**Children with Brain Cancer: Support, Developments, and Treatment**

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The Cancer assist Show, hosted by Dr. Bill Evans and brought to you by the cancer assistance program help when you really need it.

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Well, welcome to the cancer systems Podcast. I'm Dr. Bill Evans and my guest today is Dr. Sheila Singh, who has an amazing CV. I have to say Dr. Singh is talented in so many diverse ways. First of all, she's a neurosurgeon, one of the most difficult areas of surgery. She has a PhD and does basic science research. And she's the director of a master's surgeon scientist program and the principal investigator for stem cell and Cancer Research Institute. And she holds a Canada Research Chair in human cancer stem cell biology has an amazing number of things you're involved in Dr. Singh. So thank you so much for giving us some time to talk today about pediatric brain tumors.

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Thank you, I'm happy to be here with you.

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So maybe to begin with, I'd be interested to know just how you ended up being a pediatric neurosurgeon, some people would say, must, must be very difficult. You're seeing very young children's even infants with brain tumors. And the impact on parents isn't mense. And I'm sure it's immense on the doctors are trying to care for those children. Yes,

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and that's a great question. I think my path, my career path was marked by the fact that I always loved the brain, the brain, we only really know the tip of the iceberg about the brain. And there's so much unknown, and that presents a real path to discovery. And so that always intrigued me. And I think when I got into medical school at McMaster, I explored everything that had the word neuro in front of it. And so I tried pediatric neuro radiology and neurology and neuro pathology, neuro radiology, everything. And what I found is that really, medicine is a bit of a matching game, you have to find the career that suits your character. And whereas I love the intellectual puzzle of trying to solve for a patient, when they present with certain symptoms, trying to what we call localize the lesion, figure out where in the whole central nervous system pathway is there a block or a disconnect, and you can track that just by piecing together the symptoms. So it's like a bit of detective work, and it's very intellectually rewarding. But and you do that very often in neurology, but then I, you are often faced with the problem of saying to a patient, here, I've localized your lesion and you have this neurodegenerative disease. And I'm really sorry, there's nothing I can do for it. And so the passive parts of things and neuropathology, looking down a microscope diagnosing things fascinating intellectually, but I didn't feel like in those other specialties, that there was much in the form of activism. Surgery is all activism. And so I really loved the concept of being able to say to someone, you have this mass in your brain, it's causing pressure on your brain, we figured out it's causing all your symptoms. And now I'm going to remove it and make you feel better. And so you realize there's an almost instant gratification in surgery, that is very rewarding if you can do things properly and navigate all of the risks of the surgery. And if you end up successful, then it's extremely gratifying and rewarding. But then you realize that a lot of things we do in neurosurgery are only short term solutions in themselves. And that's when I realized during my neurosurgery training, I realized I can learn everything in the world that I need to know about neurosurgery, and I still won't be able to offer a durable cure for brain tumors. Brain tumors were such a challenge, right? Speaking of the tip of the iceberg. So you can sort of temporarily fix someone's problems by removing a brain tumor, take the

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pressure off inside the skull, and so on and feel better for

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time. Exactly. And you buy someone time, but does that provide them a gerbil cure, and it turns out for more than 50% of brain cancers, just removing it alone doesn't provide a cure. So then you have other therapies, you have systemic therapies, you have chemotherapy and radiation therapy. But if you think about it, those are pretty nonspecific. It's delivering a toxin or a poison to every cell in your body. And every cell that's rapidly dividing will absorb that whether it's a normal cell or a cancer cell, they all get hit. And that's why there's so much toxicity from those systemic therapies that are delivered sort of across the board to every cell. And so that's when I began thinking, well, we need therapies that are specific to the tumor, we need to find the mechanisms inside tumor cells that only drive the tumor cells that are the Achilles heels of the tumor cell, but spare the normal cell populations. Now

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you chose this particular area because you're intellectually curious, but you're a doer, you want to do things. And you don't want to just do things that are short term. You want to have the understanding the mechanism so that you can treat better and advanced the science and clinical care of these patients. Exactly

