Thank you so much for coming.

You know, we are getting back to full in person and I know there are a lot of people on Zoom as well.

So thank you so much for coming today.

And I will be talking about immune checkpoint inhibition and Novant therapies for myelodysplastic syndromes.

These are my disclosures and this is the outline.

I’m going to cover 4 areas that have seen a lot of developments in the last few years.
as well as risk stratification

and response assessment MD’s,

the evolving therapies for lower risk MD’s,

high risk MD’s and then specifically

about the immune checkpoint inhibition

efforts that I have been trying to

kind of doing in these disease areas.

So what are myelodysplastic syndromes,

You can see that we actually have

formally added the name neoplasms finally

because for a long time myelosplastic syndromes were thought of as syndrome

but they are actually cancers and this

has been formally diagnosed by The Who.
They are basically uncommon only four in 100,000 a year, 20,000 cases of MD’s in the US. However, the median ages in the early 70s and the number of patients with MD’s has been increasing because we have more and more cancer survivors. I share many patients with many of you on the solid tumor side because those patients have secondary myelodysplastic syndromes and those can be among the most challenging patients to treat. And you can see here another fact that emphasizes the malignant nature of MD’s.
So this is the five year survival of patients with MD’s in Violet and you can see it’s 31%, very close to what you get with AML which is 25% but much worse than some of the more common solid tumors such as breast and lung when you take all the patients together. Again further emphasizing the malignant nature of these conditions. And more recently, a process called clonal hematopoiesis of indeterminate potential or CHIP. And this is a condition that happens...
in up to 10% of people older than 70. And some of those progress to MD’s but they are also associated with inflammation and cardiovascular risk and many other syndromic dysfunction across the body. This is why multiple disciplines including cardiology have been interested in and for that more and more cancer centers have been interested in establishing clinics for chip and seekers. And here our newest recruit, Dr. Lourdes Mendez has taken over this aspect and I think this is going to
become very important in the coming years.

The management of MD’s, as I’m going to show you in a little bit, has been difficult to get new therapies.

And part of this is because of the large heterogeneity of the disease.

This is a schema showing the genetic landscape of MD’s.

And you can see here that there are more than 40 recurrently abnormal somatic mutations that can happen in patients.

However, less than six of those happen in more than 10% of patients.

Therefore, there are many different driver genes and developing therapies that work across the spectrum for patients.
00:03:12.601 --> 00:03:14.976 with MD’s has been quite challenging.

00:03:14.980 --> 00:03:16.865 Another I think challenging feature has been the classification of MD’s.

00:03:16.865 --> 00:03:19.100 And over the years,

00:03:19.100 --> 00:03:20.420 how do you separate MD’s from AML has been a moving target.

00:03:20.420 --> 00:03:27.686 Historically A+ count of 30% was used and then this was changed to 20% most recently last year and this created a huge difficulty in the field is the target blast count has been moved to 10%.

00:03:27.686 --> 00:03:30.793 00:03:34.244 So now there is this new entity called MD’s slash AML which is 10 to 19% blast and this is causing a lot of confusion for patients especially
that the PATH reports get released immediately to patient nowadays or they are being told that you have MD’s by 1 classification and AML by another classification.

And to address this issue, we actually have worked with a large number of international colleagues to establish international consortium of MD’s. This is an effort that involves many experts across the world to try to come up with a unified way of classifying the disease. And indeed we have put together more than 7000 cases, which by the numbers of MD’s is 8.
00:04:25.558 --> 00:04:27.896 quite actually quite large of highly
NOTE Confidence: 0.87494814
00:04:27.896 --> 00:04:30.087 annotated cases to try to come up
NOTE Confidence: 0.87494814
00:04:30.087 --> 00:04:32.229 with one unified classification.
NOTE Confidence: 0.87494814
00:04:32.230 --> 00:04:33.970 There’s another update of this effort
NOTE Confidence: 0.87494814
00:04:33.970 --> 00:04:36.124 that will be presented in ASH in an
NOTE Confidence: 0.87494814
00:04:36.124 --> 00:04:37.540 oral fashion this year and hopefully
NOTE Confidence: 0.87494814
00:04:37.597 --> 00:04:39.186 the paper will be published soon so
NOTE Confidence: 0.87494814
00:04:39.186 --> 00:04:41.955 that we can have one common way in
NOTE Confidence: 0.87494814
00:04:41.955 --> 00:04:45.979 which we can talk to patients with MD’s.
NOTE Confidence: 0.87494814
00:04:45.980 --> 00:04:46.528 After that.
NOTE Confidence: 0.87494814
00:04:46.528 --> 00:04:48.720 What is I think important is the risk
NOTE Confidence: 0.87494814
00:04:48.780 --> 00:04:50.764 stratification. Why is that important?
NOTE Confidence: 0.87494814
00:04:50.764 --> 00:04:51.908 Because patients with MD’s
NOTE Confidence: 0.87494814
00:04:51.908 --> 00:04:52.980 have variable prognosis.
NOTE Confidence: 0.87494814
00:04:52.980 --> 00:04:54.930 Some patients can live for multiple
NOTE Confidence: 0.87494814
years while other patients have prognosis that’s almost akin to that of acute leukemia patients,
meaning that the prognosis can be less than six to nine months and therefore having good risk stratification systems is very important. Historically, you can see in this table four of the most commonly used stratification systems. All of them rely on the number of the plast in the bone marrow as well as the karyotypic abnormalities and the blood counts. However, none of those were very good because
for a long time we and others have shown that some of the patients that are called lower risk MD’s die quickly within two years of diagnosis. More than 1/4 of those lower risk MD’s patients and it was clear that these prognostic risk scores are not capturing the whole spectrum of the disease severity. And we also have shown that among patients with therapy related MD’s, which historically have been considered very high risk disease, some of them do OK, do better than some of the other patients.
And that's again reflective of the variability on prognosis of those patients. And this is why it's important to apply good risk stratification process for every patient. After all of this basically the IPSSM, the molecular IPSS was finally published after a large international effort in the New England Journal of Evidence. You can see the Bernard ET al Citation. But the short of this is that it incorporated the molecular alterations in the calculation and that led to a more accurate risk stratification picture. And we have shown in a large analysis of two phase,
phase two and phase three trials that were presented last year in ASH that this system does lead to upstaging of patients.

