How to make CPAP More Comfortable? Use AI of Course! Transcript

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Pre-show banter and guest introduction

All right. Time for a new episode. So, folks, you know what that means. It's time for some pre-calibrations. Robert, what's going on? Well, before what was going.

Where is Emerson? I don't know. I have a feeling our questions may not be quite as intelligent today. I think you'll make up for that. Definitely not me.

Well, Emerson, he always brings the heat when it comes to asking the probing and sophisticated questions. So we'll do our best to keep it in the road today.

Agreed. But yeah, so what's going on? All right, so today we dive into the mind shaping innovation and technology joining us today is Hamid Hanafi who is the CEO of Novoresp.

He has a PhD in biomedical engineering with an MSc in electrical and electronics engineering from Dalhousie University. Hamed is a recognized leader in the respiratory technology space.

As an adjunct professor at Dalhousie, he bridges academia and industry, driving cutting edge solutions in a fight against sleep apnea and other breathing disorders.

Under his leadership, Novoresp is pioneering breakthroughs that are transforming the future of respiratory health. Stay tuned as we explore Homed's inspiring journey, the challenges of innovation, and his vision for a healthier tomorrow.

All right, it sounds like we have another one of these underachievers on the show, huh? My gosh, a PhD, huh? Yes. Incredible, incredible guest that we get to meet here on the podcast.

And I think it's going to be interesting. We've talked a little bit about the fact that, we all know that. we need better technology from a PAP therapy perspective for our patient populations.

He is on, the cutting edge of delivering an AI auto CPAP algorithm. So I can't wait to talk to him. Yeah, that is exciting.

Novoresp and the AI CPAP concept

I mean, I remember back when we were at Respironics, how it was like a wonder to figure out what is the next algorithm going to be and how much more can we do?

We can't really do much. And I, remember one of the engineers like, Hey, we're just getting started. and I I. Remember as a clinician thinking what more we can do and to here now to leverage AI.

to create a new algorithm and make something that's more comfortable for patients. It's just absolutely exciting. And we were lucky enough to have some of the others developing these things, you know, with Dr.

Noah and the other gentleman from the University of Cleveland, right? I can't remember the… Yes. That's it. Yeah. The rocket scientist, Vortex Bab with the rocket scientists.

So it's going to be interesting to hear AI now for this. Absolutely. Let's jump into the show. All right. On the Show. Now a word from our sponsor, MedBridge Healthcare.

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Gerald George-Moneycrow. Folks, you will notice a missing person today and we won't give it away right now. But in the meanwhile, we just want to say thank you so much for all the support that you've given us.

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A huge shout out to our sponsors without whom we can't do this. So thank you all so much. And folks, be sure to check out our Sponsors as Well. With that being said, we've got an amazing, amazing guest today for this amazing show.

Robert, who's on the show today? Hey, Jerry. Thanks, everyone, for joining the show today. We have with us Hamed Hanafi, who is the CEO of a new company called Novoresp.

You may have started to see more information about Novoresp, but it is an AI auto CPAP algorithm. And we're excited to learn about Hameed's journey into sleep medicine, But then also the development of this new CPAPP algorithm, we certainly need more tools to help our patients from an adherence.

and a PAP therapy standpoint. So we're excited today to hear more. Dr. Hnafi, can you tell us a little bit about yourself and how you got into sleep medicine?

And then we'll jump into the AI algorithm. Firstly, thanks so much for having me. Hello, everyone. So my background is in electrical engineering, masters in microelectronics.

And then during the PhD, I got into the biomedical engineering with a focus on respiratory mechanics. I also took business courses during that PhD. And that's where I got interested generally in medical devices with focus on respiratory.

And then later on, I get familiar with, you know, new ideas and how to help patients in the respiratory field with focused on anesthesia machines at first.

Another motivational factor here is that my father has severe sleep apnea with an AHI of 70 that was diagnosed and didn't want to use his CPAP machine.

So I slowly got interested and wanted to make the therapy better. Started working with key opinion leaders and came up with and idea to track changes faster.

And then later on in 2018, came up with the idea of what if we could predict and prevent apneas to help patients?