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right villain. So the end of that story is that in science, you have to learn delayed gratification. And so surgery is a little bit of instant gratification gives you a big thrill that you help people in the, you know, in a stressful moment. But the durable cure is going to come from science. And this is good for someone, you'll find a lot of surgeons are impatient people. And this is a really good way to correct your long term character flaw is do something that teaches you that rewards you for the opposite of your behavior. So science provides me with the long term lens of how are we going to fix what surgery alone could never fix, and what chemotherapy and radiation sometimes fix but with a lot of collateral damage. So now the challenge is how do we develop more targeted molecular therapies for brain tumors that spare the normal cells, especially in a healthy developing child, where those normal cell populations are critical to spare. And so that's what my lab works on now. So

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we want to come back to that in a minute. But first, let's maybe set the scene for someone listening who does doesn't know much about brain tumors, and maybe they think they're all the same. And there are different types of brain cancers of different names. And increasingly, they're being defined by their molecular signature. So it's becoming very much more complicated was already complicated when we just describe what we saw down the microscope. But it seems to be it's becoming so much more complicated as we identified all the various genetic genomic mutations. So maybe in simple terms, we could kind of tell people that there are different main types of brain cancer, and then talk a little bit about how each of them is managed.

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Absolutely. So the first thing to try to break this down is to say brain cancers, and children overall are rare. And that's a good thing. However, they are the leading cause of cancer mortality. And brain cancers have become the second most common cancer in children, only followed by only following leukemia. And so it is still a problem we have to deal with, but just to contextualize, so that your listeners are not scared all day about their grandchildren and children. It's very, very rare. And so overall, if you look at the whole basket of brain tumors, the second Good thing I have to tell you is that the majority of brain tumors in children are actually benign or low grade. And so we call these tumors low grade gliomas. So in our medical language, if you have OMA at the end of anything, it means tumor. And then usually the word in front of OMA comes the word that specifies the cell of origin or what people a long time ago thought the cancer originated from. So glioma refers to tumors that originate from glial cells in the brain. And glial cells are all of the supportive cells, almost everything except neurons basically. So neurons are the electrical connecting cells in our brain that transmit all the messages that make us think and and and talk and and see. And then the neurons need a lot of support. They need to be nourished and fed and so on. And so we call the other cells Aust astrocytes and oligodendrocytes are the two other types of cells that are there basket it together into glia. So any tumors that originate from any cell that's not a neuron is called a glioma. So these gliomas Fortunately, most of the time in children, they're low grade. That means that they're indolent, slow growing tumors that tend to form solitary, big masses, and they can press on things, but when surgically removed, and treated with a very type of low grade to chemo, so when you have a low grade tumor, you don't have to throw everything at it, you can treat it with a low grade chemo. And that means that chemo has lower toxicity, you can actually keep that low grade glioma under control over the lifetime of the child. So what we aim to do with children with low grade gliomas is manage their tumor over their lifetime, almost like a chronic disease. And we just go in and do little minimal interventions medically or surgically whenever we have to. But we try to spare the child from interventions as much as possible and have them have a good quality of life. So it's more like managing a lump that is sitting sometimes in a bad place in the brain and pressing on a lot of nerves. And we do our best to keep that under control. And that's possible with a low grade glioma.

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So the prognosis for the low grade gliomas is really quite good.

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Exactly. So you've got like a nine over 90% tenure survivorship, but it's about, you know, almost like you, when you have a car, you need to take it to the mechanic every once in a while and get a tune up and get it looked at and get it fixed. So you can imagine that children with low grade gliomas have a wonderful team, a multidisciplinary team of physicians and therapists who take care of them over their lifetime and make sure they're always functionally functioning optimally.

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Then on the other end of the spectrum are the more aggressive are grade three grade four gliomas and they don't do as well and they tend to be more infiltrated less likely to be surgically resectable. Yes,

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so if we leave the low grade glioma basket, there's a very, very, very tiny fraction of tumors that are high grade gliomas that look more like the glioblastomas that you see in adults. Sometimes in children, they can arise in the center of the brainstem. And these brainstem gliomas are terrible tumors, because, for me, as a neurosurgeon, I can rarely do anything about them. Because they're right in the middle of the control center of the brain. These tumors are offering inoperable, and we don't have good cures for those tumors. So those diffuse gliomas of the brainstem that are high grade, they're more of a problem. They're incredibly rare. So that's sort of the glioma basket. And then, as you mentioned, the minority of tumors in children are malignant. And those ones tend to arise from cells that are more like progenitor cells in the brain. And so those

