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Blood Cancer United

The Bloodline with Blood Cancer United Podcast

A podcast for patients and caregivers

Episode: 'Acute Myeloid Leukemia (AML): New Approaches For A Complex Diagnosis'

Description:

Acute myeloid leukemia (AML) is a complex diagnosis, and it can be difficult to know what to expect in those early conversations after diagnosis. In this episode, we speak with Dr. Rebecca Olin from the University of California, San Francisco (UCSF), who helps explain what AML is and how care is approached today.

Dr. Olin walks us through how doctors evaluate AML, what factors influence treatment decisions, and how therapies - including targeted treatments, stem cell transplant, and clinical trials - are helping improve outcomes and quality of life. We also discuss the importance of supportive care and ongoing research, offering listeners a clearer picture of how AML is treated now and where progress continues to be made.

Transcript:

Elissa: Welcome to *The Bloodline* with Blood Cancer United. I'm Elissa.

Lizette: And I'm Lizette. Thank you so much for joining us on this episode.

Elissa: Today, we are speaking to Dr. Rebecca Olin, a hematologist-oncologist and Professor of Medicine at the University of California, San Francisco. Her interests are in older adults with leukemias and other blood cancers and in the use of stem cell transplant for older adults. She also serves as the Medical Director of the Inpatient

Hematology, Blood, and Marrow Transplant & Cellular Therapy Service and directs the leukemia program at UCSF. Welcome, Dr. Olin.

Rebecca Olin, MD, MSCE: Thank you so much for having me. It's a pleasure to be here.

Elissa: Well, thank you for being here. So, our episode today is on acute myeloid leukemia, or AML. Could you tell our listeners what that is?

Dr. Olin: Absolutely. So, AML is a cancer of a baby white blood cell, which is also known as a blast. And normally, in the bone marrow, the bone marrow has stem cells; and those stem cells produce all of the other cells that live in the bone marrow and in the blood. And that includes baby white blood cells, baby red blood cells, and baby platelets. And then those grow up inside the bone marrow to become adult cells, and then they go out into the bone marrow to do their job.

And so, it's normal in the bone marrow to have less than 5% blasts or baby white blood cells. But when one of those baby white blood cells becomes cancerous, that creates the disease called acute leukemia, and AML is one type of acute leukemia.

Lizette: And I know that there's a lot of different gene mutations or chromosomal abnormalities. Can you tell us a little bit more about that and what it means for different risk or favorability for AML?

Dr. Olin: Yeah, so a lot of people are familiar with stage for cancer, like Stage I or Stage IV. And for leukemia, we don't really talk about stage that much. But instead, we use some of the genetic changes that are happening in the cancer cells as a way for us to prognosticate.

And there are two main types of genetic changes that we look at. One of them is called cytogenetics, and that looks at large scale changes in the chromosomes, like a piece of this chromosome is missing or this chromosome got stuck to that chromosome. We also look at very small genetic changes, which are specific mutations in genes that are involved in AML. And so, we use both of those types of information to help tell us about a person's risk or probability of responding to treatment, risk of progressing after treatment. And it all goes into sort of an algorithm that we can kind of put in that information and come out with an overall risk category; and there are three risk categories which are favorable risk, intermediate risk, and adverse risk.

Elissa: And then treatment is going to be dependent on that, whether they're favorable or intermediate or adverse?

Dr. Olin: Exactly. So, especially for younger patients, in general for patients with favorable-risk leukemia, we try to cure the leukemia using chemotherapy alone. Whereas, for patients who have intermediate risk or adverse risk disease, we think that their probability of cure is probably highest using a stem cell transplant as part of their

treatment. So, that's one of the big decision-makers in terms of what goes into considering transplant.

A lot of times that genetic information can also be used to help guide treatment options. So, for example, if you have a mutation in this gene, we have a specific treatment that's available to treat that type of leukemia. Not everybody has a relevant mutation like that; but, of course, our goal is to develop more and more treatment so that we can identify a targeted treatment for everybody with AML.