Predictive therapy, pressure reduction, and phenotyping

And we can get into that during the podcast. Well, that's fantastic. I think that in order for you to have recognized that there was the need for this advancement from an auto algorithm standpoint, you must have done some research on the current offerings that are on market and found maybe a space where there were some opportunities for improvement, I'm assuming.

Yes. So acclimation to therapy is pretty difficult at first. There's a lot of advancements that have been made. I should first honestly step back and say that I really appreciate the work that has gone into CPAP, APAP and other

therapy here at Novorusp is an evolution to that and to make things better and move forward.

and just making things predictive instead of reactive. The research we had done was that the Acclimation to therapy seemed difficult and a lot of the issues came from at first accepting that you're going to have to wear a mask and deal with a tube and the machine on your bedside table, but through interviewing respiratory therapists that were setting up patients at DME's, I realized there is a big missing information here where You know, it's the pressure and air flow that's being delivered through the mask.

And a lot of patients might at first think that it is the mass that is a problem. But you realize that sometimes patients are sleeping and at the first the pressures low and they accept it because the doctor told them, you're going to get heart attacks and strokes if you don't use this machine.

So they fall asleep with it, but somehow they don t sometimes even remember ripping the masks off. They don't have it on. And as you know, having it for more than four hours a night is very important.

At that point, we started thinking of how could we use what we have found in terms of predicting and preventing apneas. to lower the pressure of therapy and make it more comfortable in this application.

I have to say the application of this algorithm is bigger than CPAP therapy in sleep apnea. You can make any sort of ventilation sort of predictive and preventative instead of being reactive.

But we decided to focus on CPAP for personal motivation and it's the trials are at home and easier to conduct trials at the hospital and we had access to data.

So, Doc, you had mentioned just now predictive as opposed to just simply interventional. So when you talk about predictive, do you see, I know you said other applications, but let's focus on CPAP right now.

What other application apart from just the patient doesn't rip it off the face? What are the applications could we look forward to with this? In terms of general med tech, No, no, in CPAP itself, when you're talking about predictive, are we going to be able to use this to better leverage on how we understand patients requiring CPap, for example?

Absolutely. So there's multiple aspects to this. We know that long-term adherence is super important, and we know the patients that are even adherent to therapy in the beginning, they meet the criteria, the cost of the machine is covered, long-term adherence still drops.

And it's partly due to not going through sleep staging and actually feeling the benefits of better sleep long term. That's because the algorithms were not necessarily designed for that.

They were aimed at lowering AHI. So this is where our algorithm really comes in handy where based on our trial results that I'll discuss, it seems like patients are having better sleep staging and comfort.

Now it's partly due to lowering the pressure and not having to tighten the mask as much and such, but we've seen better results in existing patients, patients that have been using the machines for two to four years.

They rated our algorithm better. And we were using a sleep tracker ring called Sleep Image Ring that through cardiopulmonary coupling, as you're familiar, was scoring sleep staging.

And, we saw significant improvements there as well. So I'm assuming that the patient experience is better because of a lower mean pressure that's able to be delivered through the AI algorithm.

I also know that looking at some of the other algorithms that are available on the market today, some are flow-based. There's also volume that makes up some the auto-algorithms, but then, you know, I've even heard recently where there's a work of breathing, type of algorithm that's being developed, is maybe Noverest takes all of those things into account.

Can you tell us as much as you can about that specific part of the algorithm? So in lump sum, yes, but our approach is through using AI. And let me elaborate here.

We've designed it in a way that while our IP covers the use of other inputs, CMAP was designed for CPAPs in way, that would only use the sensors that is available on any CPOP machine in the market.

So it could be applicable to them. And what it does is that it predicts apneas before they would have, it's trained by breathing patterns of, um, you know, millions of samples of breathing pattern.

Uh, so it generates probabilities of the future. It's like a weather forecast. If you, the rain is coming, You sort of set up your yard for the ring that's coming.

So it constantly generates probability, uh, in terms of what's going to happen in the. Um, now any sort breathing and abnormality or predicting that there's gonna be normal breathing.

Sleep staging trial results and comfort improvements

By doing so, when these probabilities cross a certain threshold, let's say we know an obstructive event is coming, you can intervene gently before that apnea to prevent apneas.

Now we've done trials to prove that this prevention is possible because first we realized that you could predict apnias, we were thinking, how come Nobody else did this.

