EPISODE 47: Spotlight on Endocrinology with Dr. Run Yu

Lisa Yen 00:00

Welcome to the Neuroendocrine Cancer Foundation podcast. I'm your host Lisa Yen. I'm the Director of Programs & Outreach, as well as a caregiver and advocate for my husband who is living with neuroendocrine cancer. In each podcast episode, we talk to an expert who answers your top 10 questions. This podcast is for educational purposes only and does not constitute medical advice. Please discuss your questions and concerns with your physician.

Lisa Yen 00:30

Welcome to the Neuroendocrine Cancer Foundation Podcast. I'm pleased to introduce our guest for today, Dr Run Yu. Dr Yu received his medical degree from Peking Union Medical College in Beijing and his PhD degree in pharmacology from the University of Rochester in New York. Dr Yu completed an Endocrine Research Fellowship and Internal Medicine Residency and the Clinical Endocrine Fellowship at Cedars-Sinai Medical Center. And he was at Cedars-Sinai Medical Center for many years, working with Dr Wolin, who is a friend to our foundation and a friend to our founder for many years as well. Dr Yu's clinical and research interests includes diabetes, thyroid and endocrine tumors and syndromes, and he enjoys novel clinical findings and endocrinology. I should also add that after working at Cedars-Sinai for many years, he's now at UCLA, and we've gotten to know him well. And on a personal note, I've gotten to know Dr Yu as my husband sees him as well. Dr Yu has over three decades of experience in neuroendocrine cancer, and I personally think of him as a walking encyclopedia, because of the wealth of knowledge and wisdom that he has in neuroendocrine and endocrine diabetes, carcinoid syndrome, genetics, and also rare subsets of neuroendocrine including pheochromocytoma and paraganglioma. So, we're really grateful for all the knowledge and expertise that you bring to the field. And also, a fun fact about Dr Yu. Dr Yu loves our national parks, and he's visited most of the beautiful national parks in the United States. The park that he visited most recently was the New River Gorge National Park in West

Virginia. So, Dr Yu, welcome to the podcast, and we'd love to hear from you, what got you involved in neuroendocrine?

Dr. Run Yu 02:13
Thank you so much for this very nice introduction and also thank you for the compliments on my knowledge. I hope one day I would become a true encyclopedic neuroendocrine tumor specialist. But I did learn a lot from my experience, but also from giants like Dr Edward Wolin. So I came to the field of neuroendocrine tumor actually, kind of by chance. You guys probably know Dr Anthony Heaney, who was at the Cedar-Sinai while I was graduating from our endocrine fellowship. Then Dr Heaney left for UCLA. You know he's still at UCLA. He's my boss. He's the chief of Endocrinology here. So after he left Cedar-Sinai, we need an endocrinologist to participate in the care of patients with neuroendocrine tumor. And at that time, I was like to do some beta cell research. You know, beta cells are one of the endocrine cells of the pancreas. At that time, the debater feel like my work at that time is closer to neuroendocrine tumor. So they asked me to take care of the patients Dr Heaney has left, and then I got into the field. But once I began to work in the field, I was fascinated by these tumors. I just feel like this is like a love by chance. But I just really enjoyed working with patients with neuroendocrine tumor and also fascinated by the tumors themselves.

Lisa Yen 03:27
Yeah, there are sometimes happy coincidences. We really appreciate the fascination and interest and the work that you've done. I know that you've been involved in research studies and some pivotal ones. Well, if you would like to, we'll jump right into the top 10 questions.

Dr. Run Yu 03:43
Sure

Lisa Yen 03:44
So many people in their neuroendocrine cancer journey see a variety of specialists. Yeah, might see a medical oncologist might see a surgeon, some people see an endocrinologist. And we want to kind of delineate for people, kind of break it down what each specialist does, so that people have an idea of who they are and how they might play a role in their care. So, the first question we'll start with is a basic one: what is an endocrinologist and what training is involved?

Dr. Run Yu 04:09
So, an endocrinologist takes care of a patient with a hormone or metabolism issues. So traditionally, endocrinologists are mostly dealing with a hormone issue, but metabolism becomes another important part of Endocrinology. Although metabolism is regulated by a hormone, but sometimes are not directly regulated by a single hormone. But both are part of the spectrum of disease we see. But traditionally, most endocrinologists prefer seeing hormonal issues, because this is what we are traditionally trained with, but the metabolic issues are becoming more and more important in our practice. To become an endocrinologist, you have to first do internal medicine residency, and then you need to do an added endocrine fellowship in an accredited program. So, for example, I actually did two fellowships, one

research fellowship, one clinical fellowship. Before that, you have to do internal medicine residency. We call it "double-boarded," meaning that we're certified in internal medicine and in endocrinology.

Lisa Yen 05:11
Wow, that's amazing that you put in all that time and effort, the research and the study so that you could have the amount of knowledge and expertise that you have now. Thank you for that.

Dr. Run Yu 05:22
Of course, learning on the job is probably more important than the training, and I think all doctors continue to learn well on the job. For example, my own training did not really provide much insight into neuroendocrine tumor per se. Most of knowledge and skills I gained on neuroendocrine tumors were actually obtained while I took care of my patients.

Lisa Yen 05:43
That's very insightful that perhaps a lot of the training isn't dependent on the schooling and the residency and fellowship, but really in the clinical care.

Dr. Run Yu 05:52
Yeah, so it's kind of related to one question about not all endocrinologists are the same. Most endocrine knowledges are very qualified. In diabetes, thyroid disease, those common endocrine issues, but in terms of neuroendocrine tumor, very few endocrinologists actually have an in-depth knowledge and experience. So when you choose your endocrinologist, you got to ask endocrinologist, are you experiencing neuroendocrine tumors, or you are mostly seeing all the general thyroid nodules, general, you know, diabetes?

Lisa Yen 06:22
That's a really good point. So not all endocrinologists know neuroendocrine so we have to find the ones that do.

So, let's dive into that a little bit. Since there is that endocrine word in neuroendocrine patients. Often wonder, do all neuroendocrine tumor patients need to see an endocrinologist?

Dr. Run Yu 06:37
Not necessarily. We all know that a patient with neuroendocrine tumor should be taken by a multidisciplinary team, preferably at an academic center. So, within each center, or within each locale where there is a multidisciplinary team, the sort of division of labor can be very different. So, you could have an oncologist, very knowledgeable with endocrine aspect. You can also have an endocrinologist, very knowledgeable on the oncological aspect of a neuroendocrine tumor. So, by being an endocrinologist does not mean you are going to know a lot about neuroendocrine tumor. But also, by being an endocrinologist, you could be the main doctor. You could also be a doctor who helps with the main doc, like the quarterback of your care. And I would say that in a modern Academic Center, I think the oncologist, especially GI oncologist, gastrointestinal oncologist, probably for most patients, would be

the quarterback. And for example, in UCLA, we have Dr Hecht. I think he should be our main neuroendocrine tumor doctor while the endocrinologist, like me would help and facilitate the care.

