CASAT Podcast Network

Welcome to season five of CASAT Conversations, a holistic look at mental health.

Join us for a series of thought provoking conversations that delve into the vast dimensions of mental well being from the intricate link between physical, emotional and spiritual aspects of well being to the latest scientific research practices and therapies.

We navigate the multifaceted landscape of mental health together.

We hope you enjoy today's conversation.

I am delighted to welcome Dr. Alessandro Serretti.

Dr. Serretti is an Associate Professor of Psychiatry at the University of Bologna.

Welcome Dr. Serretti.

So happy to have you here today.

Thank you.

So as we dive in, I'd love for you to just share a little bit about yourself and the work that you do.

Yes.

Thank you.

As you said, I'm an associate professor of Psychiatry here at Bologna University.

And my background is basically as a clinician, a psychiatrist, but I worked there since many years also in the genetic field.

And therefore, I would say that my expertise is a combination of clinical research and genetic knowledge.

Of course, I'm seeing patients and I'm trying to integrate all these aspects together.

How did you get into genetics.

What took you from psychiatry to genetics?

Well, this is a difference between probably Europe and the US where I know that in the US careers are clearly separated.

Someone that is doing research usually is doing only research and clinicians as well.

Here, it's quite common to have a combination of activities.

Um, our time is by law divided in 50% clinical activity and 50% research and teaching.

And therefore it is my background since more than 30 years.

Hm, I love that.

That makes so much sense.

I would imagine that your clinical practice informs your research and vice versa.

Exactly.

Wonderful.

So I'd love for you to just paint a picture for us on the current landscape of the field of genetics.

And maybe even the intersection of psychiatry too, that'll be helpful for our listeners.

Yes, I understand that for people that is not working in the field, genetics is some frightening or complex and opinions.

Usually a big variation when I talk with people that is not working in this field.

So let's start with some very basic findings.

Very basic facts about genetics.

Genetics are of course, the genes that we all have and that constitute the basis for everything that we have in our body, that is the brain, of course, but also the other parts of the body and the genes are not all the same for every person.

And it is exactly in this variation and that we are looking at the difference and trying to understand the link with psychiatry but not only psychiatry, there are other fields of medicine.

Of course, the variation.

The problem is that it is huge.

Um you should have in mind just a few numbers.

So we have seven billions based per in our DNA.

And they code for a lot of different proteins in a very different and complex way out of these seven billions, we have more than 20 million variants, the common ones and another other million variants that are more rare, rare.

It means that less than 1% of the population.

So you can easily understand that there is a very challenging situation to understand which of these 20 million variants are responsible for what.

And this is exactly which is the framework that we are working in.

And the genetic is working in point is that usually the people has knowledge of the so called Mendelian disease.

Mendelian disease are the very simple genetic diseases where one gene has a variation so important that gives clinical consequences.

And these are quite rare usually in the population and severe when they, when they happen.

These are the easy part of the genetic studies because one gene is altered and you have the disease and these are known since many years.

What is more challenging and interesting.

And this of course, with much more broad interest are the complex diseases, complex diseases means that a lot of genes, a lot means hundreds or even more interact in a combined way to give liability to the disease.

So today, we are mainly talking of this second part because it's more relevant for us because the simple mandal diseases are already known and are treated by physicians at everyday basis.

Of course, this is raising a large interest because it affects all diseases in a different degree, but all of them psychiatric cardiology, internal medicine, diseases, and so on.

And this is why the landscape now is very exciting.

There are these large consortium, one, the largest is called Psychiatric Genetic Consortium PCC that is collecting samples all over the world, Western and Asia and Africa and putting together 100 of thousands and they are reaching also millions of samples together.

It's quite possible now to understand all these complex interactions and we are starting to have the first clinical applications.

Um I'm just thinking about cardiology in cardiology.

It's possible now to use the so called polygenic scores to predict some risk of my carbon production of other aspects and conditions are already using these scores.

But maybe we will detail this a little bit more more later.

Thank you for painting that picture.

It's so helpful.

I do find genetics a little overwhelming, especially, you know, I mean, you're talking about 7 billion, you know, 7 billion, 20 million.

I mean, it's just and the complexity of it.