You can see in red the high risk patients by the old scoring system, then the revised Ipss, then most recently the molecular IPSS. And you can see that the number of patients who are being diagnosed now as high risk disease because their prognosis is indeed poor, is becoming higher and therefore more of those patients are being directed for aggressive treatments.
to therapeutics is the response criteria.

This is actually a very important area because response criteria have been quite problematic in MD’s. And I can tell you that it’s my belief and several of my colleagues at the same believe that it has impeded drug development in MD’s. Why is that? Because some of the issues with the response criteria have led to certain medications moving from phase one to phase three. That probably should not have been the case. And this is why we have many Phase 3 failures in MD’s.
So again using a large international effort over the last two years that was coordinated through the international working group, we have revised these response criteria and this consensus proposal for revised international working group criteria has been now published and it started to be implemented in some clinical trials protocols. We have been in discussions with the FDA as well about implementing this in, and I’m hopeful that this will become a more uniform way of looking at clinical trial.
00:08:12.916 --> 00:08:15.296 to further like establish their
NOTE Confidence: 0.9671921
00:08:15.296 --> 00:08:18.113 the efficacy of therapeutics in a
NOTE Confidence: 0.9671921
00:08:18.113 --> 00:08:19.367 more consistent fashion.
NOTE Confidence: 0.9671921
00:08:19.370 --> 00:08:22.010 And we are validating this using
NOTE Confidence: 0.9671921
00:08:22.010 --> 00:08:24.262 WD database which will look both
NOTE Confidence: 0.9671921
00:08:24.262 --> 00:08:25.977 at the international working group
NOTE Confidence: 0.9671921
00:08:25.977 --> 00:08:27.645 criteria as well as the IPSSM.
NOTE Confidence: 0.9671921
00:08:27.645 --> 00:08:30.220 We actually have this database
NOTE Confidence: 0.9671921
00:08:30.220 --> 00:08:33.050 again with 15 different centers.
NOTE Confidence: 0.9671921
00:08:33.050 --> 00:08:34.650 Six of those presentations are
NOTE Confidence: 0.9671921
00:08:34.650 --> 00:08:36.729 going to be upcoming in in ASH,
NOTE Confidence: 0.9671921
00:08:36.730 --> 00:08:39.046 two of them are oral presentations
NOTE Confidence: 0.9671921
00:08:39.046 --> 00:08:41.370 by Doctor Tarek Iwan and by
NOTE Confidence: 0.9671921
00:08:41.370 --> 00:08:43.125 our newer newest recruit Dr.
NOTE Confidence: 0.9671921
00:08:43.130 --> 00:08:43.852 Ian Beversdorf.
NOTE Confidence: 0.9671921
00:08:43.852 --> 00:08:46.379 So I think this is going to
00:08:46.379 --> 00:08:48.521 further validate these response
NOTE Confidence: 0.9671921
00:08:48.521 --> 00:08:53.010 criteria as the way to establish,
NOTE Confidence: 0.9671921
00:08:53.010 --> 00:08:55.008 establish them as a way to
NOTE Confidence: 0.9671921
00:08:55.008 --> 00:08:56.850 approve medications in the future.
NOTE Confidence: 0.9671921
00:08:56.850 --> 00:08:59.160 So now moving from classification
NOTE Confidence: 0.9671921
00:08:59.160 --> 00:09:01.470 and response assessment to other
NOTE Confidence: 0.9671921
00:09:01.540 --> 00:09:03.722 therapies and you are looking here
NOTE Confidence: 0.9671921
00:09:03.722 --> 00:09:05.937 at the approved therapies in in the
NOTE Confidence: 0.9671921
00:09:05.937 --> 00:09:08.133 top line by the FDA and in the lower
NOTE Confidence: 0.62744665
00:09:08.201 --> 00:09:09.177 line by the EMA.
NOTE Confidence: 0.62744665
00:09:09.180 --> 00:09:10.902 And what you can quickly see compared
NOTE Confidence: 0.62744665
00:09:10.902 --> 00:09:12.848 to many solid tumours is that we
NOTE Confidence: 0.62744665
00:09:12.848 --> 00:09:14.293 don’t have many approved therapies.
NOTE Confidence: 0.62744665
00:09:14.300 --> 00:09:16.134 This has been a very frustrating Rd.
NOTE Confidence: 0.62744665
00:09:16.140 --> 00:09:18.732 for drug development in MD’s and
NOTE Confidence: 0.62744665
in high risk MD’s. For example, we did not have a drug approved in the last 20 years until the year 2020. So I’m going to show you the main therapies that we currently have available and how we are finally breaking through that deadlock of therapeutic evolution and we are starting I think to have better therapies come along. The traditional approach of treating patients with lower risk MD’s depends on symptom control because we cannot currently cure these patients. The only way to cure a patient with MD’s with bone marrow transplant, but bone marrow transplants are
usually reserved for patients who have higher risk disease, not lower risk disease. For patients with anaemia, the standard treatment would be ESA’s erythropoiesis stimulating agents. However, those drugs are not active except in less than 1/2 of patients, and the response last less than 12 months. And I’m going to show you how this landscape has changed in the last couple of years. So the first I think major improvement was the introduction and final approval of this drug called luspetercept.
what is luspetercept,

It works on a pathway called transforming growth factor pathway.