But in some areas, the endocrinologist is a main doctor. So, these are usually pancreatic tumors, such as insulinoma, because this is a mostly a benign tumor, so that most people do not need to see oncologist, because there are no chemo needed after surgery, and patients do very well, but they do need a long term follow up. So, for this, for if you have an insulinoma, which is a pancreatic neuroendocrine tumor, you probably do not need to see oncologist. Another example is medullary thyroid cancer, which is another neuroendocrine tumor, and with the moderate serum cancer is found at a very early stage. Patients usually do very well after surgery. They also do not necessarily need to see an oncologist. They can be managed by endocrinologists. But for the vast majority of patients with neuroendocrine tumor and pancreatic neuroendocrine tumors, a GI oncologist probably should be the main doctor, but we do help with taking care of the endocrine part of the patient's whole care spectrum. So, their endocrine care may be related to the neuroendocrine tumor, such as hyperglycemia, diabetes. Patients with pancreatic neuroendocrine tumor. And they have other unrelated endocrine issues. For example, they may have hypothyroidism due to immunotherapy, then that's where we need to step in and help.

Lisa Yen 08:58
You said a lot of important things here. So, it really matters what type of neuroendocrine tumor someone has, whether they see an endocrinologist or not. Or you have an unrelated issue.

Dr. Run Yu 09:07
Yeah.

Lisa Yen 09:08
Does it also vary by country or by institution, because I know in Europe, they have more endocrinology involvement?

Dr. Run Yu 09:14
Yeah. So, for a patient who say we're talking about worldwide patient population, then the most important thing that you go to the most closer by academic center or a multidisciplinary program and learn the division of labor inside their team. This is sometimes a little intimidating for the patient to ask that question. But to get the most of your care from center or team, you do need to know that, to know which doctor is your main doctor, which doctor have a supporting role, but may become the main doctor for a certain aspect of your disease.

So, this division of labor really varies a lot geographically. For example, in Europe, there are more endocrine oncologists, and they are great endocrinologists, and they also can prescribe chemotherapy. But by convention, in the US, the endocrinologist usually does not prescribe traditional chemo or even oral chemotherapy. We can prescribe things like sunitinib, afinitor. But for the real chemo, such as, you know, temodar and xeloda, oftentimes, the pharmacy will question you. You know, “why do you prescribe this medication?” So, I think you have to look into your local practice pattern as a patient to

see which doctor is your main doctor in the team. And there's nothing wrong with either oncologist or endocrinologist or a GI doctor as a quarterback, but so long as that doctor is really deeply interested in this kind of tumor, and they're passionate about it and also knowledgeable about it.

Lisa Yen 10:45
Passionate knowledge. Okay, so if I understand you correctly, there's some exceptions. There's the insulinomas, medullary thyroid cancers, where you take more of the active role and maybe quarterback.

Dr. Run Yu 10:56
But most other tumors, I think oncologists or GI doctors would be the main doctor.

Lisa Yen 11:01
So really, to have that conversation about, and especially if someone comes in and doesn't know what to ask, what is your role? Will you be my quarterback? Or should I be having,

Dr. Run Yu 11:13
Yeah, the best way is really to ask the doctor whether he or she wants to play the role you like. For example, you can see I'm really passionate about neuroendocrine tumors, and I know Dr Hecht is as well. So, if you ask me, I will tell you my genuine feeling about it. I will see that with your condition, I think I probably should be the main doctor, but for most other patients, I will tell them that I think you better see an experienced oncology like Dr Hecht.

Lisa Yen 11:38
I appreciate your honesty. You mentioned that you can prescribe some of the targeted therapies, like sunitinib, cabozantinib, but then the oncologist would need to prescribe chemotherapy like capecitabine, temozolomide. What about somatostatin analogs? Is that something you would prescribe?

Dr. Run Yu 11:54
So, this also varies by location. In Cedars-Sinai and UCLA, the endocrinologist can prescribe a somatostatin analog, and we do have the ability to inject it for patient on a monthly basis in our clinic. But you have to ask. And not all endocrine offices, even within UCLA, are doing this. You know, we have satellite offices, and not all of them are doing it. So, you have to check with the office, check with doctor to see where is the best place to get the somatostain analogue shot.

Lisa Yen 12:24
This is really helpful. So you've given us some insight onto your role with the medical team and when you might be quarterback and when you might defer to the medical oncologist. If someone's seeing both, how would a treatment decision be made? I mean, how does that work?

Dr. Run Yu 12:38
So, it's very important for the doctors within a treatment team to communicate with each other, especially for neuroendocrine tumor. Most time, with each other, sometimes we do need to have some

discussion. Also, our knowledge complement each other. For example, oncologist has tremendous experience in the oncologic aspect while I may be more experience with tumor syndromes or ectopic hormones secretion. And then we really make a good team by communicating with each other. So, in UCLA, at least, you can assume we will automatically communicate with each other. But if you go to another place, you cannot take this for granted. You have to make sure this is happening, because we see a lot of referrals from outside facilities, and sometimes you can obviously see there's a lack of communication between teams. And for neuroendocrine tumor patient, it's really, really critical to have all the team members in the treatment team to communicate because of the timing, the sequence of treatment and the readiness of the treatment all are very critical. So you have to know what's going on with other team members in terms of the treatment plan, the timing, we need to provide some accommodations or preparation for the treatment.

Lisa Yen 13:50
Communication is key, and sometimes it takes a lot to bridge that gap.

Dr. Run Yu 13:55
Yeah.

Lisa Yen 13:55
So you touched on this already that not all neuroendocrinologists know neuroendocrine. How do we find out if someone specializes in neuroendocrine?

Dr. Run Yu 14:04
So, the Carcinoid Foundation, where Dr. Wolin is a medical director now, they have a website listed specialist. There are endocrinologists there, and if your doctor is not on the site, it does not mean your doctor is not an expert or is not passionate about neuroendocrine tumors. So, the best way is that if you are closer to an academic center, we can call the center and ask them, "Do you have endocrinologists who either specialize in neuroendocrine tumor or is reasonably knowledgeable about neuroendocrine tumor." So that's the first step.