Um And so I'm glad there's people like you who understand it and are looking at it, uh, because I think it's critically important.

Uh, how often is the landscape changing?

It seems like there's, every week there's some new finding in the news.

That's what it feels like.

I don't know if that's true.

Uh, but how often is that landscape changing?

Yes.

Uh Also here it's, it's important to have, um, a little bit of, of, of background and, and, and frame to understand what is happening for many years.

And many, I mean, about 2030 years, uh we we, I mean, researchers were looking at single genes.

And so I remember 20 years ago, 25 years ago, it was very common, for example, at the beginning of the 1991 92 that some genes were discovered.

And this confused a lot of the population because I remember also the newspaper they were reporting, oh, the gene of bipolar disorder has been discovered and people was of course, very happy about that.

The point is that it was not true.

A single gene cannot be responsible for a complex disorder.

As we said just a few minutes ago, gene for bipolar disorder.

Gene for schizophrenia, the gene of depression is not possible, a single gene.

So for more than 2030 years, some of these results were popping up and the, the general press was covering these findings and the reporting, oh discovered the gene discovered the gene and the population was confused because nothing happened after that.

Of course, everybody was expecting.

Ok.

Now that we have discovered the gene, we can find a cure, we can find a better treatment, but it was not happening.

Why?

Because the finding was not replicated because the disorder is complex.

And only later we realized that it's not just one gene, but it's a combination of many genes.

This is why the landscape changed dramatically in the last about 10 years ago where when there were different technologies that were able not only to look at a single gene, but to the whole genome, probably everybody remembers that.

At the beginning of the uh this century, there was a report of first time, the the the genetic code has been decoded completely.

Well, this was just a starting point because since then all of us is able to access to the whole genome information.

And this boosted, of course, the research so much because now we can cover everything and also the computational power of our computers and clusters that we are using is able now to manage this complexity.

So this was a single long step that changed completely the landscape.

And now we are able to look the whole genome in a powerful way in very large samples.

And now for the first time in history, the findings that we are finding, we, I mean, our researchers worldwide are there are replicated.

It's not like in the nineties where a single gene was not replicated.

Now, just to give you an example, it has been reported that about 200 genes are involved with the risk of schizophrenia.

And these 200 genes are consistently replicated almost completely in all the populations.

So now we are quite confident that these 200 genes have indeed a role in schizophrenia.

But I understand that the population is so has been so overwhelmed with false hopes in the past that even now maybe they can be skeptical, but this is not the case.

Now, the situation is different.

That makes so much sense.

Thank you for giving us that history because I think it, for me, I know it helps because it's always like, well, I mean, really, I feel like we heard about this, you know, 10 years ago and now it's different and so that definitely helps me understand a little bit more.

Uh So today's topic is really focused on how do genes influence our mental health.

And so I would love for you to give us some insight there.

Yes.

And this of course, is the central point of, of, of the, of the, of our work and what will happen.

And here also, it's important to have a little bit of a background about how genes can influence the human behavior and the disease.

OK.

We already said that the many variants in the genome produced are transcribed into proteins that can be different for one person to another, just think about the color of the eye or color of the skin.

And the same happens to the brain.

So our brain, I mean, the brain of each individual is different from another.

And this difference is largely due to the genetic background.

Maybe we will discuss a little bit.

This later largely means in numbers from 40 to 80% controlled by genes.

So different genes, hundreds thousands of different genes create slightly different proteins that combine in the architecture of the brain neurons, glial cells and communications between neurons in a different way.

So some person may have just an example.

An Amygdala.

Amygdala is the structure in the brain that is responsible for anxiety that gives us anxiety, that anxiety is not bad per se.

We need anxiety, we need to escape when a when a danger is closed.

So Amygdala is there for anxiety and some person have a genetically uh let's say liable built Amygdala that is more active and these those persons are on average, more anxious.

So this is a straightforward and clear example about how small variations in many genes can at the end, create and structure in the brain.

And this is the example of anxiety that is giving a liability.

So those persons with this genetically more anxious, Amygdala, for example, are on average, more alert, more anxious.