Elissa: Okay. Now, you mentioned there's a lot of different gene mutations and chromosomal abnormalities. You know, I'm sure a lot of patients listening and as an AML survivor myself, I know that this is something that I thought about as well. Were these things that we were born with, or did they maybe spontaneously happen at some point through our lives?

Dr. Olin: That's such a great question, and I think this is so important to clarify when patients are newly diagnosed. So, in general, these are not things that you are born with. And that word "genetic" is so misleading because people think about that as something that we inherited, or we pass along to our children. But, in fact, what we're really talking about are changes in the genetic material that are happening only in the cancer cells. So, I sort of think of those changes as like a marker or a bar code of the cancer cells, and they are not present in all the rest of the person's cells. They weren't born with them, and they wouldn't pass them on to children.

Now, there are exceptions to that. There are definitely some more rare cases where families can have mutations that are hereditary and that do predispose to an increased risk of leukemia. But for the most part, when we're talking about these genetics of the cancer, we're talking about changes that have evolved over time that you weren't born with.

Elissa: That is good to know and I'm sure a comfort for a lot of patients listening-

Dr. Olin: For sure.

Elissa: -especially when it comes to passing things down to your children. So, now why is AML such a complex disease?

Dr. Olin: Yeah, it's interesting. And, as we're learning more and more about AML and other cancer types, we're starting to realize that many of the things that we would think of as one type of cancer are actually different types that are driven by different mutations or different changes in the cells and that may have different disease biology – maybe more or less aggressive – and maybe better treated with one therapy or another.

So, when we do clinical trials, for example, we could do a clinical trial looking at all patients with AML; but there are also maybe subsets of patients where we could do a clinical trial just looking at that subset and just looking at a drug that's targeting that subset. And as we get better and better at learning about these diseases, we're

increasingly recognizing that there is just a huge amount of diversity. And, in a sense, as we're getting better and better at targeting these mutations, it's actually getting harder and harder to study because we can't lump people together as much. We really want to try to study just this slice of patients with AML, just this cohort; and we're learning so much that these are really actually fairly different diseases biologically.

Elissa: Yeah, I remember we were talking to Dr. Lee Greenberger, who was our Chief Scientific Officer and recently retired, and he had described AML, I believe, as something like 15 different diseases. Even though AML is one disease, they seemed so different and so unique under the subset of AML.

Dr. Olin: Exactly. So, let's talk about extreme cases, for example. So, there are a group of diseases called the core binding factor leukemias. These are leukemias that have specific chromosomal rearrangements in either of the 16th chromosome or a translocation between the 8th and the 21st chromosome. Those leukemias tend to have a very good prognosis. Patients do pretty well with intensive chemotherapy, and they are curable cancers, which is great; and we always love to talk about cure.

And on the other extreme, we have leukemias that have a mutation in a gene called TP53. And what we know about that mutation is that it's generally associated with very aggressive disease, and it's very difficult to treat with the therapies that we have currently. So, those two types of diseases are almost entirely different in terms of how we treat them, how we counsel patients about prognosis, how we think about the role

of stem cell transplant. And really, I want to highlight that TP53-mutated AML is a huge area of unmet need, and we really want to prioritize clinical trials for those patients. So, we really encourage patients who have that mutation to really ask about what clinical trials may be available for them and to really explore those options.

Elissa: That's wonderful, and we'll be sure to have links to our Clinical Trial Support Center for patients that can look into clinical trials at any point after diagnosis. That's a very important part that we want to tell patients, but we will have links in the show notes.

Dr. Olin: Great.

Lizette: Yes. And what you're saying, I think, APL (acute promyelocytic leukemia) is one of those really good examples as to one type. And I say one type because a long time ago when I started here, there were like eight types of AML. And I always remember APL being so different and knowing that it had such a high cure rate, and I think that that was kind of hard for me to understand-

Dr. Olin: Yeah.