These ligands suppress erythropoiesis, especially late erythropoiesis and using this ligand trap has led to restoration of effective erythropoiesis and ultimately improved transition independence.

This led to transition independence in around 40% of patients in the phase three Middle East trial which was the landmark paper published in the New England Journal of Medicine.

And based on this this drug was approved.
And we have subsequently published additional follow up from this trial that showed that this drug not only lead to high rates of transfusion independence but it actually also leads to significant reduction in transfusions for patients who do not become transfusion dependent and lead to hematologic improvements. And this year the major development in lower risk MD’s has been the final publication of the commands trial which looked at the activity of the specter sit in the frontline setting. So this is comparing it against.
erythropoiesis stimulating agents in patients with ringsidroplasts and without ringsidroplasts. So this was a primary analysis. This paper is now out in The Lancet journal showing that patients who received Los Pertoset achieved 60% transition independence, almost double that what you expect with patients who receive ESA. So clearly a very active drug and it’s moving to the frontline treatment of MD’s which is a fundamental change in how we treat patients with lower risk MD’s. We are trying to move this further through two other trials.
00:12:01.550 --> 00:12:03.110 One is the element trial,
00:12:03.110 --> 00:12:05.091 which is a large phase three trial
00:12:05.091 --> 00:12:07.230 that will be looking at patients
00:12:07.230 --> 00:12:09.265 who are not transfusion dependent.
00:12:09.270 --> 00:12:10.789 Here we are trying to move the
00:12:10.789 --> 00:12:11.440 bar higher and
00:12:11.489 --> 00:12:13.337 we are trying to prevent patients
00:12:13.337 --> 00:12:14.569 from even becoming transfusion
00:12:14.625 --> 00:12:16.185 dependent by treating them at a
00:12:16.185 --> 00:12:17.607 earlier stage of their anaemia.
00:12:17.607 --> 00:12:20.246 So this trial which will open at
00:12:20.246 --> 00:12:22.971 TLI think will be very important as
00:12:22.971 --> 00:12:24.597 a landmark trial in the management
00:12:24.597 --> 00:12:26.624 of MD’s if it’s positive because it
00:12:26.624 --> 00:12:28.978 would be the first time we get a drug
potentially approved for patients who are not yet transfusion dependent.

And another phase three trial that we are working on with the sponsor basically is looking at the use of the drug at maximal doses because we currently many of the patients are not being escalated to the right dose that leads to highest response rate.

So I think starting with the higher response with the higher dose is going to increase the response rate and potentially open the door for more and more patients responding to this drug.

And this trial is also going to open ATL, another drug that I think generated
NOTE Confidence: 0.34587935
00:13:02.934 --> 00:13:04.790 a lot of interest is Amitelestad.
NOTE Confidence: 0.34587935
00:13:04.790 --> 00:13:07.520 This is a first in class telomerase inhibitor.
NOTE Confidence: 0.34587935
00:13:07.910 --> 00:13:10.275 So telomerase activity in patients with MD’s has been associated with high risk disease and inhibition.
NOTE Confidence: 0.34587935
00:13:14.710 --> 00:13:17.318 of the telomerase it has led to restoration of effective erythropoiesis in a large phase two trial.
NOTE Confidence: 0.34587935
00:13:18.874 --> 00:13:21.119 This is a drug that’s given intravenously every four weeks and in a phase two trial lead to 40% transfusion independence.
NOTE Confidence: 0.34587935
00:13:28.562 --> 00:13:32.240 So this was taken to a phase three trial.
NOTE Confidence: 0.34587935
00:13:32.240 --> 00:13:35.159 We have presented the data of this paper in in ASCO.
NOTE Confidence: 0.34587935
2023 and the paper is now in Lancet in press where patients were randomized to receive hematillostat versus placebo. Again those are patients who are heavily transfusion dependent with lower risk MD’s and you can see here that the rate of transfusion dependence was similar to phase two trial with 40% compared to 15%. And importantly, the degree of hemoglobin elevation is actually quite prominence. So the hemoglobin increase was almost 3 grams on average from a hemoglobin of eight to hemoglobin of 11.
00:14:13.318 --> 00:14:15.812 is very good, It’s around 51 weeks,
NOTE Confidence: 0.34587935
00:14:15.812 --> 00:14:18.230 which fought by MD’s criteria is
NOTE Confidence: 0.34587935
00:14:18.311 --> 00:14:19.880 actually pretty good.
NOTE Confidence: 0.34587935
00:14:19.880 --> 00:14:21.581 So this drug is currently in front
NOTE Confidence: 0.34587935
00:14:21.581 --> 00:14:23.274 of the FDA for consideration of
NOTE Confidence: 0.34587935
00:14:23.274 --> 00:14:25.388 approval and if it gets approved it
NOTE Confidence: 0.34587935
00:14:25.451 --> 00:14:27.565 will offer another I think very good
NOTE Confidence: 0.34587935
00:14:27.565 --> 00:14:29.128 opportunity for our patients with
NOTE Confidence: 0.34587935
00:14:29.128 --> 00:14:31.396 lower risk MD’s to become transition free,
NOTE Confidence: 0.34587935
00:14:31.400 --> 00:14:33.360 which is very important moving
NOTE Confidence: 0.34587935
00:14:33.360 --> 00:14:34.928 to high risk MD’s.
NOTE Confidence: 0.34587935
00:14:34.930 --> 00:14:37.874 This is where we have more of our
NOTE Confidence: 0.34587935
00:14:37.874 --> 00:14:40.090 recent failures I would say in
NOTE Confidence: 0.34587935
00:14:40.090 --> 00:14:41.930 in development of new therapies.
NOTE Confidence: 0.34587935
00:14:41.930 --> 00:14:43.694 This figure I’m showing you has not
NOTE Confidence: 0.34587935
really changed in the last almost 20 years.