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that are explained progenitors your audience so so we all

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come from germ cells and germ cells are can be, for example, sperm and eggs, or germ cells. And those are the cells that have the potential to make every other cell in the body once they unite. And so if you think about what germ cells are, there's also germ cells specific to every organ. So you have stem cells, or germ cells that are specific to the brain, and they're called neural stem cells. And they're capable of making up all of the lineages or every cell that exists in the brain. And similarly, you'll have colon stem cells that give rise to the entire colon. And so we call these tissue specific stem cells. So they're not quite as powerful as the germ cells that can make every every type of cell but they're able to make every type of cell within a specific organ. And so neural stem cells are thought or they actually give rise to the entire brain. And children have very large populations of neural stem cells, because as you can imagine, they're still growing and developing. But Bill, you and I, unfortunately, we have very few neural stem cells left as adults

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are declining rapidly.

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And so the neural stem cell compartment of the brain is thought to be more permissive to mutations that drive cancer because those cells are very powerful cells that are always dividing and giving rise to other cells. And maybe they accumulate mutations more rapidly. So that primitive cell population in the brain is particularly susceptible to transformation into cancers. And we think that's why children get these very aggressive cancers. It's probably one of the stem or progenitor cells that just accumulated too many mutations, and it couldn't control those mutations. And that cell goes awry, and it turns into a cancer cell. And so we see the other two types of tumors, which are called medulla blastoma. So OMA again, tumor, what's modulo? So a long time ago, they thought there was a primitive cell in the in the developing brain called a modulo blast. And they thought that cell gave rise to the entire back of the brain, the cerebellum, and that was thought to be the sellable origin of medulla blastoma. And it turns out, we're not so far wrong from what people thought seven years ago. So medulla blastoma, is a very high grade, very aggressive tumor. And unlike low grade glioma, where we treat it with low grade chemo, we have to treat medulloblastoma with the highest grade chemo and radiation possible, because we have to have an aggressive therapy to treat such an aggressive tumor. And fortunately, our five year survivorship for the tumor with all of the good surgery and radiation and chemo we're able to give is eked out now to 80%, which is amazing, still have 20 or 30% of children, who after you fully treated them will relapse. And for those children, we have almost no therapeutic options. Also think about in the 70 or 80% of children we cure, they've got a lot of survivorship toxicities that they have from all of the chemo and the radiation. So again, this is where my lab comes in. We really want to develop cures not only to cure those children who are relapsing who have no other options right now, but also potentially to provide a respite for the other children to maybe not one day not have to take all that radiation and chemo and just take a more targeted therapy so that they can grow up without any cognitive problems or developmental problems or growth problems that they sometimes have as a result of the chemo and radiation.

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It's a beautiful overview of the different types of cancer and gave me a lot of information on missa Howard medical school, I think, but maybe just for parents and grandparents who might start worrying about the kids, as you said, with every little symptom, what are the main symptoms of brain tumors that parents might need to be aware of? Just in case they have a child with a rare brain cancer? Yeah,