There must be a, there must have been something wrong with this, so we had to design a trial to see, are we actually preventing apneas? We did that at the hospital with full-on polysomnography and proved that in another trial back in 2020. Now, then in 2023, we focused on actually lowering the pressure, not just preventing the apneas that are coming on top of APAP.

And what it does is that, it's one thing to prevent apnea, but still it is inevitable that some apnoas would happen, right? So you need to have the reactive APP enabled to keep therapy safe.

The difference is, when pressure goes up after an apnea, now because you have confidence in these probabilities, instead of decaying the pressure for the next 40 minutes, an hour, hoping that no more apnea would happen, you can drop the pleasure back down and look at the probabilities.

So that's where this happens. And then also it's adapting on the patient where it tries to find the right pressure, which is what APAP tried to do, but in a reactive way, this one is trying to it in proactive way.

So it finds the right pressure, the lowest pressure possible for that patient. Just to add the possibilities that would come out of this, we've trained this algorithm with the general population data, so it would be applicable to the Think about a future when actual application of AI is possible through the regulatory pathways.

Now, all of a sudden, if you can categorize phenotype patients into groups, which we have IP on as well and we've tested it, There's a couple of abstracts that I'll be presenting at the American Thoracic Society that's upcoming on this.

You can categorize patients into groups like patients with diabetes, patients, with cardiovascular health, Patients that have a high hypoxic burden. you could categorise those patients and then develop their own algorithm with the breathing patterns specific to that population.

So that would be the phenotyping part. And then think of the individual. Every individual is breathing different from the other. We can't have a one-size-fits-all type of solution.

On the individual, if you train our algorithm with, you take the general one, and then you feed more and more of the individuals' breathing pattern on it, now all of a sudden, we can push an update to the CPAP machine.

where it treats the individual's type of breathing. And then over time also, we're not always breathing the same. Over time, I could be developing asthma, COPD.

All of a sudden, my breathing patterns are changing. There could updates applied. So the possibilities are endless. But for now, it's a fixed model that can predict and prevent and find the lowest pressure possible for the patient during therapy.

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Now back to the show. Doc, that's fascinating, absolutely fascinating what you're talking about. I want to just kind of move a little bit now to sleep staging.

Could you talk a bit more about that? That sounded also fascinating. So just a disclaimer here, the obvious thing is that sleep staging with EEG is the most accurate sleep-staging, but we all know that doing trials at the hospital with uncomfortable beds and EEGs, patients have a hard time sleeping.

So we designed the trial that we started and completed in 2024 to compare CMAP with APAP on the same machine with a switch on it. Also to explain how we do this we modify a machine we go to Health Canada and ask for permission to run this on a limited number of patients, just to compare performance of the common algorithm versus ours.

And then we recruited patients that already were used to their CPAP. And to be honest, when we started the trial, we weren't expecting improvements in sleep staging.

We just started this trial on existing patients because they don't have leaks. They don' have problems with their masks. Now you can actually head to head compare algorithms.

So we did a trial where for nine days they would use APAP or our software. It's a crossover randomized trial. We threw out the first two days because it's acclimation.

Patients think we're trying two new algorithms on them. They don't know one of them is the exact algorithm on their home machine. In between transferring over to the other algorithm, they filled out the questionnaire firstly to rank how they did with the first algorithm.

And then the five nights of washout period where they go back on their own machine and then they turn the switch that's randomized and use the new algorithm and we were tracking them the whole time.

They fill out a questionnaire at the end of that too. This whole they're wearing the sleep imagery. So we just did this to prove that we can reduce the pressure without compromising efficacy or AHI or SAHI.

SAHi is an AHi that's deep imaging outputs that is equivalent. They've shown that it has over 90% correlation with the pulse ethnography AHIs. So, we showed that could reduce pressure by 20%. There is between patients some more, some less, without comprising AH.

But then the staggering results were from sleep staging. They spit out a number called sleep quality index. That is a combination of REM sleep, fragmentation, stable sleep and unstable sleep.

So we significantly improved stable, we reduced unstable, improved REM, reduced fragmented.

Mask leak, manufacturer integration, and adherence trials

And we reduced something they call, I believe, wakefulness. But it was correlating. It's just arousals. So we reduce the arusals, but then this correlated with the comfort and sleepiness question, upward sleep in this questionnaire that we sent to patients.

