts to occur and after the patient has turned the device on using the little remote that we all saw on the NFL football games this year.

So they turn it on and they're taking a breath in, oh, it's going to send an impulse to the hypoglossal nerve, which is going cause the tongue to protrude to some extent.

And that's regulated by how much voltage we deliver to phrenic nerve. I'm sorry, to the hypoglossal nerve. So if you think about it, remember, in central sleep apnea, the problem is there's no breath.

A hypoglycemic nerve stimulator is not going to do anything of any help, particularly because the problems is still going be there. The patient's still not gonna initiate a breath, and furthermore, for many of the patients with central asleep apnia, their problem has nothing to with upper airway collapse, so there is no need to stimulate the tongue and try to increase the size of their airways.

The reverse is true in the patient who has, let's say, pure or pretty pure obstructive sleep apnea. For them, remember, they're trying to breathe, but their airway's obstructed.

So the goal of hypoglossal nerve stimulation therapy is to try to create that space by causing the tongue to protrude a little bit. And where that gets really important is, if we don't carefully discriminate between obst constructive and central predominant sleep apnea, we could put in the wrong device.

That will not only be expensive and increase risk, but it'll be very ineffective and very annoying for everybody involved because you will have gone through a lot of expense, risk effort, time delay, and you won't have really helped the patient.

The best patient for phrenic nerve stimulation, I'm going back to the remedy, is the person who has predominantly central events, central apneas, and central hypopneus.

I'll bet in many cases, hypopenias are not being discriminated between whether they're a central or an obstructive event. When our tools were like ASV, I'm not sure how important was that we discriminate because remember with the ASV I can do both I Can prop the airway open and deliver a breath, but with frantic nerve stimulation, it's not going to help me with The airways so I really need a patient who has mostly central sleep apnea.

And that would be central apneas and hypopneus make up the majority of the breathing disturbance. So the typical candidates that we see are patients who have central sleep apnea due to heart failure without a lot of obstructive events, some idiopathic central asleep apnoea or primary central Sleep Apnea, as we call it.

Yes, the FDA approval does include patients who have treatment emergent central sleep apnea, so long as their obstructive events make up a minority of the events.

But we have to realize, if you use this type of device in those patients, they're still going to have obst destructive events that may be problematic.

And so I do have some patients you know, have a phrenic nerve stimulator. I actually have several patients where we put that in, it was quite effective for them.

It got them kind of more active and involved in life. And like one of them went to Mexico and had a nice vacation and probably had too much to eat and drink and came back and now they had obstructive sleep apnea, they gained some weight.

So now we're using an oral appliance and a Phrenik nerve simulator, which is not an ideal outcome in my view, but these things happen. Dr.

Who Should Get TPNS and Guideline Updates

Morgenthaler, One of the things I think that is taking place over the last bit is some real guidelines from the Academy and others to try to give us some insight into where, who, and what, how, relative to dealing with central sleep apnea.

Can you take us down that road? What are the rules of the road that we need to follow relative this? Sure. There has been a guideline from the American Academy of Sleep Medicine for treatment of central And that first guideline, I might not have the dates quite right, but I think it came up like in 2014 or maybe 2013. And then I know in 2015, when the CERV-HF trial came out and said, whoa, look out, there seems to be a signal for increased mortality in patients with low ejection fractions, There was a modification of that 1st guideline to say, hey, we probably shouldn't use the existing ASV devices in patients with a very low ejection fraction, at least until further data becomes available.

Well, two things. One of them is that first guideline paper did not consider of phrenic nerve stimulation therapy at all because it wasn't FDA approved at the time.

And I'm not even sure that the pivotal trial was published at that time that we were looking at those data to put together the guidelines. So the absence from the first guidelines wasn' an indictment against it.

It was just, it didn't exist. I wasn t in consideration. That's one thing that's changed from back then till the 2025 guidelines that just came out recently.

The other thing is that, well, there are other things, a whole other topic, but very briefly, the ResMed ASV machine that was used in the CERV-HF trial had a number of things that are very different from today's version of ASB machines.

One was the way that study was designed, if you really dig deep into the supplements where they show you the data, they were a lot of people with uncontrolled obstructive sleep apnea.

And so one caveat to the bad or not so very enthusiastic outcomes of that trial was, yeah, you still had a lot of people with moderate to severe obstructive sleep apnea that you weren't treating, and so maybe we shouldn't be surprised that they didn't have good outcomes.

The second thing was there seems to have been something unique with that particular version of the ASV back

then, because when people went back to dig in and say, that was not the expected outcome of trial, they were expecting it to be good for people, not have a signal with increased mortality.

The other thing in that machine was that it was actually delivering quite high pressures and quite title volumes. And a lot of people theorize that they may have inadvertently hyperventilated those patients.