If you do not have an academic center, then you can, for example, ask UCLA. For example, you can call UCLA. Just say, I just need to know some knowledge about potential endocrinologist in my area, because they may not know, but we may happen to know a few names. And the last resort will be just call your endocrinologist and ask. Most endocrinologists want to let you know clearly whether they know or they do not know, because we also need to find a good fit between a patient and a doctor. So, if they do not have the knowledge or interest in this disease, they will let you know. They will tell you that, "Sorry, I do not know this very well," but they can ask, "Do you know anyone else who happen to know this?" But I will say that outside of the academic center setting, very few endocrinologists specialize in neuroendocrine tumor because these diseases are rare. So usually, they cannot have the sufficient financial success if they only see neuroendocrine tumor so they have to see more common disease, such as thyroid and diabetes. Well, in academic centers, we do see thyroid and diabetes, but we have the luxury of seeing a neuroendocrine tumor patient as well.

Lisa Yen 15:47
So we'll have the most success possibly, with academic centers.

Dr. Run Yu 15:51
Exactly.

Lisa Yen 15:51
Okay. So, you kind of explained a touch on the fact that some people may have hormone issues and some people may have metabolic issues. Can you explain the difference between hormonal issues and metabolic issues?

Dr. Run Yu 16:02
Sure. So the hormonal issues are usually [a] more distinct disease. For example, say, if we have too much thyroid hormone called hyperthyroidism. We know your thyroid gland produces too much thyroid hormone. So this is more like a well-studied entities. So, we know how to do with that. For metabolic disease, their cause is often multifactorial. So, they're much more complicated. For example, some patient may have a high triglyceride level, and this usually not because there's one hormone that regulates triglyceride and this hormone goes awry, then you have a high triglyceridemia. It's actually not that simple. It's a combination of diet, medications, whether you have diabetes, whether you have genetic predisposition. This is more complicated. So that's why this is a very important field. But a lot of doctors are a little bit intimidated by this disease because they do not have a single cause. So your differential diagnosis and management often are more complicated than the traditional endocrine disease.

So we have to have a more knowledge and understanding of the metabolic process. And I can tell you that even this day, I'm still not 100% comfortable with metabolic disease because there are so many of them. For the most common one, I have enough knowledge, but sometimes patients say, "Oh, I have this assay level. What should I do?" And oftentimes you have to say, "I frankly do not know, but I'm willing to study that with you, and we can look into that."

Lisa Yen 17:28
It's so complex. So with hormonal issues, how do you know if someone's neuroendocrine tumors are active or hormonal?

Dr. Run Yu 17:35
Yeah. So, from an endocrinologist's point of view, we want to first know where the tumor is from. So you have a pancreatic neuroendocrine tumor, then there are certain set of hormones that we worry about. And if you have a small bowel carcinoid, usually the hormone is serotonin. So that's the default abnormal hormone. But if we have a lung carcinoid, it usually does not produce hormones unless occasionally it can produce a hormone not related to carcinoid, per se. It's called ectopic hormone syndrome. For example, a lung carcinoid can produce ectopic Cushing syndrome and also ectopic,

acromegaly. Acromagaly, meaning that you have too much growth hormone as an adult. But practically speaking, because most patients with a neuroendocrine tumor have the tumor from the pancreas or the small bowel, we kind of know roughly what potential hormone problems they may have. So usually it's a hormonal hypersecretion over secretion rather than deficiency. So, this hormone usually are produced too much rather than too little. But if you have a pancreatic surgery removing most part of pancreas, then you do have a hormone deficiency. That's why you go to see me oftentimes order a number of hormones as a screening test. That's why we order those specific tests, because we know the most common hormones secreted by pancreatic and neuroendocrine tumor, but you have a lung carcinoid, then we may check cortisol and maybe **IGF-1** as a screening test. We usually do not screen that in most patients.

Lisa Yen 19:05
That's helpful to know. So, depends on the type of tumor, and so cortisol or IGF-1 for lung. And then what are the ones that you would check for pancreas?

Dr. Run Yu 19:16
So, the pancreas is the most colorful tumor, so they secrete a whole lot of hormone. So, we usually start with gastrin, and then insulin, pro-insulin and the pancreatic polypeptide. These are the most common ones.

So, the most common functional tumor from a pancreatic neuroendocrine tumor are **gastrin** and **insulin**. But **pancreatic polypeptid**e often is a tumor marker, but we do not exactly know what that hormone does. So we use that as tumor marker rather than worry about the consequences of too much pancreatic polypeptide. Last common one will be **VIP, vasointestinal peptide**. These are in patients with diarrhea. We can also check for **glucagon**. These are for patients with glucose syndrome such as rash, diabetes. And there are a few other rare ones that are usually not present when the tumor is small. So, usually only started to happen when the tumor metastasizes to the liver, usually even not even in the lymph nodes.

So that brings to a one other fascinating aspect of pancreatic neuroendocrine tumor: their hormonal profile can change over time. This is a very important point, and many times, even my experienced colleagues are surprised that you have a non-functioning tumor, now suddenly you have hypoglycemia. So by having initially non-functioning tumor does not mean the tumor will remain non-functioning forever. So their profile can change. Also, they may secrete one hormone at a time, but they may change to secreting another hormone. For example, there's another hormone called **PTHrP, PTH-related protein**. PTH stands for parathyroid hormone. So, this kind of hormone can cause a high calcium level. And not only infrequently, a patient with pancreatic neuroendocrine tumor present with a high calcium level called hypercalcemia, but usually their pancreatic neuroendocrine tumor already metastasized to the liver, and they can suddenly manifest, sometimes in a dramatic way.

Lisa Yen 21:13

Fascinating. So, there's so many different hormones. So does this mean that everyone with pancreatine needs to have all those tested? The gastrin, insulin, pro-insulin, VIP, PTHrP?

Dr. Run Yu 21:26
Not necessarily. I have to admit, I tend to over order hormones. This is, I think, probably some area, you know, I can improve a little bit, because I just have seen so many patients with hormone issues. You always find some small suggestion from the patient's symptoms that maybe something is brewing there. Maybe it's a low level. So, I tend to over order hormones. But in practical sense, I order gastrin and insulin, pro-insulin for every patient because they are more common and they could have a subtle presentation. For example, here you might have some GERD, thinking just common reflux, but that may be a sign of gastronoma. So I do check the first three. So, **gastrin, pro-insulin and insulin, and also pancreatic peptide** in all my patients. For the others, I choose to test additional hormone if they have a certain syndrome or symptoms. For example, if they have diarrhea, then I order VIP, but if they have a rash or new onset of diabetes, then I check glucagon. But you have the high calcium, I check PTHrP. You have a Cushing syndrome-like symptom, then I check ACTH and cortisol.