The results, while CPAP improves, sleepiness to the acceptable level and comfort to acceptable if you're compliant, there was a significant difference between the level of comfort they experienced with ours and the sleep that was reduced on them.

This was on 50 patients. Obviously, when this is applied to a specific hardware, it's going to be tested on a larger number of patients and And newer generations of CMAP are also coming out, but it was pretty promising.

And that's when we gained a lot of attention as we presented this at European Respiratory Society Conference back in Vienna. Fantastic. I've got two questions for you, not necessarily related, but so one of the things that certainly auto algorithms have to manage for a patient is mask leak.

So maybe you could share a little bit of how the AI algorithm manages mask leaks. But then secondly, from a from patient standpoint, is the Is the goal to have Novaris become an AI algorithm in a manufacturer platform or is it something that a patient would be able to apply to their own existing CPAP device potentially in the future and change their therapy?

Great question. Leak was significantly reduced in those patients. One of the surprising comments we received from patients voluntarily was from their partners.

So our study coordinator would go to collect the device and then the partner calls her in and says, Hey, like I've been sleeping next to my wife or husband for a while.

And, uh, this was the easiest I could sleep because I don't get the airdraft to. As much a draft and the noise was less. And looking into actual numbers from leak, we reduced the 95th percentile leak significant.

And a 95% leak as you know is the leak that blows out of the mask and wakes up yourself and your partner. So that was another sign of, okay, what we're probably gonna do well with adherence.

If there's time, I'll explain our adherents trial as well on brand new patients. Well, Jerry is always our timekeeper. And I thought that we would probably be getting to the end of, but the second part of the question was where you see the auto algorithm being administered to a patient, whether it's through your device or a patients self application of their CPAP unit.

Absolutely. So firstly, our team is very purpose driven. The final answer is it's going to be on manufacturers' devices. But the team is purpose-driven.

We want this to reach millions of patients, the current and future versions of the algorithm. So the fastest way to get it to patients is through you know, manufacturers that already have access to patients.

It's the most logical path for us. In 2023, when I was telling you that we were fully developing the algorithm, that was tests on our own parents, our on and on calls until it got to a place then we could go to legit trial.

We do have a lot of interesting talks with the manufacturers personally, and the team is focused on running and finishing our adherence trial and keep tracking our long-term adherents results.

But there's a lotta talks, so I think we'll be on A, or potentially multiple manufacturers' machines in the future. So, Doc, we are getting close to time, but I did have a question for you, because Emerson's not here today, and you said one word that would have perked his ears, that was phenotyping.

Can you speak a little bit more about that, just because? I can talk more about it now because we have filed the patent for it, but as we were collecting data on patients, the importance of phenotyping, I don't know if your

audience knows the important of it.

sleep and neurology doctors are emphasizing on the importance of not applying CPAP therapy as a one-size-fits-all. We notice differences in the breathing patterns of patients and we know the important of linking that into health metrics and biometrics that come from patients.

As I just said, we have a big database now after the comfort study we continued collecting data. And we have a big database of patients with their biometrics and comorbidities.

And through that, we managed to create a map of comorbitities and health metrics that would match with specific categorized clusters of patient that have specific breathing pattern or apnea signatures.

Through that we know that either during the diagnosis or the first bit of therapy we can categorize patients into different groups. the regulatory pathway is available, we could apply their own versions of algorithm to them for better outcomes.

Could I quickly explain how we're seeing long-term adherence? Please do, please do. Yeah, so our most important trial started back in the summer, where we have patients that are in month eight of trial.

These are our brand new patients. We're following a US DME protocol, were we merged the versions of several large DMEs in US, and a single study coordinator and single RT to assist all patients, this is on 200 patients 100 go on APAP and 100 on CMAP.

both on a brand new looking device. They just got diagnosed, these patients. We're halfway done with this trial with some patients in month eight. Because we're half way done, I can't give percentages, but short term and long term adherence are looking extremely promising.

Long term, adherents, to our surprise, is actually distancing itself from APAP further. we thought it might merge, even larger. The other results, like the labor costs at DME, the amount that our team needs to call the patients and adjust things or patients approach them for adjusting is much less due to less leak and lower pressures.