Lizette: -as to how everything is still under that AML umbrella.

Dr. Olin: And I didn't even mention APL because I think of that as such a different disease that I don't really think of it as AML, even though you're right. It used to be

considered a type of AML. It probably still is considered that way by some people, but it's such a different disease. It's so different biologically. It has really specific novel treatments available that have radically changed the prognosis that I just think of that as really a different disease, like not even a subset.

And you're right that it's absolutely highly curable. The first few days to weeks really matter; but once we get patients through those first few days, the cure rates are very high. And it actually used to be the most aggressive type of leukemia and with the lowest probability of cure; and with development of some of these novel treatments, it's now the most curable. So, it just shows you what science and clinical trials can do.

Lizette: Exactly. Now, let's get into the current treatments for AML, knowing that there's so many different treatments for the different subtypes of AML.

Dr. Olin: Yeah. So, there are really two categories of initial treatment that we think about for patients with AML. There is intensive therapy, and that is more traditional chemotherapy given in the hospital, typically associated with a maybe four-week stay in the hospital for the initial cycle of treatment and typically reserved for younger patients because we think that maybe older patients may not be able to tolerate that intensive treatment. And then, we also have this category of lower-intensity treatment which historically has been developed more for older patients, who, as I said, may not be able tolerate the intensive treatment.

Now, we've actually gotten better and better with our lower-intensity treatment, now to the point where we are asking ourselves maybe everybody should get that lower-intensity treatment because it's so good that it may rival the outcomes that we would see with the higher-intensity treatment. And there's been some interesting, very provocative data that was recently presented that might suggest that for some younger patients, they may be either as well or better served with the lower-intensity treatment.

Lizette: Wow.

Dr. Olin: Yeah. So, for the higher-intensity treatment, we are talking about regimens that include something called 7+3, which has been around for a long time and consists of two chemotherapy drugs. There are variants on that where we add in additional medications. For example, for patients with mutation in a gene called F-L-T-3 or FLT3, we add in an additional medicine to that 7+3 so there are different sort of varieties of ways we can do that.

And then, for the lower-intensity treatment, current standard is a hypomethylating agent, of which there are two kinds, either azacitidine or decitabine in combination with a pill medicine called venetoclax. So, those are kind of our current two types of standard-of-care treatment; and outcomes are increasingly improving as we're kind of refining those treatments.

Lizette: So, are patients getting a combination of the traditional chemotherapy, or is it in combination with these other medications because I feel like most of the newer medications are oral medications. They're pills. So, are people getting both or are you looking for people to actually just be on an all-oral medication type of regimen?

Dr. Olin: Right. So, for the higher-intensity treatments, those are traditional chemotherapy drugs. They are given through the IV. And for some patients, again, with those specific mutations, we may add additional drugs into that standard backbone; and those additional drugs could also be IV or they could be oral. So, for some patients, getting that higher-intensity therapy, they might be on a combination of both IV and oral medication.

For the lower-intensity treatment where we're talking about something like azacitidine and venetoclax, azacitidine is typically given either IV or as a subcutaneous injection. But it's typically given as an outpatient. And then venetoclax is a pill.

Now, there's a newer drug called INQOVI®, which is an oral version of decitabine, and there's a lot of interest in using that instead of the IV version of those medicines because it does allow patients to have an all-oral regimen that they can just take at home and not need to come into the infusion center to get, which, obviously, is a big benefit to patients in terms of their quality of life.

Lizette: Yeah. Now, can we talk about the newer medications for specific mutations? I know a lot of our patients, a lot of our listeners, they're aware of what type of mutation they have. And as you mentioned before, we do have, with research and science and these clinical trials, some newer medications that target these specific mutations and could possibly be better therapies as well as, hopefully, less toxic.