So patients who are candidates for transplant go for transplant and those who are not the receive hypomethylating agents. However, we know that hypomethylating agent treatment by itself is not great. The long term survival only if you use HMA without going to transplant is less than 4% and for that reason we strongly encourage patients to consider transplant whenever possible, but also try to build up on HMA therapy to improve outcomes.
And this is kind of a summary of three different real life studies that we have done that show that the real life outcomes with Hmas are actually much worse than what you see in clinical trials with immediate survival of only one year on average for patients with high risk MD’s. Again further emphasizing the point for new therapies for patients with high risk MD’s and we have tried, we have tried for a very long time over the last 20 years. Unfortunately this graveyard of combinations of drugs that were added.
to hypomethylating agents keep expanding.

The latest addition was this drug magrolimab which works on the CD 47 pathway.

This is a very exciting drug has generated a lot of excitement early on but unfortunately a recent press release couple of months ago showed that phase three trial of this drug was negative.

We can talk I guess in another time once the data is publicly released about the reasons for for failure and how we can try to come up out of this system.

The good news is that we have other drugs that are more exciting and potentially could lead to approval.
One of them is venetoclax. So venetoclax is an oral PCL 2 inhibitor. This is already approved for patients with acute myeloid leukemia who are older. The frontline phase two trial should publish a phase 1P study that shows adding venetoclax to HMA is actually active in the HMA failure setting, which is a very difficult setting to treat patients in. It leads to responses as well as transition independence. But the pivotal phase three trial is
00:17:00.498 --> 00:17:02.106 fully accrued now it’s called Verona.
NOTE Confidence: 0.40800372
00:17:02.110 --> 00:17:04.180 This trial might change the
NOTE Confidence: 0.40800372
00:17:04.180 --> 00:17:06.949 landscape of how high risk MD’s is,
NOTE Confidence: 0.40800372
00:17:06.950 --> 00:17:08.870 is going to be treated.
NOTE Confidence: 0.40800372
00:17:08.870 --> 00:17:10.502 This is the scheme of the trial that
NOTE Confidence: 0.40800372
00:17:10.502 --> 00:17:11.868 we presented a couple of years ago.
NOTE Confidence: 0.40800372
00:17:11.870 --> 00:17:13.466 This trial is now fully accrued.
NOTE Confidence: 0.40800372
00:17:13.470 --> 00:17:15.955 It’s the results are actually expected by
NOTE Confidence: 0.40800372
00:17:15.955 --> 00:17:19.544 early 2024 and if this trial is possible,
NOTE Confidence: 0.40800372
00:17:19.550 --> 00:17:22.457 it would lead to a new standard of care.
NOTE Confidence: 0.40800372
00:17:22.460 --> 00:17:24.990 Now moving to immune dysregulation
NOTE Confidence: 0.40800372
00:17:24.990 --> 00:17:27.520 myeloid malignancies and this is
NOTE Confidence: 0.40800372
00:17:27.598 --> 00:17:29.474 an area where I have personally
NOTE Confidence: 0.40800372
00:17:29.474 --> 00:17:31.560 invested quite a bit of time trying
NOTE Confidence: 0.40800372
00:17:31.618 --> 00:17:34.260 to develop new therapies for both
NOTE Confidence: 0.40800372
00:17:34.260 --> 00:17:36.860 MD’s and acute myeloid leukemia.
So we know that the most effective treatment for patients with MD’s and AML is bone marrow transplant, which is effectively an immune intervention. We know there is significant dysfunction in the immune system happens in patients with MD’s and AML both at diagnosis but also during the progression of the disease. There is both quantitative and qualitative abnormalities that happen in the T cells including the regulatory T cells, but also in the macrophages and the ANKAE cells.
And study after study have shown that these increase in frequency as the disease progresses. The question has been always are these pathogenic, are they basically mediating the progression and the resistance of AML and MD’s or are they basically are adhering, they are just a phenomena that comes with the progression of the disease. And the first trial I think that generated a lot of interest of immune checkpoint inhibition which clearly in solid tumors have led to a major revolution, but in in blood tumors has not led to the same impact so far.
However, the Dana Farber group published this trial using Epilumab which is a CTL A4 inhibitor approved for multiple solar tumors. Now it was a small phase one study, but it was done in the post transplant setting where the drug was given for patients who relapse after transplant and what they have shown that the drug was tolerated. There were some GVHD but generally it was well tolerated for the most part and they were able to achieve 5 responses, 5 complete remissions out of 13 patients, which again was a proof of principle.
that immune checkpoint inhibition post transplant does actually work.

And this generated a number of trials looking at the drug in MD’s and AML. This is one of the trials, worked on actually when I was at Hopkins and later moved it to Yale. It was multicentre, it was in the post relapse setting for patients with MD’s. And while we have shown that the drug was well tolerated,
we could manage the immune related adverse events effectively similar to what they do in solid tumors.

The clinical responses were generally very low and the drug was not clinically active.

We did achieve some disease stabilisation but stable disease always very tricky in MD’s to figure out is it related to the biology of the disease being indolent in some patients or is it related to the activity of the drug. However, among those patients who had stable disease, we have conducted extensive correlative testing with Leo Loznick at Hopkins.
And we have shown that there was an increase in the frequency of Icos, which is a costimulatory molecule, but this was not basically associated with an increase in peripheral T cell receptor diversity in terms of association with the response.