Lisa Yen 22:33
This is helpful and fascinating to get a little insight into your mind. Gastrin, insulin, pro-insulin and pancreatic polypeptide for you.

Dr. Run Yu 22:41
All patients, yeah. And if they clinically do not have any change, I usually just follow pancreatic polypeptide along with chromogranin A as a tumor marker. I do not check gastrin or pro-insulin routinely after the first original test. But if there are any clinical changes suggesting they may have an ulcer in the stomach, they may have hypoglycemic, then I check the hormones again.

Lisa Yen 22:33
Okay, so you have a baseline, and then you go based on symptoms.

Dr. Run Yu 23:07
Yes.

Lisa Yen 23:07
And then how do you interpret the pancreatic polypeptide?

Dr. Run Yu 23:10
The pancreatic polypeptide is a fascinating hormone. And on one side, we know very little about it. On the other hand, we know that misinterpretation of that hormone can cause a lot of problems. Pancreatic polypeptide is secreted by the **islets [of Langerhans of the pancreas**] and we still do not know what exactly is the endocrine function is. You know, it has some exocrine function, relating like bicarbonate secreation. Those are mostly related to our digestion. But for the endocrine part, we actually do not know exactly what it does, but the hormone level can be elevated 20 times up to a meal.

So to check hormone, you really need to be fasting in the morning. So if you do not fast, you can be scared, and the doctor can be scared. "Oh my God, your pancreatic polypeptide now is tenfold higher than before." This could be totally due to a meal. I feel that I use this as a tumor marker, and I always tell my patient, "Do the test while fasting and do not even drink water." Because even drinking water sometimes stimulates the secretion of pancreatic polypeptide.

Lisa Yen 24:11
Even water

Dr. Run Yu 24:12
Yes, and it can rise 20-fold after a full meal. So, you can imagine, if you do one test while fasting, do another test after a meal, you can be misled and scared a lot.

Lisa Yen 24:24
So how do you know if it's falsely high or if it's truly high?

Dr. Run Yu 24:29
Exactly. So, I do two things. Number one, I check the time of the test. In our medical records, you can figure out what time the blood was drawn. And then you actually ask the patient directly, "Are you sure you were fasting?" You know? You know, by taking the test at 11am does not mean the patient take it after breakfast. Maybe he was fasting then. And then I also check other tumor markers, such as chromogranin A and see whether these two correlate. Well, for example, chromogranin A are higher, pancreatic polypeptide levels are also higher, then I'm more concerned. But if pancreatic polypeptide are pretty high, much higher than before, the test was done at four o'clock in the afternoon, and then the blood sugar was pretty high, 250, you know, patient probably ate a good lunch, then you're laugh about it. But I do also correlate that with chromogranin A.

Lisa Yen 25:20
Okay, looking at the big picture. So Dr Yu, we've heard other doctors, especially medical oncologists, say they don't use the chromogranin A anymore. So what does it mean to you?

Dr. Run Yu 25:28
With all respect. I disagree. Okay, I'll tell you that for the doctors, the experienced doctor, right? The more information you have, the better. But you have to know how to handle the information. You have to tease out, what is information, what are just distractions? So that's the most important thing.

So, the reason I do not like the attitude about not ordering chromogranin A is that it's kind of like a lazy approach. Meaning that since I always find the results are troublesome to interpret, then I simply do not use it. Imaging indeed is great, but I can tell you there are cases where you do have a tumor progression, but imaging stays about the same. For example, you have a milliary form of metastasis in the liver and

imaging do not see anything, but your marker levels can be much higher. So I do feel the biochemical tumor markers and imaging complement each other, and we should not just simply not use a test because the test results are a little harder to interpret. I

do agree the test result often is hard to interpret. I actually wrote a review article on how to interpret neuroendocrine tumor markers. For example, the normal reference changes all the time, and they need to be fasting.,you have to see what their kidney function is, whether they take PPIs. All this, right? But all this are kind of annoying, but they do not really take away the importance of these tumor markers.

Lisa Yen 26:51
I think it takes a great mind to understand how it fits in and how to interpret it all.

Dr. Run Yu 26:57
Yeah, and I do feel that imaging and tumor markers complement each other. Imaging is supposed to be more objective, but markers are also objective. But you have to know how to make it objective.

Lisa Yen 27:09
Yeah, okay, it's all in the interpretation. So, what about people who say, "All of my hormone markers are negative, but I still have symptoms," and they believe that it's due to their neuroendocrine tumor? What do you say?

Dr. Run Yu 27:21
So first of all, we should never deny the veracity of the symptom patient do suffer. But one way I discuss this with patients, we have to find an actionable item to help you. You may truly have a hormone problem, but all the existing hormone tests are normal. But that does not mean we just try to give you an actual hormone or give you a medication to reduce a hormone simply because you have symptoms.

So there might be a hormone that we're not aware of causing your symptoms, but we have to be cautious and not cause more problems than you already have. You know, first, do no harm. People with neuroendocrine tumors suffer from many other things other than abnormal hormone. This is a long term chronic disease. You know, this casts a toll on the patient's mental health and physical health. The patient are chronically stressed out because of that. They have to see many, many kinds of doctors. They have do so many tests and imaging. These all are significant challenges to their lives. So they have fatigue. They have anxiety. This [is] actually all expected.

But then the important thing is that we need to have empathy and really stand in the patient's shoes and ask, "If I have to do all this, am I going to be very cheerful and happy all the time?" I will not be. So we need to show our understanding that we know the patient are suffering from something. We do not know what exactly it is, but we know the patient is suffering. And then we can help with some constructive measures to help the patient. For example, I always tell my patient to learn how to handle with stress, to learn to relax, and also to learn to delegate responsibility to other family members, to friends, so that they don't have to handle so many things. And many of my patients are like a type A

personality. They want to do everything right and also by themselves. I always tell them that "Do not be perfect. Have some time to ourselves. Enjoy little things." And oftentimes once the mentality is changed to how to feel better, rather than how to find a specific hormone. First of all, we should try to find a hormone abnormality, but if we tried very hard, we still could not find it, it may not be a very simple hormone problem. Then we may do little things to help us feel better. I find out in my experience that once a patient understands the symptom could be results of a very significant chronic disease and they need to rest more. They do not need to be perfect, then they often feel better.

Lisa Yen 29:55
Thank you for acknowledging the suffering.