Dr. Olin: Exactly, yeah. So, I think the best example of this is the FLT3 inhibitors. So, FLT3 is a gene, and it is mutated in about a third of patients with AML. And we have multiple drugs now that are called FLT3 inhibitors. So, some examples of those are midostaurin, gilteritinib, and quizartinib. And these medicines have been studied in different settings, so they may have been studied in the upfront setting, meaning in combination with initial treatment. And they've also been studied in patients whose leukemia has relapsed.

And different drugs have been successful in different spaces. So, for example, for, let's say, a younger patient who has newly diagnosed AML and has a FLT3 mutation, they may receive the 7+3 regimen, which again is the sort of chemotherapy backbone that's been around for decades, in combination with either midostaurin or quizartinib. And these medicines have been shown to improve survival compared to when you combine them with the traditional chemotherapy, compared to patients who get the traditional chemotherapy alone. So, that's absolutely a standard of care in this type of leukemia.

Gilteritinib is another FLT3 inhibitor which is a really great drug and has some really interesting data in the relapsed disease setting. So, there was a study that looked at patients with relapsed FLT3-positive leukemia, and they were randomized to get gilteritinib or some other therapy. And the patients who got gilteritinib did better. So, that study actually led to approval of the drug, and now it's being tested in a lot of different settings. Some of the recent exciting data that I've seen, looks at what we call a triplet combination, which is a combination of azacitidine, venetoclax, and gilteritinib for older patients who have FLT3-positive leukemia. So, patients who are getting the lower-intensity type of therapy, we can give them the standard plus adding in the gilteritinib; and the data from that actually look quite good.

Lizette: That's promising. That's great. And I know we're hearing a lot about menin inhibitors. And I don't know if they're all oral also. I think most of them are. But what are menin inhibitors, and how are they utilized for AML patients?

Dr. Olin: Yeah. So, menin inhibitors are a really exciting new class of drugs that have somewhat recently been approved. There are two that are approved right now. One is called revumenib, and the other one is called ziftomenib. That one was pretty recently approved. And these are both oral medicines, and there's data to support their use in patients who have two different types of AML. One type is patients who have a mutation in a gene called NPM1, and the other is patients who have a rearrangement of a gene called MLL.

And there are mechanistic reasons why this particular drug would work well in those particular subsets; and those subsets have been studied separately and together in clinical trials. Right now, they're approved for patients whose leukemias have relapsed, but there is a lot of interest in looking at moving the use of those drugs into the upfront setting to see if we can incorporate them with initial treatment and get even better outcomes. Some of that data has been recently presented, and some of it is still ongoing.

Elissa: And then I'm curious about CAR T-cell therapy and bispecifics. Those kind of seem to be the hot topics in a lot of blood cancers. But are they approved for AML?

Dr. Olin: Yeah, right now they're not. And maybe you can hear the sigh in my voice with that.

Elissa: Yeah.

Dr. Olin: So, there's been a lot of interest in looking at CAR T in AML. I'm sure some of our listeners know that CAR T has been really successful for patients with a different type of leukemia called ALL (acute lymphoblastic leukemia) and also have been very effective in patients with lymphoma and patients with multiple myeloma.

In AML, there have been a lot of trials trying to look at this; and those trials, so far, have not been as successful as we would like them to be. There's a lot of questions about which is the best target for those CAR T-cells because the CAR T-cells have to

attack a specific target on the leukemia cell. And we're still trying to figure out what the best target is. And then, we're also trying to figure out how to make the CAR Ts less toxic because there have been some concerns about side effects and risks in the trials that have gone on so far. So, there's still a lot of work ongoing. There are a lot of clinical trials available, but right now there's no CAR T approved.

Sort of similar story with the BiTEs, the bispecifics. Nothing currently approved for AML. It's a little bit newer of a field, I think, so there are some really exciting ongoing trials looking at this, but nothing currently approved, which is disappointing, but hopefully that will change soon.