And if there is a combination of environment, environment, I mean education, parenting style, stressful life events in childhood and this can even further increment, this liability to, for example, anxiety, but it is the same for depression and the other disorder.

And then we may have the full blown picture of an anxiety disorder.

It could be a panic disorder, it could be a generalized anxiety disorder.

But one point that is very important not to be mistaken is that genetic is not 100% prediction of what will happen.

It's just a liability.

So a person that is taller is more liable.

And we know that um of some physical disorder like back pain, if you are very high, very tall, you are more liable to back pain and many other examples like that.

So an amygdala that is genetically more liable to anxiety doesn't mean 100%.

You will have panic disorder or generalized anxiety disorder, but you are more liable to it.

So, if a combination of environmental variables converge, then you can develop the picture.

And this is the same for depression, schizophrenia and bipolar disorder.

The structures are different in depression structures involved are mainly some prefrontal cortex and the hippocampus and schizophrenia is probably an issue of connectivity and bipolar disorder is even different.

So the genetic background can orient a little bit the person into specific directions of liability of diseases.

But you can have persons that have a strong uh liability for disease but doesn't develop the disease.

This is the example of uh twins, monozygotic twins are very interesting in this uh in this aspect because monozygotic twins have the same genes.

Exactly the same.

But the concordance means the rate of the disease in monozygotic twins is not 100% is very high because of course, they have the same liability, but it's not 100%.

For example, in schizophrenia, the concordance is 60 80%.

It means that you can have one twin that is suffering from schizophrenia and other twin that the same.

Exactly.

Genes is not suffering from schizophrenia.

Why probably the combination of some environmental risk and protective factors that intervened during the development and the childhood of the subject that makes a lot of sense.

Um You know, I'm thinking about the impact of lifestyle.

Uh and so the behaviors that a person does along with environment.

Um and you mentioned this percentage of 40 to 80% controlled by genes.

And do you have a sense of the breakdown of the impact of health, you know, health behaviors.

So lifestyle environmental factors, genes like that picture that's influencing exactly.

I think this is very important for people that is not working in the field to know exactly how does it work?

First, the contribution, the genetic contribution is variable across disorders.

Some of them have a very strong genetic contribution.

Always talking about complex disease, not Mandarin ones just to name two schizophrenia and autism are the ones that have the highest contribution of genes.

Some people estimate also to 80% other mental disorders have a much lower contribution of genetic factors just to name a Ebola depression and anxiety are much lower but below 40%.

So it's not the same for every psychiatric disorder.

Some have a higher and some have a lower and this is a starting point.

And then as you said, which is the combination of the other factors I mentioned one recent study that is extremely interesting in this direction that has been done in in us and where they studied the subject with a very high genetic predisposition for depression.

But when those subjects were exposed to very protective environments and with protective environments, I mean, of course, the usual things that everybody knows like physical exercise that is good for mood and anxiety, like healthy food, vegetables um to its compared to foods that we know that are less healthy.

So if you use all the possible environmental tools, lifestyle food relationships and we can think about psychotherapy anything.

Well, it's interesting to see that the effects were almost completely reversed.

So this is a key point that is important for people to know because people is looking like like science fiction movies where the genetic prediction means 100% it will happen.

Reality is different.

There is a liability.

But as you mentioned, liability can be modulated, epigenetic is just a tool epigenetic is is, is is a mechanism that can silence or activate some genes on the basis of what the environment is doing and the environment is everything, all the things that I mentioned before.

So indeed, yes, genetic is a liability, but this liability can be heavily modulated by the environment.

Yeah, I'm I remember having a student many years ago who um mom whose mom had anxiety and she had anxiety and she had this belief in her mind that her genes were her destiny when it came to anxiety and that she would always have it.

And that was, that was it for her.

Um And it was such an interesting perspective, it was a class where we were trying, where, where we were teaching about lifestyle factors and their influence.

Um And she was dead set on this belief that her genes, that was it for her.

So yes, this is indeed raising the issue of counseling.

That is very important because when a people, people knows about their, for example, liability to any kind of, of, of disorder, there is the risk of uh the, the, the, the the that the prophecy is, is self fulfilling.

So uh if I know that I have a risk for anxiety, I became more anxious, of course.

So it's a question of vicious circle.