Now, remember the first versions that came out in Teshler's work, they were hypoventilating patients, These patients may have kind of had a bit too much dose.

So two things have changed. One is that the ASV machines have change and they now almost all have the capability to auto EPAP and control obstructive apneas.

And people I think are much more sophisticated about setting them to begin with. The second thing is they, you know, now have algorithms that don't maybe result in quite such large tidal volumes and minute ventilations.

And the third thing that's changed in that whole thing is that there have been a lot more studies done. Overall, there have been very large, quite a number of observational studies that really don't have this uncomfortable, gee, this is a bad safety signal.

So I think more and more people are thinking, hey, ASV, actually, we shouldn't necessarily restrict it from use in patients with low ejection fractions.

We should bring that back on the table. And also, the SAVE trial, which had all kinds of problems with COVID and machine recalls and so forth and on. Although it wasn't designed to determine safety, there was no adverse safety signal in the trial.

And so the current guidelines have two big changes. The current Guidelines for Treatment of Central Sleep Apnea. One of them is that, yeah, in the right hands, careful sleep specialists who have experience with ASV, that could be used in patients with central sleep apnea, even if they have a lowish ejection fraction.

So the paper has a soft call on that to say, yep, we could use it. And you can use in many, many cases of central asleep apnia. The second one, which is where you asked me to go, is, Oh, now we actually have a conditional recommendation for use of phrenic nerve stimulation in primary central sleep apnea and in heart failure related central Sleep Apnea.

And that's very significant. I gave you that wording. It has a Conditional Recommendation. Many of the recommendations in the guideline have conditional recommendations because we just don't have enormous studies with lots of central sleep apnea patients and lots outcomes.

Now, I'm going to share a bias of mine that's not in the guidelines, but of all the therapies, if you look at just trial size, interestingly enough, the TPNS, the Remedy Pivotal Trial, actually was one of the larger trials.

And it actually had very reasonable safety, and it had a lot of very good outcomes, some of them better than those from the ASV trials and so forth. So I think what the AASM guideline is suggesting is try the other things first, then in some select cases, maybe use transplanting transvenous nerve stimulation, I tend to think of it more as let's personalize therapy for the patient.

I have some of my patients that we've used this in who just, if you show them a mask, they just shake their head and want to leave the room. They're not going to be interested in it.

Just like hypoglossal nerve simulation, we have to make everybody suffer and be tortured by a failure of some other therapy I think we need to use our, our clinical skills and talk with our patients and decide what we needed to do.

You know in light of that I know we're up on time but if you can just briefly you know maybe expand on your. your

conversations with patients, how the program works there at the Mayo Clinic for our listeners who are curious, How do I implement this?

Building a TPNS Program at Mayo Clinic

And how do we have a successful program for patients that would certainly qualify for the TP&S technology? Yeah, okay, Emerson. So it is a little bit of a startup issue, because you first of all have to have availability and willingness of clinicians who are going to take care of these patients.

And that's one of the things that we've run into as these devices, I mentioned you have to program the time window and all these things. like always a win the first time around.

There's a lot of back and forth with these patients. They might have to come back. You might to adjust the intensity. you might change electrode parameters and so forth.

So that not uncommonly takes some back-and-forth. Maybe a patient that lives 300 miles away is not going to be a good patient for you unless they have a private plane or something.

The other thing is, gee, let's say everything's working great and they decide they're going on vacation in France. they live in the Midwest. Well, that's five time zones away.

We actually have to manually change the settings on the device. It's not something that can be done remotely. Or let's say they have a sudden need to have an MRI or a surgery, you have And they have to be physically present for you to do that so they can have their procedure, and then you have the physically turn it back on.

So, the reason I'm mentioning that is, you know, as we've started our program and ramped it up I was just kind of the lone ranger at first, And very quickly I had to recruit some colleagues who are also willing to learn how to deal with these, this technology and these patients because I'm not here at Mayo Clinic 365. I do try to go on vacations, I have trips and things, but we need to be able to take care of that patient who needs help.

You need the staffing. The second thing I would say important in staffing is, of course, you need cardiology colleagues who are willing to place the devices.

in mixed in all that someplace, somebody's going to have to figure out the business side of this. It has to get approved and paid for and who gets the funds.

In our center, the cardiologists place the device. Their pre-authorization people handle the preauth on how are they going get paid replacing the evaluation, the initial evaluation and all of the subsequent programming of device.

So it's very similar to the way we work with Inspire. It's a very simple type of thing. Then I would say that you also need to have technologists that are on board with this, because on the one hand, if you have a patient who is just crystal clear, they've got 40 central apneas per hour and five hypopneus per hours, I don't really care so much about the hypopenias, we're going to treat central sleep apnea.