Elissa: I'm really looking forward to the future and seeing if you might be able to work something out and figure out how to best utilize those types of treatment.

Now, you mentioned a lot of different treatments, including stem cell transplant a little bit earlier. What are the side effects that a patient may experience from these various treatments, and can they be managed?

Dr. Olin: Yeah. That's such an important part of the work that we do is, not just giving the treatment but making sure that patients are tolerating it and feeling okay through the process.

Absolutely, side effects can be managed. I think we've gotten a lot better in terms of the supportive care that we can offer patients. For example, nausea. You know, we

have much better nausea medicines than we used to; and I usually tell patients that they may still have some nausea, but we have a lot of tricks up our sleeve to deal with that. And it's pretty rare that somebody can't tolerate a treatment because of the side effects. Usually, we're able to get patients through it. Of course, there are exceptions to that, but in general, I think, side effects are generally manageable; and that's part of developing a new drug is making sure that it's effective and that the side effects are manageable.

Stem cell transplant is a pretty different type of treatment from a chemotherapy with a lot of different risks and potential rewards. And that might be more than we want to go into today, because that's a pretty big discussion; but, that's a very complex decision, and there are some real risks there that sometimes are difficult to manage.

Elissa: Yeah, and we can make sure to have some more information in the show notes about stem cell transplantation if patients would like to look more into it and see a little bit more about the side effects.

Dr. Olin: Yeah, that would be great.

Elissa: We know that the cost of care can create real stress for patients and their loved ones during and after a cancer treatment. Before we continue, we want to highlight a resource that may be helpful for our listeners.

Lizette: Now, let's discuss the future of AML treatments. First, I would like to discuss the ongoing studies within the *Beat AML Master Clinical Trial*. Could you just explain to our listeners what that trial is and why it has been so important for our AML patients?

Dr. Olin: Yeah, Beat AML is a nationally run cooperative clinical trial. It is run by Blood Cancer United, which used to be called The Leukemia & Lymphoma Society, or LLS. And it is an umbrella trial. That's the term we use where it's specifically looking at older adults, or at least that was how it was initially designed.

And the goal of the Master protocol was to take a patient's diagnostic bone marrow specimen and do the genetic testing quickly on it and be able to come back quickly to the treating team with a genetic profile and then assign the patient to what we call a substudy that would be specifically treating the mutation that that patient's leukemia has. So, within the big umbrella, there would be multiple substudies, and then patients would get assigned to one or the other, depending on what type of leukemia they had. So, it was really a way to deliver personalized medicine to patients in a rapid way at the beginning of their treatment.

And then the Master protocol would also have a substudy for patients who didn't have any mutation that had a specific target available. So, the goal would be that there would always be something novel to offer patients to hopefully improve upon the standard option.

And so, substudies have opened and closed throughout the life of the protocol, as we test new treatments and either find them to be not effective or find them to be effective and move them forward, so we're always kind of rotating through the latest and greatest thing to test. And I think it's been great for patients because they've been able to access some of our newest and most exciting treatments in their treatment that they wouldn't otherwise be able to access if they were just getting standard-of-care treatment.

Elissa: Yeah, absolutely. And it's great to see that this is still going on. I believe the Master Clinical Trial started in 2016?

Dr. Olin: That sounds about right. Yeah, it's been quite some time.

Elissa: Yeah, it's so great to see it still going on; and I see that you're currently an investigator on new Beat AML sub studies. And you mentioned a little bit earlier the triplet study, which is, I believe, one of them. But there's another I think you were an investigator on. Could you tell us more about that and what the objective is?

Dr. Olin: Yeah, so one of the studies that has been recently published, at least in a preliminary form, is a study looking at the combination of azacitidine, venetoclax, and that menin inhibitor, revumenib, for patients who have either that NPM1 mutation or the MLL rearrangement.