Dr. Run Yu 29:57
Yeah.

Lisa Yen 29:58
And look, you have both the knowledge and the empathy. What an amazing combination. This is the ideal of what we want from our providers. Really appreciate that.

Dr. Run Yu 30:06
Thank you.

Lisa Yen 30:07
You know, if we could, I'd like to pick your brain about some of these other issues that come up with either neuroendocrine or unrelated to neuroendocrine, people live with them. So let's first touch on thyroid. It comes up quite frequently in conversations and educational meetings. People have thyroid issues. And I'm just wondering, how might thyroid issues be related to NET, and also other thyroid. Issues that might come up?

Dr. Run Yu 30:31
So first of all, thyroid problems are very, very common in the general population. Up to 30% of female patients who have some thyroid function abnormalities. Thyroid usually is not directly related to a neuroendocrine tumor, but there are a few exceptions. For example, you do have a medullary thyroid cancer, then you need to do a total thyroidectomy, then you'll become hypothyroid after surgery. The other thing is that, because now we are doing more immunotherapy, the immunotherapy can often render a patient either briefly hyperthyroid or long-term chronically hypothyroid. So, these are recognized very well now. But for most other patients, they probably just happen to have a thyroid problem along with their neuroendocrine tumor. The chances are these are not directly related.

Lisa Yen 31:18
So other than medullary thyroid cancer and immunotherapy, are there other times where we should be closely monitoring one's thyroid function?

Dr. Run Yu 31:26
Yeah, in the general population, we recommend monitoring the thyroid function every year, at least. So I think for any patient with neuroendocrine tumor, we should have our thyroid check once a year.But if you have done immunotherapy, then the thyroid test needs to be done very frequently, even like every four weeks, to make sure they catch the potential abnormality in thyroid.

Lisa Yen 31:48
How about targeted therapies or PRRT? Sometimes people wonder, because their thyroid might light up on the dotatate scan, does that mean there's something wrong with my thyroid?

Dr. Run Yu 31:56
That's great question. Actually, I recently had a patient with this as the main referral reason. Dotatate uptake in the thyroid, it's not very common, but we certainly can see that. Also for the FDG PET, thyroid can also light up. But most patients with diffuse uptake in the thyroid by FDG PET or by dotatate PET do not have thyroid cancer, but some of them do.

Thyroid cancer usually present as a isolated, single spot in the thyroid, rather than diffuse uptake. So diffused uptake usually is not cancer, but it can be. But that's pretty rare. But if you have a single nodule that takes up FDG, although they say, then it's a little bit more concerning. So if you have that found out, we usually do a thyroid ultrasound to see whether there's a mass or the thyroid - we call it "echo texture," meaning how the thyroid appear on the ultrasound. And then they can have a good sense whether there's high risk thyroid cancer or not. And then we also check the thyroid function to see whether you have a hyper or hypothyroidism. This is usually a good outcome. So to have thyroid cancer directly or incidentally found by dotatate or FDG PET, it's pretty rare, but it can happen.

Lisa Yen 33:09
And it's reassuring to know that a lot of times that's not necessarily metastases or spread.

Dr. Run Yu 33:13
Most of them are not, especially if diffuse uptake. Diffuse uptake is almost never cancer.

Lisa Yen 33:18
Okay.

Dr. Run Yu 33:19
Thyroid metastasis from neuroendocrine cancer is very rare. But it can happen, but it's very, very rare.

Lisa Yen 32:25
Okay, that is a little reassuring. And then I want to circle back to parathyroid. What's the difference between thyroid and parathyroid?

Dr. Run Yu 33:32

That's a very legitimate question. So the thyroid is like a butterfly shaped organ in front of our windpipe. And hidden behind it are four tiny glands called **parathyroid gland**. You know para means beside. So everybody have about four tiny gland called **parathyroid**. They are on the back of the thyroid gland. Although the name sounds similar, they have a very different function. The parathyroid gland secretes a hormone called **parathyroid hormone, called the PTH**. It regulates our calcium, so it basically maintains our calcium in a normal range. But if you have a parathyroid hyperplasia or parathyroid tumor. [By the way, a parathyroid adenoma is a neuroendocrine tumor, but it's just one other tumor that traditionally is seen by endocrinology, not by oncologist, but it is a neuroendocrine tumor.] And then you have a hyperparathyroidism, the calcium level will be high. People have a kidney stone or osteoporosis, and so these are taken care of by endocrinologist.

Lisa Yen 34:29
So when would someone need to check their parathyroid level?

Dr. Run Yu 34:02
We usually do not routinely check parathyroid unless their calcium levels are abnormal. So, if their calcium levels are normal, we do not routinely check but some doctor routinely check parathyroid, so then they begin to find more subtle, mild hyperparathyroidism. That is, you have a slightly high parathyroid hormone, but your calcium is normal, vitamin D is normal, your kidney is normal, then we usually just monitor these patients.

Lisa Yen 34:59
Okay, based on the calcium levels.

Dr. Run Yu 35:01
Yeah.

Lisa Yen 35:02
And I've heard that it's somewhat related to something called MEN.

Dr. Run Yu 35:07
Yeah. So **MEN1, multiple endocrine neoplasia type one** is an endocrine syndrome caused by a mutation in the MEN gene called **menin**. It has three common tumors associated with that. The number one is hyperparathyroidism. Number two is the pancreatic neuroendocrine tumor. Number three is the pituitary tumor. So **hyperparathyroid adenoma, or hyperparathyroidism**, is the most common feature of MEN1. So almost all patients with MEN1 have hyperparathyroidism.

But the unique feature of this kind of hyperparathyroidism is that, remember, we have four parathyroid glands. All the glands are hypoplastic, meaning all the glands are getting bigger. Maybe one is particularly large, but all four are bigger. So, if you need to do surgery, you need to take three or three and a half, rather than taking only the biggest one. Because for most patients with sporadic hyperparathyroidism, meaning they have one isolated tumor outside the background of genetic issue,

we usually take out the adenoma, then problem solved. But for hyperparathyroidism in MEN1, we need to take three or three and a half because all the parathyroid glands are hyper-functioning. So you've only take one, and you may need to do a surgery in the next year or so to take some remaining one. So we really like to take three or three and a half on one setting to avoid repeated surgery.

Lisa Yen 36:29
To be thorough and make sure that they don't have to go through surgery again.

Dr. Run Yu 36:32
Yeah.

Lisa Yen 36:33
It sounds like though, if someone has have three and a half of those taken out, then they're gonna need some follow up and treatment.