But what if we have patient, who has Shane Stokes respiration, and they have six central aptness per-hour, but they got You know, 40, what am I 44 hypopneas per hour, I need to know if those are central hypomanias or obstructive hypotonia so that I do the right thing.

So I needed to have technologists who are going to be engaged with me and help me take care of this type of thing Then also here, our technologists also help with a lot of the education pre-implant, and they can help us field questions.

Of course, they have to be available when these patients come in. We often will put them in one of beds to do these adjustments and so forth. You have that cohesive team of technologist, clinicians, even your nursing staff have be able to handle incoming patient inquiries and so forth.

And then scheduling is a big thing. These are not 20 minute visits. these patients come in for programming, they're going to be there for a while. It takes an hour plus to do the initial activation.

When everything's going really smoothly, we still say, hey, for one of these patience, let's schedule an our follow-up, an extended follow up time, because otherwise we get backed up and rushed and it's not a good experience for anybody.

So those are the things I would say. You know, obviously you always kind of want to go My dad didn't fish. I had to learn how to fish from my father-in-law, but he was a really avid, good fisherman.

And when he took me out as a young son- in- law, he kind of taught me, where do you go fishing? Well, you got fishing where the fish are, and otherwise you're just wasting your time.

So he taught how me to spot where they fish out. Well where are your central sleep apnea patients going to come from? They do dribble in amongst the masses, because not everybody who's referred to you with obstructive sleep apnea has obstrative sleep Apnea, but boy, you're going to find a pretty target rich environment in the referrals from cardiology, especially your patients who have Shane Stokes respiration, AFib, reduced ejection fraction, age over 60, those kinds of people, and males, Those are risk factors.

And of course, if you do have a pain management clinic with a large pool of opiate opioid patients, that might be another area where you'll see these patients.

So I guess in summary, I would say start small, identify a few strong candidates, try to pick really clear ones to begin with, so it always helps to lead with success, build your team, refine your processes, and go from there.

Well, Doc, thank you so much. And I appreciate that last bit there, a very concise way of putting it all together. But we are really out of time. Where could people find more information about TP&S?

That's a good question. Of course, the company Remedy has websites, and there are clinician education materials there. Just using Google Scholar, if you Google phrenic nerve stimulation therapy, many of the sentinel articles about this, including the pivotal trial and other things, you can actually get an open source and download them and take a look at them there.

Otherwise, there's seminars at different national meetings, CHEST, AASM, ERS that I'm sure that you can get. And I know that they've had some courses on this in the technologist tracks of the sleep meeting and so forth.

So those would be, I guess, the places I'd go. Thanks, Doc. Now it reminded me at the Texas Sleep Society meeting, we had a representative from Zoll speak on that as well.

So that's a great point. Thank you so much. Appreciate you joining us. You bet. Glad to visit with you. Take care. Folks out there, thank you all for joining on this very special episode.

We'll have more information in the show notes. And don't forget to share this with everybody out and until next time, lights on. if if All right.

Wrap-Up and Reflections

And it's another amazing show in the books. Man, I love it when we have such guests like this and then we get to nerd out, geek out on some of this stuff.

servo ventilation that was one. Then on top of that, the surgical intervention, TPNS. There's always that query about what is inspired versus this other thing that's out there, remedy, which is by Zoll.

I was really happy to hear this. Gentlemen, your thoughts. Yeah. It's absolutely fantastic to get to here about remedy in the context of the larger picture of central sleep apnea because And as we said in the pre-show, it's one

of those things that can be a bit mysterious.

And so to hear where this fits in, the ecosystem of treating this type of patient was fantastic. The history around it and really what it is going to do, I mean, is quite an indictment by Dr.

Morgenthau to see this as something he prefers now over his long history with ASV. So really exciting to here that that speaks volumes about the capability of this technology.

I think, Emerson, one of the things that we are absolutely missing on this particular program are slide examples so that our audience would be able to see some of things I've seen in presentations where there's a before and after with the implant, and it's amazing to the significant difference.

in the treatment of those patients with central sleep apnea. So maybe the mystery of central asleep apneas is going to be solved one of these days. We certainly have a much better tool, I would say, in treating central seat apnoea than we have before.

I agree, I think that this really opens up a whole world that just really kind of is a moving target and has been difficult for both sleep technologists and sleep physicians to manage.

And I'm looking forward to seeing more and more information around this and in more outcomes data in the future. I will say that I felt a little under underdressed looking at Dr.

Morgan-Thaler. That gentleman is sharp. You know, he's the definition of like what you think of, you know a high profile physician when you go see a specialist like him and man he sure is one of the best to ever do it.

Yeah, I'm really glad. I think this was a huge treat for not just us, but for our audience, the clinical people especially, and also those that are just sleep curious.

So I am glad we got to do this.