This is why it is important that the professionals are able to modulate these, these factors, explaining and then teaching and coaching people that is not a complete destiny, of course.

Yeah, that makes sense.

Um So that raises the question.

Um because people are getting more and more genetic reports and having this really valuable information, as you know, the vast majority of our listeners are behavioral health providers.

Um What should they do if a person comes to them with a genetic report?

Yes, this is uh increasingly more common.

Of course, when there is a scientific finding, uh companies, they do their best interest.

That is, of course, uh working on, on on market and profits.

And therefore it can, it can happen that companies and there are many companies at present that are offering this kind of services may overstate the scientific evidence.

Uh Just to be clear, probably not everybody in the audience is, is is familiar with this topic at present.

It is possible for everybody without a medical doctor or prescription to, to ship a sample of saliva, for example, in, in a small box to a company and the company extract DNA from the saliva cells and the performs a whole genome analysis.

And then the company compares the whole genome analysis of the individual with the available knowledge with the database.

And usually a very fancy outcome is, is, is given back to the individual.

I've seen books of 200 pages that are some kind of individual analysis to the to the person.

So first part is about the cardiovascular system and then you read, OK, your DNA increases your risk of myocardial infarction by 20% or it can be the opposite.

The report could say your genetic profile decreases the risk of myocardial infarction or 20% or about lung cancer.

And also about psychiatry, you have a higher risk of Alzheimer's disease.

You have a lower risk of schizophrenia and so on.

Of course, I can understand that people is extremely curious about this and therefore, uh some are willing to pay in, in the range of also $1000.

It's not cheap.

Of course, point is that some of this statement can be solid.

Others as we discussed before may be uh less solid.

So this is why it's important that the professional is, is is uh filtering this information to give the real weight.

So if, if, if, if you indeed you have a gene, it is increasing your myocardial infection of 20%.

It doesn't mean that tomorrow you will have a myocardial infection.

I've read and I know that people with the, the the risk genes of, of breast cancer, they go to surgery before having the, the, the breast cancer.

Is it correct?

It's not?

Well, it should be discussed with a doctor.

Of course, uh many of these risks are not relevant in terms of an epidemiological perspective.

So, uh of course, it's important to change your lifestyle.

If you have a higher risk for obesity, be careful about your diet.

But doesn't mean that if you don't have the risk genes for obesity, you can eat whatever you want because at the end, the damage is there as well and the same for psychiatric disorders.

So overall, um I suggest to people some caution in in interpreting and working with this kind of uh reports that are increasingly more and more present.

But this doesn't mean that they are not useful.

Of course, this is a very useful service to the population because the uh the national system is not able to offer to the whole population this kind of analysis.

So if someone is willing to spend 1000 or so to get this information, it can be useful, however, be aware that it is sometime just a minor increase or decrease on the risk and sometimes the evidence can change.

Maybe in some report, you can have risk of of schizophrenia.

And then after five years, the the the the results are a little bit different and different and then your score may not be the same.

So it's important to differentiate which are the solid findings and which are the still preliminary findings that are not so solid yet.

Mhm I can see the value of the report but also that you need a professional who can help you.

Um you talked about the importance of a teacher and a coach uh when it comes to deciphering this information.

And so you know, seeing a genetic counselor or someone who has the knowledge to be able to support the translation of that information because the report itself.

I've had one, you know, it's, uh, I guess over, I go back to that overwhelming sense that I talked about earlier.

Like, I don't know what this means.

I'd love for you to just talk a little bit about how genetics can inform treatment.

I know this is a kind of a emerging field I would say.

Yes.

Yes.

Uh, this is exactly probably my, the center of, of my research.

Uh, Of course, I'm working also on the genetic of, of, of the psychiatric disorders.

But the genetic of treatment is, is something that uh I do since uh now, more than 25 years, I could say that probably we were the first in Milan to discover the pharmacogenetics of antidepressants in 1997.

So I think this is extremely important and this is not only important but it is also available at the present.

So it is clear now for the audience that we discussed that variants in the gene can create a variation in the proteins that can create variations in the brain and not only in the brain.

And therefore, it's, it's it's clear in intuitive that when you take a drug, a compound, it impacts differently based on your genetic background.