And the results of that study show that the response rates using that triplet combination, those three medicines, were very high. And it was particularly notable in patients who had that MLL rearrangement where that particular abnormality is typically associated with a very unfavorable prognosis and the addition of this medicine called revumenib really had resulted in a very high rate of remission. Really dramatically different. And then for the patients with the NPM1 mutation, it seemed like there was some improvement, maybe not as much of an improvement as there was for the MLL patients but definitely promising in both groups of patients.

And this was a single-arm study, which meant that all patients who were enrolled got the three medications. But the degree to which this has been such a promising study has prompted the development of a randomized Phase 3 study where patients are going to be randomized to either receive the doublet, which is the azacitidine-venetoclax – that's the sort of standard treatment compared to the triplet. And that is really going to allow us to have the best comparison to really prove that that new medication really improves outcomes and hopefully improves survival. And that is a study that is getting up and running, and we're really excited about that because Beat AML was involved in really pioneering this triplet; and now it really has the potential to change the standard of care for these types of leukemia. So, we're really proud of that study and excited about the future.

Elissa: Yeah, absolutely. I've just seen so many great things come out of Beat AML study. I was diagnosed in 2016, and there really wasn't anything. It was 7+3 or 7+3+transplant. And that was it. And so, it's so exciting to see over the ten years how many new drugs have come out for AML and that it's so great to hear that you're continuing this study and, looking at more and more drugs.

Now, a question that I had, you mentioned a little earlier that the original Beat AML study was done on older patients with AML. I'm not sure if that is the same with the sub studies now and if it is, do you think those drugs tested will be used for different age populations or they're still going to be primarily approved for older adults?

Dr. Olin: Yeah. So, Beat AML is currently primarily looking at older adults with AML. But these medicines are also being looked at in younger patients. So, there is another menin inhibitor that's going to be looked at in combination with 7+3, with the higher intensity treatment for younger patients. So, these drugs are being developed in both older and younger patients, although the Beat AML platform, again, primarily has had its focus in older adults.

We do have some studies that are in development that will look at patients whose leukemia has relapsed. And in those studies, patients of all ages are eligible. So, Beat AML is kind of diversifying; and we're developing new protocols and really looking at new areas. I think, because of the success of the platform in general, we want to, open up to be looking at all different settings and all different types of leukemias.

Elissa: Wonderful. And it also sounds like you're really trying to move a lot more towards the frontline treatment, right, with a lot of these drugs?

Dr. Olin: Yeah, that is the goal. I mean the way drug development typically works is that new drugs are often tested first in patients whose leukemia has relapsed.

Elissa: Right.

Dr. Olin: And once we see a signal that the drug is effective, then it may get approved in the setting of relapsed disease. But then if it's effective, then the next question is, well maybe we should just combine it with initial treatment to get even better results upfront. So, absolutely, we want to take drugs that show evidence that they're effective and see, can we combine them with upfront therapy? Maybe if we add them into the upfront therapy, we need to give less of the standard chemotherapy, so we can even think about deescalating therapy and giving therapy that is less toxic because now we have more targeted drugs. So, there's a lot of ways that we can take new drugs that we think are effective and then work with them to see how we can make our treatments better overall.

Lizette: Yeah. Now, outside of the Beat AML Study, which I know that you're very excited about, what other emerging therapies or clinical trials are you really particularly excited about now?

Dr. Olin: Yeah, I mean these categories of drugs are being tested outside Beat AML as well. So, there are other trials that we have that are looking at, for example, there's another two genes called IDH1 and IDH2; and we have some targeted treatments available for those types of AML and there's some new drugs being developed in that space.

I am really excited about the BiTE therapy. I think that looks really promising; and that's something that hasn't been tested a lot yet in AML. And so, I'm feeling optimistic. And I think there's a lot of work too being done in the transplant setting because many of our patients, at the moment, the standard of care is for them to receive a stem cell transplant. And as I mentioned, that can be a pretty risky thing to undergo. So, advances in the transplant setting are a huge benefit to AML patients overall. And so, there are some really, interesting trials going on looking at prevention of graft-versus-host disease, which is one of the transplant-related complications. And those can really make a huge difference for patients.