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this is a great question, Bill. And I'm glad you raised it because there's a lot of literature on diagnostic delays and brain tumors because as we're just talking about, they're so rare, and their symptoms are often nonspecific. And furthermore, very small children sometimes can't verbalize their symptoms and explain what they're going through. And that makes it all harder to diagnose something that's incredibly rare. So the most common symptoms of the malignant tumor we talked about medulloblastoma, and there's one more called a Penta MoMA that arises from the lining the cells that line the ventricles are called a pen. Emma, so there's another malignant tumor there. So the pair of those Upendo, MoMA, and medulla blastoma, grow in the back of your brain rapidly and press hard on your brainstem and block off all the pathways that control cerebrospinal fluid circulation. So the two ways that you will present is, first of all, the child will show up with vomiting. And that's a very common symptom, because when you block this, the spinal fluid circulation, and your fluid spaces in your brain blow up, you've got pressure on the brain and pressure on the brain causes vomiting. And pressure on the brainstem can also cause vomiting. So very often vomiting or protracted vomiting. And that doesn't isn't relieved by anything. And very often, that vomiting happens most in the morning, because that's when the pressure on the brain is greatest. And so a lot of morning vomiting that doesn't go away, and you know, isn't within the timeframe of a stomach flu, take your child into the emergency department again investigated for that. And often an MRI or a CT scan will be done, which will reveal the cause of that vomiting. So that's one presentation. Another thing is there's all these nerves that come off the brainstem that control things like eye movements. And so if you notice your child's, you know, blinking a lot or rubbing their eyes, and they seem to have double vision, or they're tripping or falling more often, that's something to go in and get checked out for sure. And, you know, often that's a primary eye problem. But sometimes that can be a brain tumor, as well. And finally, symptoms like children who have falls more often, tumors that grow in the back of the brain can press on the cerebellum, which controls our balance. So that's something to watch out for. And finally, one thing I'd like to say is that very often with the eyes of love, parents will ignore things in children like a really big head. And I can't tell you how many times a child is brought in with a really big head, and they say, Oh, that's okay. He just looks like his grandpa's grandpa has a really big head too. And whereas that may be true, a head that's growing abnormally quickly as a sign of a baby trying to accommodate raised pressure in the brain. So if you notice your child's you know, head growing rapidly or being bigger than their siblings, then bring that bring them in to get that checked out in a baby who has amazing ability to compensate for pressure because their skull isn't fused yet. So they can literally push their their skull out to accommodate a mass in the brain. So sometimes in babies, the very first symptom of a brain tumor is what we call macrocephaly, or big heads. Now, just to reassure your audience 99% of the time macrocephaly is genetic. It's we call it big heads run in the family or familial macrocephaly. And usually, the way I diagnose that is I bring in the mom and the dad and I measure their heads and plot them. And I measure the baby's head and plot it. And what you find is if the baby is otherwise completely healthy and developmentally normal, and their head tracks well above the 98th percentile, I often find a culprit and one of the parents. And so very often it's dad, and then dad says, Yeah, my dad has a big head too. And then you know, it runs in the family. So I just want to be reassuring that most of the time, a big head is not a sign of a brain tumor, but it can be okay.

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I hope we don't cause a rush to all the emergency departments of every child who has vomiting in the next short while. But that should be very helpful in terms of sending out the signals of when parent parents should be concerned as opposed to when it's growing up in minor things that are happening, infections and flu and this sort of thing. So that's, that's very important to set the scene. I want to talk about the changes in therapy. We've talked about the research, but I want to just take a brief break so that we can do a little commercial for the cancer Assistance Program and we'll be right back with Dr. Shi Alisa.

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We'd like to take a moment to thank our generous supporters, the Hudson Family Fund and Becker creative studio, who make the cancer assist show possible. The COVID 19 pandemic has not stopped cancer. Instead, it has added to the isolation and challenges already faced by cancer patients and their families. The cancer assistance program remains committed to providing free essential support to cancer patients in our community, whether it be transportation and equipment, loans, personal care and comfort items to parking, practical education. With no sustainable government funding, we need your help so we can continue to be there for those who depend on cat to stay safely at home. individual and corporate support of signature events, third party fundraising and financial gifts are greatly needed. Visit cancer assist.ca to see how you can make a difference in the lives of cancer patients and their families.

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All right, we're back with Dr. Sheila Singh. And we're going to talk about some of the recent advances in the management of brain cancers. Now as I did a little bit of preparation for this podcast, I was kind of overwhelmed by all the new information about the genetic abnormalities that are identified, and finding that many of the genes I'm aware of as a long oncologists that cause various types of lung cancer are also genes that are aberrant. are abnormal in pediatric cancer. So I found that very fascinating and of itself. And then lung cancer because we've moved to targeted therapies because we know what the genetic mutation is it's driving the cell to reproduce more rapidly. And I sense that that's probably a similar kind of understanding is developing and brain tumors. But I really want to hear what, what the field is doing now and what you're specifically doing and where you see hope and advancing against those, particularly those aggressive cancers we talked about.