And I think trying to find biomarkers for patients has been one of the also challenging areas in immune checkpoint inhibition in MD's. Of course single arm trials as I mentioned are not very, are not very definitive in any kind of activity.

Some of those phase one trials
have shown positive signals, but the definitive way to achieve that would be with a randomized trial and we worked with the Celgene slash BMS to develop this trial of randomized trial. This was the only randomized published trial to date of immune checkpoint inhibition both in MD's and AML. So patients with MD's or AML in two separate cohorts, more than 210 patients were randomized to receive azacitidine or azacitidine with dorvalumab. Many of you are probably familiar.
with this PDL 1 inhibitor which is approved to multiple solid tumors and has shown overall survival prolongation in several settings. However, again this was a negative trial. You can see here complete overlap in the overall survival and progression free survival cares and no difference in the primary endpoint which was the overall response rate. So this was disappointing.

We try to understand better why did the drug not lead to improvement? So the first theory is that one common thing we see with MD’s trials is that...
when you add a drug in top of MD’s, you lead to less exposure of azacitidine which is the only drug shown to improve survival. And therefore maybe adding the volumab has led to reduced exposure of Aza and that’s why we did not see benefit. But you can see in this analysis the number of cycles between the two arms was actually similar and most patients have received more than four cycles. So it doesn’t seem like this underlines the lack of therapeutic efficacy to the right.
You can see also that there was similar hypomethylation which how we think how those drugs hypomethylating agents work and no difference between the two arms. So doesn’t seem like there was antagonism there. We also tried to see if there was an increased expression in PDL 2 as a mechanism to bypass the PDL 1 inhibition and that also was not the case. So none of those mechanisms seem to suggest why the drug did not work. What was actually quite surprising is that when we conducted serial flow cytometric analysis, we did not see T cell expansion in
diversity or in quantity by flow cytometry, neither in the bone marrow or in the peripheral blood between the two arms. And this was particularly surprising because there has been a prevailing theory that the reason why immune checkpoint inhibition does not work in AML is that once you give it subsequent lines, third, fourth line, that the immune system has been beat up a lot by the chemotherapy. So here we were giving it in the frontline sitting and still it did not lead to immune stimulation.
And the last thing we tried to do with this trial is to look at substance of patients because here you are putting all newcomers together and maybe certain subsets of patients benefit better. So we tried to look at 2 specific subsets, patients who have TP 53 mutations, which have been shown to have a microenvironment in the bone marrow that is more immunosuppressive and might be more amenable to immune checkpoint inhibition based on multiple sources as well as patients who have splicing factor mutations, which Omar Abdullah have from
Sloan Kettering and others have shown could be more susceptible to immune checkpoint inhibition. However, we also did not see any activity in those patients who have TB 53. This analysis was presented by Yan in a couple of years at ASH and is currently under consideration for publication. So we tried to think further about how can we overcome this immune checkpoint resistance for patients and one theory was, is that myeloid derived suppressor cells could be a mediating resistance. This was based on solid tumours and we replicated the data.
Doctor Tikkun Kim who’s currently at Vanderbilt was here at TL and did very nice preclinical trials that suggested that there could be the benefit of combining a drug that targets myeloid derived suppressor cells such as entenostat, which is an Estonia acetylase inhibitor, with a Pimpro or PD1 inhibitor. And based on these preclinical data, this was translated to a clinical trial, a multi-centre phase one trial conducted in collaboration with the UM one group under Pat Larosso with the theory again that adding Antinostat would suppress myeloid giraffe and therefore...
allow pimprolismab to exert its immune chip point inhibition.

So that the trial has been presented by Anne, I’m not going to go through the results because again unfortunately it was clinically negative. We are currently going through the correlative data to understand what led to the failure of the clinical data. However, I think there are more exciting agents. One of them is sabatolimab. Sabatolimab targets term 3.
So term 3 is not only expressed on T cells and mediates immune checkpoint inhibition, but it’s also expressed in leukemia stem cells and leukemia plastic and targeting. Preclinical data has suggested a potential not only efficacy but a functional mechanism in which it can lead to immune checkpoint inhibition but also direct targeting of the leukemia stem cells. So the stimulus MD’s one trial was the first randomized trial with this drug.
response and progression free survival.

We presented this data in ASH last year.

Currently the manuscript is under review and while the trial did not meet its end point, there was no significant statistically improvement in complete remission or progression free survival.

You can see that there was a late separation in the curve of the progression free survival and some trend toward improvement with the PFS.

So we also sub-analyse these data and what we have found is that patients who have lower disease
burden seem to benefit more.

However, of course this is ad hoc analysis,

But what was also exciting is

among the patients who achieved

response as you can see in the red,

patients who achieved The Who

The Who got the combination seems to have

doubled the duration of response

compared to those who have HMA alone,

which again suggests that the

combination might deepen the response leading to longer duration of activity.

So the stimulus MD’s two is a large randomized phase three trial of Sabatolimab plus Aza versus Sabatolimab alone and
This trial again is fully accrued more than 530 patients enrolled on this trial. This trial is also expected to report by early 2024.

So between venetoclax and sabatolimab, hopefully one of those two at least will be positive and change the landscape of how we treat patients with high risk MD’s.

So moving to the AML front where we have also tried to move some of those concepts forward.

The plus AML one is a randomized phase two trial an IAT that is also running through the UM 1 mechanism with Pat Larosso, Rory has been doctor.
Shalis has been working on this with me and this trial is actively enrolling. We have more than 40 patients right now where patients are getting 7 + 3 versus 7 + 3 with pemprolizumab. The primary endpoint is MRD negative CR, another randomized phase two trial that we are working through the same mechanism as last ML2 and this trial looks at older patients where the combination is cisplatin with venetoclax plus minus Pemprolizumab. This trial is also through the UM 1 mechanism and through both of those trials and in collaboration with CMAC, which is a cancer immunotherapy.
monitoring group.