Dr. Run Yu 36:40
Yes, most of them can enjoy a period of normal calcium after the surgery, but usually after 10 years, 15 years, the remaining half or one single parathyroid gland will become a problem. Then at that time, we are going to, usually, on the second surgery, usually the doctor will take that out and transplant it either in your neck muscle or your forearm, because it will be easier to find it in the future. Because if you leave it at the same site with all the scars after repeated surgery, it's very hard to find it. So usually, after the second surgery, [the] surgeon will transplant it at a known site that you know is there. Sometimes they even put a tag there so that they know where to find it.

Lisa Yen 37:23
That's interesting. So, they might save it in your neck or your forearm.

Dr. Run Yu 37:27
Yeah, because it's easier to find.

Lisa Yen 37:38
Okay, so they can go back to it. I do want to circle back to the adrenals. That's one that sometimes lights up on the dotatate PET. And then people wonder, do I have tumors in my [adrenals]...?

Dr. Run Yu 37:38
Yeah, first of all, the adrenal gland can have a main tumor, pheochromocytoma, which is my sub sub specialty. So, this is truly a neuroendocrine, but this is mostly seen by endocrinologists. But if they have metastases, oncologists need to be involved.

The one important thing to remember is that because the adrenal gland has two layers. The inner layer called the **medulla**, normally express a lot of somatastin receptor, so the adrenal gland normally lights up. So both adrenal glands normally light up during a dotatate PET. So having adrenal uptake does not

mean you have any adrenal problem. But if a CT accompanying the PET show there is a nodule there, then the doctor needs to look into the detail to see whether the nodule has more uptake, or the same uptake, or less uptake compared to the normal adrenal gland. If a nodule is large, this is often easy. If nodule is small, sometimes you have to go back and forth with our nuclear medicine doctors to see okay, is this really about the same uptake as the normal adrenal or it is less so? Dr Auerbach and I, sometimes we even argue about it, about whether this could potentially be an incidentally finding of **pheochromocytoma**. But even you do have a small nodule, it's actually not very easy to tell. But for those patients, we do need to follow them. If you have a large adrenal nodule, and that's usually pretty easy to determine whether a nodule has high uptake or not, but smaller nodule oftentimes is challenging. But bottom line that adrenal gland normally light up. The other endocrine organ normally light up is the pituitary gland. Most nuclear medicine doctor know this, so they will not worry about that. But if you read the images yourself, sometimes you may be scared, "Oh, my God. What are the two spots on my slides," and those are the normal adrenal glands?

Lisa Yen 39:24
That's helpful to know so that when we read the report, we can have a little bit of reassurance. So sometimes, though, some people develop Cushing's. And I'm just wondering, are there certain treatments that might cause or trigger it, like, say, PRRT or anything?

Dr. Run Yu 39:39
Yeah, **Cushing syndrome** in a setting of a neuroendocrine tumor, really invokes the possibility of **ectopic Cushing syndrome**. This is often under recognized, because people with ectopic Cushing syndrome often present a little bit differently than the most common Cushing syndrome. The most common Cushing syndrome is caused by a pituitary or adrenal tumor. The patients usually have a gradual weight gain and gradual changes in their appearance, in the fat distribution. But people with ectopic Cushing syndrome often present with hyperglycemia, high blood glucose, low potassium, or sometimes mental changes. They may not have the typical face shape or truncal fat. They may present just with weight gain. They may present with hyperglycemia and low potassium, called hypokalemia, so you need to have a high index of suspicion. To think of ectopic Cushing syndrome.

But if you have a really classical symptom of Cushing syndrome, then this might be just Cushing syndrome as a separate health issue, or it may be something called a pseudo-Cushing's so you should see your endocrinologist and do a definitive diagnostic workup. But just suffice to say that if I have a patient with a known neuroendocrine tumor now they have high blood sugar, low potassium, mental changes, or their face turn into very red, I worry about ectopic Cushing syndrome. Because, as I mentioned earlier, the neuroendocrine tumor during the course of the disease can change their hormone secretion profile so that they may not produce ACTH, that's a hormone to produce adrenal gland. But they may [now] suddenly produce ACTH.

Lisa Yen 41:14
That was an important take home point that the hormonal profile can change.

Dr. Run Yu 41:19
Usually treatment, per se, does not cause Cushing syndrome in most cases.

Lisa Yen 41:23
So, it's not the treatments causing it. It was already there.

Dr. Run Yu 41:27
Yeah. For example, if a patient with neuroendocrine tumor does have ectopic Cushing syndrome, it is not because the treatment you get. It's just because the tumor, during its natural progression, changes hormonal secreting profile. If they require a lot of corticosteroids, then of course, that's what we call **iatrogenic Cushing syndrome**. That's different. But if they are not using a corticosteroid, usually the treatment does not cause Cushing.

Lisa Yen 41:50
So if someone's getting steroids, it's from the steroids.

Dr. Run Yu 41:53
Yeah.

Lisa Yen 41:54
But ectopic is, it's just because.

Dr. Run Yu 41:28
It just happens.

Lisa Yen 41:29
And then what's the treatment for that?

Dr. Run Yu 42:39
The Cushing syndrome treatment is a large topic, but suffice to say, we want to reduce tumor burden if we can, by surgery, liver-directed therapy, PRRT, and on the short term, there are quite a few new medications to lower your cortisol level. And for extreme cases, adrenalectomy, to remove the tumors, remove the normal adrenal gland is a lifesaving procedure, because for people with widely metastasized tumor, often the treatment is not good enough. But we remove their adrenal glands and then give them a steroid hormone to replace the lost adrenal gland often can dramatically improve their quality of life and symptoms.

Lisa Yen 42:39
And that's what we're after, improving quality of life and symptoms.

Dr. Run Yu 42:42
Yeah.

Lisa Yen 42:43
So, does this only happen with lung NETs or can it happen with other NETs?

Dr. Run Yu 42:47
Lung NETs are notoriously known to cause ectopic Cushing syndrome. But the nice thing about lung NETs that usually it happens without metastasis, they can have sometimes even very small, lung neuroendocrine tumor secreting ACTH. So, most people with lung carcinoid can be cured by just taking the tumor out. But if the ectopic Cushing syndrome is caused by carcinoid in the gut or neuroendocrine tumor from the pancreas, it's usually much tougher to manage.

Lisa Yen 43:15
Thank you for that. I mean, this is a really a lot of information. I know it might not happen very often, but the people who it affects, it's hard to get the information. So, thank you.

Well, let's shift a little bit to an area I know that you're very knowledgeable about, which is hyperglycemia and diabetes. How is it related to neuroendocrine?