Elissa: Now, I'm curious, earlier on you talked about TP53, having some difficulty finding treatments that are around right now that work for it. And recently in the media, I think we also heard about Tatiana Schlossberg (American environmental journalist, author, and granddaughter of U. S. President John F. Kennedy and Jacqueline Kennedy Onassis). I believe she had inversion 3. And it was saying that there's not many treatments available for that that are very effective. So, what is

happening with those gene mutations, so, I don't know if there's more, where the current therapies aren't as effective?

Dr. Olin: Yeah. And you're right that Tatiana Schlossberg's leukemia did have inversion 3; and inversion 3 is a genetic rearrangement that is very difficult to treat, and you are right that we don't currently have any specific targeted treatment for the inversion 3, specifically. It's not as common of a genetic change as some of these other ones are. And when they're less common, sometimes it's harder to study. So, if you do a clinical trial looking at a new drug, and you have one patient with that particular abnormality in the trial, it's hard to draw any conclusions about whether that particular drug may be effective for that mutation or not.

For those patients, we are really just focused on getting patients into remission as best we can and getting them to stem cell transplant as best we can because we think that stem cell transplant, at the moment, represents the best chance for cure for those patients.

For patients with TP53, the problem is that a lot of the treatments that we currently have just don't work that well; and so, we are, really encouraging those patients to pursue clinical trials and try to identify something that works well for that particular change.

Elissa: Yeah, it's good to know that there's still some bit of hope there-

Dr. Olin: Absolutely.

Elissa: - for these patients that have these very rare mutations or chromosomal abnormalities.

Now our final question for today, on our patient podcast home page, we have a quote that says, "After diagnosis comes hope." What would you say to patients and their loved ones to give them hope after a diagnosis of AML?

Dr. Olin: So, the thing that I usually say to patients when they're newly diagnosed is that AML is a curable cancer. A lot of times, unfortunately, cancer, when it's diagnosed, is not curable. But in general, our goal with AML is to cure the cancer, which means that it goes away forever and ever and never comes back. And it may be a rough road. It may be difficult to cure the cancer, and it's not a guaranty. We know that we can't cure everyone, but we aim to cure everyone.

And I think patients are often very overwhelmed when they're newly diagnosed, and I really encourage them to just focus on that, to just really focus on that the goal is to cure this; and until your team tells you otherwise, that's our goal.

So, I think even when we know the disease is not curable, there are still a lot of new treatments being developed; and our goal is really to give patients the right treatment that gives them the longest amount of life with the best quality of life possible. And together as a team, that's what we try to make happen. So, we really try to offer

patients as much support as we can. We want to be realistic, but we also want to be optimistic and positive and really help patients get through it.

Elissa: Yeah, and that is great to know, that it sounds like researchers around the world are not giving up on those patients that have those rare gene mutations, have those cancers that are not responding well to treatment, that you're going to keep pushing forward, keep pushing with these studies, brand new studies opening up all the time and new drugs coming out all the time. And so, that's so wonderful to hear, and I do think that's going to give a lot of patients hope that are listening to this.

And so, thank you so much, Dr. Olin, for joining us today and telling us all about the emerging therapies coming up and the new treatments that are out now; and we hope that patients will look into clinical trials and also go back to their doctors and ask about these medications and see if those are the right fit for them. And so, thank you again so very much for being here with us today.

Dr. Olin: Thank you so much. It was really my pleasure.

Elissa: And thank you to everyone listening today. *The Bloodline with Blood Cancer United* is one part of our mission to improve the quality of lives of patients and their families.

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about the Beat AML Master Clinical Trial, please visit BloodCancerUnited.org/BeatAml. These links and more will be found in the show notes or at TheBloodline.org.

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