Within C Tib, we are conducting an extensive set of correlative studies who are also collaborating with Doctor Jerry Radic from the Hajj to look at MRD negativity through different more sensitive techniques including circulating tumor DNA and at the level of the stem cells and looking at as I mentioned that other leukaemia specific T cell activation and a number of other I think important studies. Finally on the same front we have the plasty ML3 trial which is a
phase two trial looking at combining IDH inhibitors with pimprolism AB.

This is based on preclinical data suggesting that patients who have IDH mutations also have immunosuppressed micro environment.

So Doctor Lourdes Mendez and Dr. Max Stoll at Hutch who I forgot to put his picture sorry are working on this trial and hopefully this trial is approved by Merck and hopefully it’s going to open next year.

And lastly on that front, we also have another trial with the triplet is Evan Sabatolimab.

This is a phase two trial which
enrolled more than 80 patients.

We presented the data lost ash and for the only for the safety cohort, the full set of data has not been presented and I think we have shown extensively that immune checkpoint inhibition while can be difficult in patients with leukaemia is difficult to administer for multiple reasons. For example, our patients are often have deep thrombocytopenia, so we cannot biopsy them. If the patient has inflammation in their lung,
sometimes it’s difficult to know is this a fungal infection or is this pneumonitis And in solid tumours it’s easy or not. And in solid tumours it’s easy or not at least easier to go and get a biopsy out of the lung. But in our patients it’s very difficult to get biopsies. We’re also hesitant to give steroids many times because of fungal infections that are common in our patients. So conducting immune checkpoint inhibition trials in patients with MD’s is a bit challenging. However it is it can be done and this is retrospective analysis that was done.
by Doctor Shalas in you’re looking at our own data showing that the number of immune related adverse events was somewhat similar to what is seen in patients with solid tumors when they get immune checkpoint inhibition. But also importantly that we are not seeing excess mortality when we use these agents. So I think it’s certainly feasible. I think it’s certainly has a way to kind of move forward and one of those agents I have deep confidence is going to be positive. But I think another important concept that we need to apply is
biomarker selection of patients, because currently we are unrolling all newcomers regardless of their susceptibility. And I keep making the analogy of like trying to treat patients with IDH or all patients with an IDH inhibitor when you only should treat the ones with the IDH 1 mutation or the same thing with the EGFR. So we really should select patients who are more likely to respond to the specific pathway. This is an example of I think a nice effort looking at an immune effector signature to try to
define subset of patients.

This is clearly retrospective, but I think this is what should be applied in clinical trials in a prospective fashion, so we can select patients who are more likely to respond. So and I’d like to thank the colleagues in the leukemia and myeloid malignancy program, including our wonderful MPs and the fellows and mentors and collaborators. All of them have been working with us, but also importantly our clinical research team who has been fundamental.
to all those clinical trials that I’ve just shown you and have been extremely productive even during COVID and all the staffing shortages that we had over the years.

And at the end I’d like to thank all the organizations that helped fund my research and all the collaborators and happy to take any questions.

Have a great time and let me apologize for not being here yesterday. I realized I was supposed to notice I heard you again well on your own. It’s a pretty impressive body of work that we’ve seen over these past few years.
What do we know about team eventually was when I was here, but is there any fundamental difference in MD’s in younger individuals than those who are, you know, more typically, yes, age, you know, so the occasional 40 or 50 year old person, you see it because this heavy year, 80 year old. Yeah, this is actually a very important question. So the majority of MD’s patients are older than 65, around 85% of patients are older than 65.
but generally tend to be two big areas. One of them is previous exposure to chemotherapy or radiation in the context of solid tumours, usually breast cancer actually is a common setting where we see patients who have received radiation or chemo and have secondary cancer. But the second big area is genomic predisposition. So there are a number of patients who have for example underlying Franconia’s anemia or plastic anemia or some kind of hereditary predisposition. The number of those predisposition genes actually has been increasing.
or we are discovering more and more of them and it’s quite fascinating. For example, there is one called DDX 4, one that we did not for know about until you know a few years ago and it turned out that 10% of patients with AML and MD’s have that. And those are I think important because they underlie different, different clinical behaviour. Those patients for example tend to be more indolent. I have a 96 year old patient with AML who has DDX 41 germline and it’s just just mind boggling to
me that you think that someone carried this mutation until she was 95 to develop finally AML.

So those tend to happen in older patients. There are other ones that tend to happen at a younger age. But I think the biggest message usually, I usually say regarding younger patients the MD’s is you have to look for other things because there are many things that mimic MD’s and you want to make sure what you are dealing with is indeed MD’s because the treatment is, is different.
YES.

Yeah, this is a very good question.

And actually this has always come up in our discussions with you know, IR, BS and regulators.

And there’s actually a large chunk of evidence based on as I mentioned, the problems that most of the trials that we have done in the field have been single arm trials.

So most of what we have right now is anecdotal experience.