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Yes, no, thank you, Bill. These are great questions. And so as we were talking about, we want to move beyond those systemic therapies. Because even in the children in whom we're able to win a survival, those children often have long term consequences of that systemic therapy. And they're often left with all kinds of deficits, deficits and growth, and sometimes needing lifelong hormone replacement, and problems with bone development, causing short stature, and definitely problems with cognition and thinking and sometimes emotional problems as well. And so we think that all of those things could be avoided if we could just target the driver of the cancer cell that is not present in the normal cells. And so so much work, as you mentioned, has gone into genomic or genetic classifications, molecular sub classifications of studying the sequencing of all of these different pediatric cancers and trying to come up with signatures that define all of those different brain tumors. And as happens when you give things over to, you know, genomic scientists, things get really complicated really quickly. So first, there were four molecular subtypes of medulloblastoma, and then we subdivided those four into 13. So now there's 13 subgroups of the four subtypes, and they're all identified by their specific mutational drivers. Now, you have to step back for a minute, and you say, okay, all right. So this is a rare brain tumor. And now you're telling me that in this 13th subclass, there are two common mutational drivers, and that probably represents 4% of all patients with medulla blastoma. And, you know, how am I going to convince Big Pharma to develop a cure against that when there's maybe two patients a year I'm just being I'm being sarcastic, but, but the point is, is that breaking things down into ever smaller molecular baskets is very challenging in terms of how you develop therapies. And so for us, in pediatric brain tumors, unlike lung cancer, it's unlikely that targeting every tiny little genetic driver is going to result in developing a new therapy that will have enough of a coverage to treat, you know, millions of children one day. And so what the other problem with pediatric brain cancer is that these cells still having their original stem like properties are highly intelligent, and they can evade any type of attempted therapy against a targeted mutation, what they do is they just go and pick up another mutational driver. So again, they'll escape the therapy that you designed to target that particular mutation. And so in a way, what we've learned is that you can find the needle in the haystack, but just trying to target that needle alone may not be the durable cure for cancer. And so moving beyond that, we've started looking at other types of drivers of cancer that are above the level of the gene. And so beyond the gene, of course, we have the protein, which is the product made from the map of the gene. And then beyond the protein, sometimes the protein gets modified. And we call those post translational modifications, because translation is the process of mapping the gene to the protein. And then after the protein is made, there's even more changes that can be put onto the surface of a cell. And if you don't pay attention to some of those changes, then some of the therapies we develop won't work. And so we've moved beyond the gene to looking at what are therapies that target proteins, and what are therapies that may be targeting things after the stage of the protein being made. And one of the most promising ways of, of targeting proteins is of course, immunotherapy. And I know you've probably done a lot of shows about immunotherapy. It's been one of the most promising advances for cancer overall in the past decade, and particularly successful in patients with melanoma. And it's, it's there's been surprising and amazing cures and things like leukemia and lymphoma, with things like engineered T cells, so harnessing the power of the immune system to go and target cancers. I think it's probably the next frontier for brain cancers as well. I

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always thought that the immune system really didn't get inside the brain to attack things and then that was kind of a barrier whereas we know immune system obviously circulates through your whole body and immune cells do and various cytokines, etc. But is there sort of a special relationship, immune system in the brain