And we know that all the psychiatric drugs that we have in psychiatry, we have more than 100 different uh drugs for the antidepressant, 30 antipsychotics and many benzodiazepines mos stabilizers and so on.

So each of them is useful, but none of them is perfect.

So the difficulty that we clinicians have is to find the right treatment for every patient.

When a patient comes to us with depression, we have to choose one out of the 41 antidepressants which well uh at present, what we are doing is based on clinical knowledge, comorbidity.

If you have, for example, diabetes, I will avoid the antidepressants that can increase weight gain.

And there are a lot of criteria for choosing, but they are all clinical criteria.

So the ideal, the ideal scenario is to have a genetically driven indication of the drugs that you should be prescribed.

Because what happens is in the end, you always almost always find the right drug.

But what I say to my patients at the beginning, I say, OK, I see you today for the first time.

Now you have a clinical picture of depression.

I will do my best to find the best treatment for you, but it may take a while.

It may take six months, nine months, one year, one year and a half because every drug should be tested for 234 weeks.

Uh for some person lucky.

The first is the most effective and it is working for other persons.

We have to shift to combine and then it takes months.

So it would be a big improvement if we have a genetically driven prescription at present, something is already there because genetic factors they control also the metabolic enzymes of the liver.

And we all know that all the drugs are metabolized by the liver.

And so at present, we know that 20% of the population are either poor metabolizer or rapid metabolizer.

It means that they have a different, differently active liver enzymes.

So it means that for 10% of the population, you should use much lower doses than usual because they are poor metabolizers.

And if you give the normal dose, they will have a lot of side effects.

And then you have the opposite of very rapid metabolizers where the standard dose is not effective because it is metabolized by the liver very quickly.

And therefore, you should increase the dose above sometime the threshold of the label.

And this is already in the label of many antidepressants and many hospitals are already doing this, not all of them.

The point is that it is expensive, of course.

And so not all clinicians are willing to do and to pay for it, but it is already there and it is useful, practical and, and, and this is an application of genetics that we have in our clinical practice.

You go to the hospital, you see if you are a poor metabolizer or api metabolizer and then the dose is adjusted accordingly.

And this is the simple thing that is already there.

The most complex is the so called pharmacodynamic analysis.

That means the genes that modulate your brain structures.

So for example, you are taking an antidepressant.

Antidepressants are serotonin re uptake.

He is the most common that inhibit the re uptake of serotonin and increased serotonin in your brain.

But you can have different serotonin allergic receptor in your brain from a genetic perspective.

And therefore, some of these compounds may be more useful for you or less useful.

Maybe you need another energy antidepressant.

Maybe the serotonergic are not working because just as an example, your serotonergic receptors are less plastic and the plasticity, the lack of plasticity and therefore they do not adapt to the compound.

And this is the frontier that we all in the world are working to try to understand which are the genes that modify the brain structures that in turn modify your response and tolerability to antidepressants, antipsychotics and mori.

So this is what is already here, what we are working on on this.

There are many companies that are already selling.

Uh uh In the last paper, we counted about 54 companies worldwide that are already selling the prediction of efficacy of antidepressant or antipsychotic.

Again, like I said a few minutes ago, some of the information on this prediction is sound like the one about the pharmaco uh kinetic liver enzymes.

Some information about the pharmacodynamic variation in the brain is less stable at present.

And therefore all the society like for example, the Psychiatric Genetics Society are suggesting the population to be careful about interpreting and working on this data at present.

And then there is a possible impact in the future.

All this knowledge about the genes can allow us to use new treatments that are not used now for psychiatry.

For example, some of the genes and proteins that we identify as risk factors for schizophrenia or depression can be modulated by compounds that are used in other fields of medicine like diabetes, for example.

And this is called the drug repurposing that are out there 5000 drugs that may be the impact on some genes and proteins that are relevant for psychiatry.

And this is a field that is receiving a lot of interest because you don't need a new drug.

You just repurpose a drug that is already used for something else in psychiatry.

And then there is the last stage that is the knowledge of the genes that are involved in schizophrenia or bipolar or depression.

And then you can target these genes or even change those genes on this.