We are not seeing overall, if you look at the entirety of data, we’re not seeing an increased incidence.
of GVHD that is of high severity. However, we have never had a randomized trial that would look at this in both arms and This is why I think our tube last trials are going to be very important because we have two arms and patients from both arms are going to transplant and I think this is going to give us a good sense of what is potential that you could increase GVHD, there’s also a potential that you could actually increase GVL, because the way GVL is a graft.
versus leukemia effect and this is how we think transplant can work. So I think it’s always a risk benefit and I don’t think you can answer that without a randomized data. This is something we are certainly keeping a very close eye on in our different trials and the regulators have been also kind of keeping a close eye on this. And I have to say in in our practice we usually try to say stop the immune checkpoint inhibitor like you know in the last six weeks before transplant 6 to 8 weeks ideally just.
because of that theoretical concern. I would say at the end is that in immune checkpoint inhibitors are approved in some in substance of lymphoma and in that setting like Hodgkin’s disease and generally there has not they have not seen that issue as much. So I guess we’ll, you know, we’ll have to wait and see for AML and MD’s. Yeah, this is a great question And part of why I did not divulge and like go too much into this is that this methylation business has been
I think one of the most challenging aspect of you know Steve Gorwin, he used to hate calling these hypomethylating agents because we are not even 100% sure that this is how they actually work. You know, we always like to call them DNMT3 inhibitors. I guess the big answer is that in those trials that I presented they did not do like site specific methylation. But we still don’t fully understand what because you are seeing a mix of hyper methylation.
00:39:08.240 --> 00:39:10.318 you are looking within the genome and
NOTE Confidence: 0.55645
00:39:10.318 --> 00:39:12.271 until now we don’t fully understand the
NOTE Confidence: 0.55645
00:39:12.271 --> 00:39:13.757 mechanism of action of these drugs.
NOTE Confidence: 0.55645
00:39:13.760 --> 00:39:16.672 I did not go into this because of,
NOTE Confidence: 0.55645
00:39:16.672 --> 00:39:17.800 of, you know,
NOTE Confidence: 0.55645
00:39:17.800 --> 00:39:19.396 the nature of of the audience here.
NOTE Confidence: 0.55645
00:39:19.400 --> 00:39:21.710 But I think one of the biggest
NOTE Confidence: 0.55645
00:39:21.710 --> 00:39:23.676 challenges in my own view about why
NOTE Confidence: 0.55645
00:39:23.676 --> 00:39:25.696 we could not go beyond HMAS is that
NOTE Confidence: 0.55645
00:39:25.696 --> 00:39:27.190 we are stuck with this schedule
NOTE Confidence: 0.55645
00:39:27.190 --> 00:39:29.265 that is at the approved seven days
NOTE Confidence: 0.55645
00:39:29.265 --> 00:39:30.780 of azacitidine in every single
NOTE Confidence: 0.55645
00:39:30.780 --> 00:39:32.272 trial that we have.
NOTE Confidence: 0.55645
00:39:32.272 --> 00:39:34.137 And this is a myelosuppressive
NOTE Confidence: 0.55645
00:39:34.140 --> 00:39:35.766 combination and trying to add things
NOTE Confidence: 0.55645
00:39:35.766 --> 00:39:37.859 to it has been quite challenging.
But currently it’s not considered ethical to randomize, you know, without including the seven days of HMA because it’s the only drug that has been want to improve our all survival. But you’re right, there could be agents that could antagonize that methylation or it could be the other way around where this methylation is negatively impacting it. So that has been a big problem, Nathaniel. Like those seven the therapy
we know that those therapies result in quite profound immune suppression and not only they, they’re also quite lymphopenic when you have 0.1. So does it make sense to give them concurrently? I mean, completely suppressing their chemo, so it doesn’t make sense to get them concurrently. Or would you have a more clever way where you perhaps cumulate the marrow, allow them to recover, have some given or reconstitution and then, you know, yeah.
So there are people working on concepts like this where they are giving it around the time of immune reconstitution as you mentioned. I think 2 points on this front is that they actually have combined and solid tumours. They have multiple and you know, Barbara and others know more about this like solid tumours where you are giving chemo with immune therapy and it seems like it has worked, their drugs are not as lymphodepleting as ours. But the other thing we actually
have tried to do on these trials,

I did not go into this into detail is that we moved the initiation of the immune checkpoint inhibition to day eight.

So rather than waiting until day 21 when you know all the cells have have died.

So around the aid, the idea of doing it early is similar to that you have. This is when you have all the antigens being from the dying cells coming out and trying to activate lymphocytes at that at that point.

But you're right, I mean this is another I think big
00:41:53.104 --> 00:41:54.798 challenge of when what is the exact
NOTE Confidence: 0.27404776
00:41:54.798 --> 00:41:58.494 time to to use these these drugs has
NOTE Confidence: 0.27404776
00:41:58.494 --> 00:42:00.114 been somewhat kind of frustrating
NOTE Confidence: 0.27404776
00:42:00.114 --> 00:42:02.688 I have to say with with both PD1,
NOTE Confidence: 0.27404776
00:42:02.690 --> 00:42:05.210 PDL 1 so far and because multiple
NOTE Confidence: 0.27404776
00:42:05.210 --> 00:42:06.613 trials have been negative.
NOTE Confidence: 0.27404776
00:42:06.613 --> 00:42:09.197 So it might be that none of those
NOTE Confidence: 0.27404776
00:42:09.197 --> 00:42:11.350 pathways are you know what really
NOTE Confidence: 0.27404776
00:42:11.350 --> 00:42:13.734 is important in the MLN MD’s and
NOTE Confidence: 0.27404776
00:42:13.734 --> 00:42:15.342 maybe the Sabatoli map that I
NOTE Confidence: 0.27404776
00:42:15.342 --> 00:42:17.090 just showed or some other.
NOTE Confidence: 0.27404776
00:42:17.090 --> 00:42:18.890 You know there are other,
NOTE Confidence: 0.27404776
00:42:18.890 --> 00:42:21.010 I did not go on to this as well in detail,
NOTE Confidence: 0.27404776
00:42:21.010 --> 00:42:23.222 but they are lag three, they are Lil RP4.
NOTE Confidence: 0.27404776
00:42:23.222 --> 00:42:25.486 There are a number of other immune
NOTE Confidence: 0.27404776
checkpoint pathways that are also being tested in MD’s and AML.