And the questionnaires are looking pretty promising as well. But the most important metric I will give you today is patients are sleeping much, much longer on the CMAP arm compared to the ATV arm.

Those are amazing results. That's exactly what we need. I think in the world of this novel pharmaceutical treatment for sleep apnea that seems to be on the horizon with more and more candidates in that space, we, need better PAP therapy so that, because we ultimately know that it's still the gold standard of treatment, but we to make it so more tolerant for patients to be able to utilize and comfortable and not something that patients dread the thought of.

So thank you for being a part of developing the future. I agree. We thank you so much for that. I mean, people are talking right now, we have all this technology, why is CPAP just exactly the same as it was 30, 40, 50 years ago, just the reverse vacuum cleaner.

Future of PAP therapy and closing remarks

So why aren't we doing that? And for you to harness, like you said, millions and millions of breathing patterns and use leveraging AI for, that we thank so you much, for the direction that you're taking, taking the therapy.

Thank you. What we're doing is just something that makes sense. A lot of the artists tell us, oh, we see the pattern with our own eyes. We know it's coming.

So machines can do it too. It's kind of evolved. Well, thank you so much, Doc. And we are out of time. If people want to find more information, where can they go?

Novoest.ai is our website. Is where the information could be found about us. Excellent. So you heard it here, folks,

NovoResp.ai, and we're going to have more information in the show notes for you.

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All right then. That was quite a show. So that means it's time for some post calibrations. Robert, what do you think? You know, we're so close to having more tools, more sophistication as it relates to the delivery of CPAP therapy.

And I just can't wait till these things are commercially available. It sounds like they're nearing the end of some of their clinical trials at Novoresp.

I did ask the question, is it something that a patient's going to add to their machine or would it be potentially in a manufacturer's PAP device? It sounds like the manufacturer is certainly the route that they're going take.

I'm interested to see what that's gonna look like. We know who the manufacturers are that are out there. and there are many others that are trying to get through the FDA approval.

So, you know, it feels like we're in a race to a better patient experience. I agree. It's really exciting. And yeah, we are this close. Once these kind of things happen, it's just going to get more and more.

I think it is going be even better for the patients. You had mentioned this during the show about the novel therapies that are coming out. Then you have something like this on the other side of it.

I wouldn't say combat that, but to have another opportunity for patients to try CPAP once again, to make it more comfortable without the risk of the side effects that you have with an orally-ingested therapy.

So I think it's just exciting overall for us to see the direction that things are going. There was a time when CPap was about having a tower next to your bed, and it got to be so small that could carry it around anywhere.

But the basic technology in there remained the same. Now to hear something else that changes so that it predicts what you need and delivers the therapy so it's not remaining super high during the night and makes the patient…

And the other exciting part is not just the patients, but also the bed partner say that, it wasn't blowing in my face. That's really something to be grateful for.

I absolutely agree. He mentioned the fact that the response to sleep disorder breathing events with an algorithm has historically left the pressure at elevated levels potentially over a longer period of time when maybe that's not exactly what's necessary to maintain a patient's airway.

The delivery of lower pressure is certainly going to drive patient adherence and adoption. If there was better technology, my guess is that less patients would seek out some of these other potential pharmaceutical treatments and that sort of thing for sleep apnea.

Stay tuned, America. Lots of technology on the CPAP therapy forefront that's on their horizon. So we're excited to be a part of it. And you heard it here first, most of the time, that we sort of brought K-PAP before.

Many people had heard about it in the industry. We had the Vortex PAP researcher on them on program, and now we have Novoresp and their CMAP algorithm.

so we are excited be part the future of sleep medicine. Agreed. And it's not just Stay Tuned America. Don't forget, he presented this at the European Respiratory Society.

So it is going to be going out to the rest of the world as well. Very, very exciting times. Absolutely. And I mean, shout out to Emerson, man, I wish he was here.

I think he would have really enjoyed this. Dr. Hanafi, he spoke about phenotyping, and I know that's Emersons thing. It was a fun part, it caught my attention that I immediately zoned in that, oh, Emberson should have been here, Hey, Emerson, this one's for you, all right?

That's right. All right, folks out there, thank you so much once again. And I hope you enjoyed this show and the latest news in CPAP. So until next time, we say cheers.

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