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there's been a huge renovation in the way we have thought about the dogma of the brain being immune privileged, as it turns out, Bill, even research and anatomy can discover new things in 2020, which really shocks me because you think we already know everything about anatomy, right? Go? Well, we don't because in 2016, an amazing researcher called Jonathan Kipnis, discovered through anatomical studies of lots of mammalian and human brains, that the brain actually has lymphatics. And so within the covering of the brain, the dura, there are actually what we call meningeal lymphatics, and those, of course, are draining systems that connect the brain to the rest of the body and through those lymphatics immune cells freely pass across the blood brain barrier, and go and survey the brain anytime they want. And in fact, that provides a path to mobilize immune cells from the bone marrow and the rest of the body to go flood into the brain. If we could program them to go there. The problem is brain tumors can still find an immunosuppressive environment in the brain, they hide out in the brain, because there is that regular immuno surveillance that we've discovered does happen. But for some reason, pediatric brain tumors have figured out ways to evade them. So the immune system itself is not likely going to cure brain cancers. But there is a pathway whereby if we deliver supercharged immune cells into the bloodstream, we now know, they're going to cross the blood brain barrier and get into a brain tumor. So we have to actually develop immune immunotherapies that can specifically target with great detail and precision, those proteins on the surface of brain tumor cells that are only expressed on the brain tumor cells, and not anywhere else. And there's a new basket of targets that we found. And this is a really exciting way to take advantage of stem cells and development. So I told you about stem cells that make up the whole brain, a lot of those stem cells, when they're primitive in their most powerful stage, when you know, someone's a fetus, or just being born, that's when they're really populating their brain with cells, that those stem cells at that point in time express certain proteins to power their engines to do things that they never have to do again. And so those proteins will be expressed only for a short window of time, while they're populating the entire brain. And then they'll go away, they're turned off. And they're silenced because they're not needed or called upon, because as you and I already know, we don't need to our brains are developed. So we don't need to generate those stem cells anymore, or get them to express those proteins to to generate the whole brain. But those proteins can be apparently activated again, to generate an abnormal brain tumor. And so what we realized we call those type of proteins, oncofetal antigens, because they're present during the fetal development. They're silent in everybody's normal development, and in the normal adult state, and in the normal childhood state, they're silent, but they're reactivated in cancer, so they can become a target. Yes, a tumor specific target. So we found that looking back to development and trying to map those onco fetal antigens onto the pediatric brain tumors and figure out which which of you guys is turned on again, apparently, and you're not going to be on in any other tissue or part of the brain only in the brain tumor, let's design an immunotherapy to target that. And so that's what's been happening. And in Seattle Children's Hospital and other places in the United States, there are amazing trials going on right now, with car T cells, which are genetically engineered T cells. So those are the immune system, the soldiers of your immune system, white blood cells, what if you could take them and instead of just randomly floating around in our bloodstream, serving the brain checking things out? What if you could take them and make them into a Rambo? So instead of just sort of a nice surveyor that's checking out the brain? What if you could put on body armor and in you know, pump them up. So they look like Arnold Schwarzenegger and say, go after this protein now and kill it. And so now you've got these supercharged car T cells that can go into the brain, but they're on a seek and destroy mission. And so these car T cells have already been successful in curing children with leukemia. And so we think there's great promise for them also, in particularly, engineering these car T cells against these oncofetal antigens.

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Are there some positive results of those trials, like have some early results in there? And we see this with that kind of approach? Yes,

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so far, there's some very early signal very promising studies being done by my colleagues at Stanford, Crystal Mackel, and Michelle Manji, two wonderful scientists and a clinician scientists actually both of them like me, and they've developed a car T cell against one of those targets called GT two, and it's expressed in the abnormally activated proteins in that diffuse pontine glioma, I told you about the brainstem, diffuse brainstem, glioma, and there's trials that have been showing great promise so far at Stanford and children. Very,

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very encouraging. Yeah. And I imagine the research in the in the immunotherapy side is maybe similar or parallel to the radio light again, type research again, type targeting a specific oncofetal antigen, I imagine but linked to radioactive. Absolutely.

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So my colleague, John Valliant, who's the CEO of fusion, and someone that I work with to develop molecular probes For my research, this is a very promising new area. Because if you think about it, we're trying to target a specific protein, we need to know where that protein is expressed, what better way than to develop a probe that serves as a diagnostic biomarker. So in order to enroll a child in a trial, I need to know if they have that protein expressed on their brain tumor, I could do a PET scan, if I found a radio labeled probe that could just light up the brain tumor, and then I would enroll that child. So that's a better chance for that child to succeed in that trial than if we just enrolled all comers into a trial without having that molecular map of their brain tumor. So first of all, the radio labeled things can provide a great advantage in companion diagnostic biomarkers. But secondly, it can also be converted into a therapy. So you just change that little chemical linker, and then all of a sudden, you can link it up to something that a toxin that can destroy a cancer cell, and now you convert the diagnostic probe into a therapeutic probe, a theranostic, they call them. So I think that it developing these kinds of strategies in parallel to the car T cells and the immunotherapies, that's going to be a great way to move forward into these clinical trials where we're trying to develop targeted molecular therapies that spare the normal cells.