Yes, with the actually TM3 without the PD one.

Yeah, so I did not go through that the solid tumor literature with TM3 but they actually had a big trial combined TM3 and PD1 and that has not led to clinical improvement in solid tumours. So the development has been largely focused on the MD’s space. They have a, the company has sponsored trials where they are combining different immune checkpoint inhibitors and actually sabotrimab with other drugs.
So those I think could give you an idea, but from a regulatory path, you know as I was saying a little bit earlier is you have to combine with HMA to kind of get your first approval and then I think you know contagion, hago. Contagion also said like the real research starts once a drug is approved like you really need to get like something like once it’s approved, but the initial focus is always on trying to kind of get the trial that leads to approval and then you can do all these kind of bigger concepts.
You can do them now in a small phase, but not in a large setting.

Yes, Sir.

Clearly the post transplant setting is a very important development area because most of our patients unfortunately relapse even after transplant.

So I think with the epilogue map, the trial, the New England Journal paper I showed you, people have had a very tough time replicating these, and most people are not using Epilomab.
00:45:18.603 --> 00:45:20.995 of kind of label to to give it.

00:45:21.000 --> 00:45:23.191 And most of those responses by the

00:45:23.191 --> 00:45:25.127 way happened in the extramedullary

00:45:25.127 --> 00:45:27.166 relapses like skin disease and

00:45:27.166 --> 00:45:28.781 probably that speaks to different

00:45:28.781 --> 00:45:30.320 microenvironment between the bone marrow,

00:45:30.320 --> 00:45:31.571 between the extramedullary

00:45:31.571 --> 00:45:33.664 versus the bone marrow relapse.

00:45:33.664 --> 00:45:36.208 In terms of your other questions

00:45:36.208 --> 00:45:37.840 specific about the TM3,

00:45:37.840 --> 00:45:40.360 there’s actually a trial giving

00:45:40.360 --> 00:45:41.400 TM3 inhibitor post transplant.

00:45:41.400 --> 00:45:42.960 I didn’t go into this one,

00:45:42.960 --> 00:45:45.025 but this one is ongoing and I

00:45:45.025 --> 00:45:46.676 believe there could be presentations
00:45:46.676 --> 00:45:48.794 in the near future about this.
NOTE Confidence: 0.290338
00:45:48.800 --> 00:45:49.958 I'm not involved in it.
NOTE Confidence: 0.46746305
00:46:07.150 --> 00:46:09.214 Yeah. No. I think again, like,
NOTE Confidence: 0.46746305
00:46:09.214 --> 00:46:10.318 you know, I think it's like
NOTE Confidence: 0.46746305
00:46:10.318 --> 00:46:11.269 we're getting out like that.
NOTE Confidence: 0.46746305
00:46:11.270 --> 00:46:12.188 Sit right. Sitting.
NOTE Confidence: 0.46746305
00:46:23.180 --> 00:46:23.580 Yes,
NOTE Confidence: 0.26404873
00:46:41.910 --> 00:46:43.308 sorry, Could you phrase your hand?
NOTE Confidence: 0.26404873
00:46:50.710 --> 00:46:54.790 Is there any evidence that that
NOTE Confidence: 0.26404873
00:46:54.790 --> 00:46:57.390 prevents basically the development
NOTE Confidence: 0.26404873
00:46:57.390 --> 00:47:02.190 of an MPs or weighted MPs or AFL?
NOTE Confidence: 0.26404873
00:47:02.190 --> 00:47:04.050 Just thinking of like ways to
NOTE Confidence: 0.26404873
00:47:04.050 --> 00:47:06.101 sort of look at that rather
NOTE Confidence: 0.26404873
00:47:06.101 --> 00:47:07.710 than a code reading with like
NOTE Confidence: 0.5107637
00:47:10.790 --> 00:47:14.070 yeah, I think inhibiting development of
NOTE Confidence: 0.5107637
00:47:14.070 --> 00:47:17.534 MD's. This is actually an area
that is getting more attention now because of what I showed at the beginning like this chip slash seeker spectrum where clonal hematopoiesis. We are seeing some of this actually in solid tumors. For example a breast cancer patient under you know underlying more and more people are doing these next Gen. sequencing and then the patient turned out to have TP 53 mutation chip like the blood counts are completely normal but she has TP53 mutation. And one of the increasing questions that are being asked like you know
the oncologists are afraid to give chemotherapy because that TP53 clone could expand and lead to MD’s or or AML. So I would say this is an evolving area. Currently we don’t think immune checkpoint inhibition would work. Most of the trials that are looking at agents are looking at things that are very non-toxic. Let me put it this way because those are patients with good counts generally and normal bone marrow. However those drugs can be given together.
One of the things actually we benefited from doing these trials is that I have a number of patients I share with our colleagues here that need some checkpoint inhibition. I have multiple patients including with Barbara where they are on some kind of immune checkpoint inhibitor and they have MD’s now and I need to give them azacitidine because they have MD’s and we have been doing this in a number of patients and for the most part is pretty safe.
be a horrendous situation.

It's still a horrendous situation.

You have two active tumours,

MD's and solid tumour,

but many of those patients used to get only supportive care and nothing else.

But now we for the most part because immune checkpoint inhibitors generally will not lower your blood count.

So they are able to give them even with patients with MD's and I'm able to treat the patient with azacitidine because it does not worsen their immunosuppression.

You can give it safely.

But again,
This I think how to prevent clonal evolution is I think is an important area as well.

OK. Thank you so much my e-mail if anybody has any questions then.