Dr. Run Yu 43:33
This, actually, is a very relevant issue. People with neuroendocrine tumors do have a additional risk factor for high blood sugar or diabetes. If they have a pancreatic neuroendocrine tumor, they often undergo pancreas surgery. So, removing a chunk of normal pancreas as well that reduces the insulin reserve. And the other thing is their treatment, such as somatostatin analog, which is known to inhibit insulin secretion, and another treatment, like **mTOR inhibitor** everolimus also called Afinitor, can also inhibit insulin secretion. So that the patient with especially pancreatic neuroendocrine tumor have several additional risk factor for high blood sugar. So, they do need to be screened and followed long term to make sure that they do not have a poorly controlled high blood sugar or diabetes.

Lisa Yen 44:22
So, surgery can cause it or put people at risk and medications. So, what is the categories like? How do you look at hyperglycemia or pre-diabetes?

Dr. Run Yu 44:30
Yeah, so this is sort like a technical classification to inform the doctor and the patient how severe the issue is. So, hyperglycemia, usually we mean some kind of like one time finding or episodic finding. But for this, hyperglycemia really is just diabetes. We usually check both their blood sugar and their hemoglobin A1c level, because sometimes patients with neuroendocrine tumor may have anemia due to a poor absorption of nutrients. So the A1C become not very accurate. So we do look at their blood sugar and the A1c level. If they are generally otherwise pretty healthy, the A1C is pretty reliable, then we see how the A1C is. For example, if the A1C is under 6.5, we call them having prediabetes. If it's higher than 6.5, we call them having diabetes. So this kind of diabetes, it's not your typical type 1 or type 2. They are called a diabetes of specific causes called type 3 diabetes. But in real time, we sometimes

label you as having type two or type one because your insurance and your pharmacist often not know there are type 3, so they do not like the name. Then the insurance say, "I never heard of this type of diabetes, so I'm not going to approve something." So sometimes we are forced to label you as having type 2 diabetes or sometimes even type 1 diabetes, to just make the story simpler for the payers and for the pharmacist.

Lisa Yen 45:53
Does it matter for treatment?

Dr. Run Yu 44:55
Most people with type 3 have a combined causes of diabetes, so most commonly is due to a decreased insulin secretion. So this is closer to type one diabetes, but usually people with neuroendocrine tumors are on the older side. They may have some insulin resistance already, so they may have type 2 diabetes component. So we usually treat them with oral medication first to see whether the oral medication can control the hyperglycemia or diabetes. But if they have a large resection of a pancreas, if their sugar levels are very high, we may put them on insulin even as an initial treatment or as a step-up treatment.

Lisa Yen 46:32
Okay, so what about Metformin? Does Metformin help? And I think there's some curiosity in the community about if Metformin can potentially slow down cancer growth.

Dr. Run Yu 46:13
So, metformin is a great drug. Some people say it's a godsend gift to citizen living in the modern affluent society. Metformin basically does a lot of good things to our body as if you are exercising or you are very skinny. Because in a modern society like America, we have too much nutrients in our body, so that then the overnutrition causes problems. So, metformin basically can revert a lot of the features of overnutrition. So it's a great drug. And also on an episodic basis, metformin has been shown to be anti-aging, anti-tumor or anti-cancer. It's a great medication. Also, it's very cheap. Some people may not like it. Oh, I don't want to take an old and cheap medication. But the only evil with metformin is a GI side effects. So we do need to consider that, especially for patients with carcinoid or pancreatic neuroendocrine tumor, they might have diarrhea already. So I usually give a patient the extended-release form that can minimize GI side effect and also ask them to try it. There are about 15 to 20% patients who have side effect to Metformin, but the other 80% or more tolerate it really well. I think if you can tolerate it, by being old, by being cheap, does not mean it is bad. It's actually one of the best medication for diabetes.

Lisa Yen 47:57
An oldie but a goodie.

Dr. Run Yu 47:58
Yeah.

Lisa Yen 47:58
One common question that comes up is, if someone has pancreatic surgery, does that mean diabetes is inevitable?

Dr. Run Yu 48:04
It depends on the extent of the surgery. For example, if you have, say, a small insulinoma at the tail of the pancreas, you do a small distal pancreatectomy, remove a small part of the pancreas, it's really a very small risk for you to develop diabetes in the long run. But if you have about a 40, 50% pancreas removed, some blood sugar issue will arise in the future. So it's, in a way, inevitable, but we can always delayed by eating the right food and by having treatment early on, so that we don't have to use insulin immediately.

Lisa Yen 49:36
What about with somatostatin analogs? Does that also affect someone's risk?

Dr. Run Yu 48:41
Yeah, somatostatin analogs is a major risk factor for developing diabetes, and there are different kind of somatostatin analog. We have sandostatin, which is octreotide. There's also medication for Cushing sydrome called Pasireotide, which is notoriously known to cause very severe hyperglycemia. So if you are not on pasireotide, you are only taking octreotide or lanreotide, both do raise blood sugar level, but usually the extent is not very bad. So, by starting sandostatin or lanreotide does not mean you will have high blood sugar in the next year, next few months, but you do need to monitor the blood sugar.

Lisa Yen 50:22
So how would you recommend monitoring? People need to check their blood sugars at home?

Dr. Run Yu 49:25
Usually immediately after their surgery, if their blood sugar are reasonably good, I do not think the patient need to take glucometer home to check their sugar. Because patients with neuroendocrine tumors often do numerous blood tests anyway, check their basic metabolic panel, a complete metabolic panel, where glucose is an item. So you kind of know that. So when I recommend that ask your doctor, the surgeon or the oncologist, other endocrinologist, "Do you feel I have a high, medium, low risk of diabetes in the next few years?" If they have a high risk, then you probably need to get a glucose meter, monitor a few times a week. If they say, "Yeah, the risk is moderate." And then you may choose not to have a meter, but you do want to read your glucose numbers on your blood test, because the glucose is test usually many times. But we often look at the chromogranin A rather than the glucose. Otherwise, my patients look at the glucose to see you have any some particular bad or persistent bad number. For example, you have one 200 after eating ice cream. Then that's fine. But if you have a few 250 and you do not recall eating anything sweet, then that's a big concern. But even the observer say, if you have a lower risk due to multiple factors, then you can just go about with your life unless the sugar problem arises.

Lisa Yen 50:44
So, it depends on your risk level. So, when do you recommend a continuous glucose monitor?