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So I would say the future is looking very bright for for children with brain cancers with these exciting things happen. But it's also getting very complicated. And so decision making for what therapy for this particular child has become very complicated, I imagine so. And in the past, often, physician surgeons made their decisions by themselves, kind of in their own offices, their own clinic room, whatever. That's changed now into tumor boards and molecular tumor boards. What happens for the pediatric population at McMaster? So

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right now we already have one of the best clinics that I've ever seen, which is our multidisciplinary pediatric neuro oncology clinic. So this is a team of doctors. We've got radiation oncologist, we've got chemotherapy oncologist, we've got neurosurgeons, we've got neuro radiologists who help us diagnose the brain tumors neuro pathologist who look at it under the microscope. And then on top of that, we've got all our very important Allied Health Partners, we have social work, we have neuro psychologists who do neuropsychological testing in the best possible sense pre op, and then post op and figure out what deficits the child has, so we can help them with their learning as they go through all their therapy. We have speech therapists, occupational therapist, physiotherapist, and even a really amazing category of career counselors who helped the children tent transition into adulthood with our goal of making them not dependent on their parental caregivers, but hopefully be able to lead an independent life. So

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a cast of professionals who are available and do they meet in a sort of conference room and discuss each individual case

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can we meet once a week, every Tuesday afternoon, we run a clinic and we have a full hour where we just discuss all the details of the child of the children who come to clinic later that afternoon. And we make treatment decisions together. As you said, No one makes decisions alone anymore. We need all the pieces of the puzzle now to make those decisions. And in fact, when children relapse with cancers, we are also the frontline people who are deciding what clinical trials can we recommend for this child now that we've run out of our standard of care therapy, we need to find the best match for an experimental therapy. And that's where my being a scientist also is a very helpful thing. So

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I think this is incredibly important for for people to understand, particularly parents of children with a malignancy, that there's so many people who are focused on the diverse aspects of the illness, it isn't just the surgeon focusing on an operation, or medical oncologist on what drugs to give it's a it's a whole group of professionals can bring various skills and expertise to bear on it. And I think one of the things that sometimes gets overlooked, certainly an adult oncology is just caring for the caregiver, in this case, its parents and, and coping with a child who's who's ill. And it must be particularly hard to see a youngster with that diagnosis and going through therapy. And so what supports are there available for the parents of children? This is

34:12

a wonderful question, Bill. And it allows me to touch on a few things that I wanted to tell you about today. So one thing is we were really indebted. We have a wonderful partnership with the Ronald McDonald House, which is across the street from McMaster Children's Hospital. And there there are a whole team of people who are just primed to provide comfort and solace and, and support to parents who are undergoing this really difficult journey of caring for a child with cancer and not knowing whether their child is going to fall into the survivor category or not. And doing everything in their power just as their caregivers are to put them into the survivor category. And it's a huge emotional undertaking, and so we have some support from our own social workers. And then of course, we have the wonderful team at Ronald McDonald House, but I need to emphasize it for the children. Whose journey doesn't end in survivorship? Those families require even more special support. And unfortunately, within the field of palliative medicine, just whatever we're covered for by Oh, hip, it's often not everything we want to do for those families. And so I wanted to tell you, that hospice care for children is something that's becoming a really important principle. And when it's done well, it delivers the most wonderful palliative and relief of suffering and end of life care, not only for the child, but for their whole family. And sometimes the neglected partners, the siblings, the poor children who don't even understand why they're losing their sibling, but also, very often parental attention is diverted to the child who's suffering from cancer. And so siblings are an important and often neglected part of the puzzle. And so pediatric hospice care, I'm happy to tell you, we're actually looking to build pediatric hospices in Hamilton. And so the Bob camp hospice has started a campaign to raise funding for pediatric hospice, building a pediatric hospice, and I'm really happy for anyone to contact me offline if they're more interested to hear more about this. But I think it's a really important endeavor to provide, really the support we know we're capable of giving to those families and the children who are facing palliation and death. And the campaign overall is, is led by our wonderful Pediatric Palliative Care Physician Dave Lai Seki. He is a great individual, a wonderful philosophy of care. And I'm so happy that the you know, this hospice campaign will provide Dr. Lysimachia, with the ability to use all of his training now and put it into put it to good for families with children with cancer.

36:41

Well, that's really interesting to hear about. I'm so pleased that there's this initiative underway to add this kind of service within our medical community here in Hamilton. This has been an amazing conversation, covering everything from molecular details of glial cells all the way through to hospice care. So I think the audience has really had an excellent opportunity to be informed about pediatric brain cancers. And I just want to thank you so much for giving up your time. I know how busy you are. And it's it's great that you were able to come in today to have this conversation. So thank you so much, Dr. Simon.

37:16

Thank you for inviting me, Bill.

37:20

This has been the cancer assist show, brought to you by the cancer assistance program. Thanks for listening