Dr. Run Yu 50:49
There are two aspects. One is a practical aspect. One is a medical aspect. For medical aspect, patient with frequent hypoglycemia truly need a continual glucose monitoring. We need to find a pattern about the low blood sugar to see when it happens, how bad it happened. Because hypoglycemia can be life threatening. And for practical reasons, that insurance usually does not cover it either is Dexcom or Libre, unless you're on insulin. So if you are on insulin, we do feel using continual glucose monitoring is beneficial, but it's not required. But if you have hypoglycemia, you really need a continual glucose monitoring. But if you just have a poorly controlled diabetes, continuous monitoring has the convenience that it will show your glucose without you doing anything, so that can increase patient compliance in terms of checking blood sugar. And also, it can kind of scare the patient because as humans, we all can fool ourselves by ignoring something. You know your blood will be high. But you do not see it, maybe it's okay. But when you take continuous glucose monitoring, oh, it's actually 400 after I eat ice cream. So next time you may be more careful.

Lisa Yen 52:00
It's a nice check, especially when you're talking about ice cream or sweets. So you mentioned hypoglycemia. I'm glad you brought that up. Who is affected by hypoglycemia?

Dr. Run Yu 52:09
So patient with pancreatic neuroendocrine tumor, whenever there's any concern of hypoglycemia, it should be taken very seriously. Because insulinoma, which is a pancreatic neuroendocrine tumor, can cause hypoglycemia. Also, I mentioned earlier, even a non-functioning pancreatic neuroendocrine tumor can produce insulin later. So whenever hypoglycemia happens or suspicion of hypoglycemia happens, which we'll pay serious attention. Sometimes in patients with extensive liver metastases and liver problems or kidney problems, hypoglycemia can happen because of liver and kidney are not working very well, and these are usually not due to the tumor per se, just because of deteriorating liver and kidney function. Sometimes patients have very poor absorption. Then naturally, sometimes they have low blood sugar. But that does not mean there's a hormone problem. It just means they have very poor nutrition.

Lisa Yen 53:01
Wow. So, it can be complicated. And what do you do if you have something like an insulinoma?

Dr. Run Yu 53:06
If you have insulinoma and you have the most common insulinoma, which is usually benign, in most cases, you just do surgery and then the patient usually is cured. But if you have a malignant insulinoma, meaning that you have the tumor in the lymph node, in liver as well, treatment is a little more complicated. The treatment essentially is the same as treating any metastatic neuroendocrine tumor. But there's one particular interesting point, that is, you can use mTOR inhibitor like afinitor, use the side

effect to the benefit of patient. Remember, I mentioned mTOR inhibitor raises your blood sugar level. So you have metastatic insulinoma, you can use mTOR inhibitor to raise your blood sugar level. So, you turn a side effect into a treatment benefit.

Lisa Yen 53:52
Wow, yeah. So, using that side effect of medication, the mTOR inhibitor is like everolimus.

Dr. Run Yu 53:58
Yes.

Lisa Yen 53:58
I really appreciate all your knowledge and wisdom. Let's just end with this last question. What is on the horizon for neuroendocrine cancer that you're most optimistic about?

Dr. Run Yu 54:07
You know, for me now, I feel that the field, fortunately or unfortunately, come to a relatively steady period. In the last of the 10 years, we got all these major trials of somatostatin analog, mTOR inhibitor, Sutent, then PRRT. So, we're kind of in an explosive period of rolling in knowledge and treatment options.

But after PRRT is approved, there is relatively kind of like a wider period. I don't know you have the same feeling, Lisa. I certainly feel like we have not got any like more like a revolutionary treatment. But I do think that in a few years or several years, the specific, targeted therapy would give us hope into more patient-centered treatment, like more customized treatment. I'll give you one example. You probably heard about [the] medication, **Belzutifan**, for patients with **von Hippel-Lindau (VHL)** disease. This is a inhibitor of HIF-2α and hypoxia-inducible factor 2α, which is specifically active with von Hippel-Lindau disease. Now, no matter whether you have renal cell cancer, you have a pancreatic neuroendocrine tumor, if you have von Hippel-Lindau disease, you can use this medication. So this one targets a specific molecule that is a result of a genetic mutation.

So I think, although we do not know patients without genetic syndrome what exactly their molecular profile in the tumor is, but now we can do a lot of tests to actually show what molecules are activated, what is not. Then we can pick up a specific inhibitor activator to treat the patient. That I think holds the, maybe even the Holy Grail. You know, we know PRRT, any neuroendocrine tumor, you can take it. This is great, but also not that great. You do not even have to look at any specifics. Just okay, you have a neuroendocrine tumor, you have a high doses update, you can use it. It's great. But on the other hand, you feel like it's probably not very specific to you. So I imagine in the future that we do both genetic tests based on the white blood cell, we can also do a tumor test so that we will figure out what mutation the patient could have in the tumor, whether genetic or it's acquired, then we can figure out a molecule from our shelf to fit this patient's tumor specifically. It's already happening for Belzutifan for von Hippel-Lindau, and also, to some extent, for another medication for MEN2, like RET oncogene. But I do feel that we should have more of this. But of course, this will take time and research.

Lisa Yen 56:41
Yeah, and that's a great example **Belzutifan** for VHL, von Hippel-Lindau. And I really love this idea. I mean, yes, we want new treatments, and there's been an explosion of new treatments, but really learning how to use it better and personalizing treatments.

Dr. Run Yu
Yeah.

Lisa Yen 56:57
Yeah, and that's what you're aiming to do and hopeful for.

Dr. Run Yu 56:59
Yep, that I put my bet on.

Lisa Yen 57:01
If you had a magic wand, that's what you would want.

Dr. Run Yu
Yep.

Lisa Yen 57:04
Well, thank you so much for all your time, for sharing your expertise, your knowledge and wisdom and insights. We've learned so much from you, and we're grateful for all you do for the neuroendocrine cancer community and how passionate you are. Really that passion, that interest, that curiosity, it really is just very encouraging, and we really appreciate you.

Dr. Run Yu 57:22
Thank you so much, Lisa, and I want to thank you to arrange this podcast. I always want to send my thanks to all the patients I have treated. I think, as I've discussed earlier, all my knowledge are learned from patients and not during fellowship, because fellowship usually does not provide you enough training. So I really appreciate all my patient I thank all of them for turning me into a more knowledgeable doctor in neuroendocrine tumors.

Lisa Yen 57:45
And thank you, because that knowledge continues to pay it forward, and you're continuing to pass it on for many, many people. Appreciate you so much.

Dr. Run Yu 57:52
Thank you so much.

Lisa Yen 57:54

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