Of course, we must be extremely careful because uh this is probably the future and I'm not even sure that in 50 years we will get there.

But just to tell the population, it is possible to get there.

If you know that you have one malfunctioning gene that gives you liability, for example, to the Amygdala, then anxiety disorder, you can target this gene with some tools or you can change the gene.

It is possible.

Now we have the technology to change genes in living individuals.

Of course, this is extremely dangerous because when you change a gene, you don't know which is the possible cascade of events.

You can do some damage, create cancer or whatever because it must be very well studied.

But in theory, this is possible and it could be the definite definitive treatment for psychiatric disorder because current treatments, let's remember that they modulated the disorder, but they don't curate the basis.

It's not like antibiotics for pneumonia, antibiotics kill bacteria that gives you pneumonia and then you heal completely in, in, in, in schizophrenia and depression, we are just modulating as much as possible with the drugs and psychotherapy, but the underlying cause we cannot change unless we change the genetic structure.

This may be a really silly question.

Um But I'm gonna ask it anyways.

Um has there been any research done to understand if different psychotherapies influence genes in any way?

Yes, this is a very common uh discussion uh uh among uh doctors, psychiatrists, psychologists, psychotherapist.

And in the past, it was also a kind of a fight who was supporting the psychotherapy, who was supporting the biological approach in the sixties and the seventies, particularly in the US and Europe.

There was a big debate about that.

Well, at present, we, we know that the situation is that everybody is right and everybody is wrong because indeed both drugs and psychotherapy at the end, achieve the same effect with different pathways.

When you take an antidepressant, you increase plasticity, you increase activity in some brain areas.

When you do psychotherapy with the top down mechanism that is linked with the psychotherapy process, you change the same structures.

So at the end, the outcome is the same.

This is why at present it is always suggested and to combine drugs and psychotherapy, that is by far the most effective strategy because you face the problem in one direction, bottom up with the drug that change the mechanics and molecules.

And the top down with the psychotherapy that changes the pathway of activation of the frontal cortex and limbic system.

So which is the best psychotherapy?

This is a very challenging question.

Of course, the psychotherapies that we use currently are the most easy to, to, to use C BT cognitive behavioral therapy.

It is practical, it is easy to train you can do in 2346 months.

Psychoanalytic, the psychotic treatment, it is extremely more expensive.

It can take up to 5, 10 years, sometimes more, 34 times a week.

So it is much more challenging.

It is difficult to study.

Some people say that with psychoanalysis, you can change deeply your brain structure in your functioning in your disease.

But it's difficult to study.

There are no many studies because you can understand that the 10 year long treatment is difficult to study personally.

But this is just personal opinion.

I believe that psychoanalysis is very long and intensive treatment is useful.

Not in all disorders, not in the most severe, not in the psychotic disorder probably.

But it is very expensive and, and, and, and, and burdensome for, for, for, for, for the person and the other psychotherapies are overall in my experience, very similar interpersonal cognitive behavioral.

Uh, they can be targeted on the need of the person but they change the brain in the same way, the drugs change the brain just with a different mechanism.

Mhm Well, and going back to originally talking about lifestyle, you know, physical activity and um healthy foods that those are a key component as well that sometimes can be overlooked when we look at mental health.

Yes, maybe if you want, I can briefly discuss this.

There is a very huge interest at present on this in the so called microbiome that are the bacteria that we have in the gut.

And they are extremely important because the so called junk food is promoting the so called bad bacteria in your gut.

And this bad bacteria, what they do they produce, let's say uh bad substances to be simple, like a pro inflammatory substances and so on.

And they put the individual in, in, in a state of uh uh antonia, uh insomnia, anxiety on the opposite.

Uh healthy food like vegetables, fruit, some fishes and so on.

They promote good bacteria and the good bacteria, reduce the inflammatory state of the bowel and the entire body and therefore also the brain.

So there is a very uh bidirectional clear communication between the gut and the brain and the bacteria and the gut in the brain.

So there is now increasing evidence that healthy food is changing the bacteria in the gut that in turn is changing the functioning of the brain in the direction of anti anxiety, antidepressant.

Yeah.

Thank you for mentioning that.

Um it's amazing all that we continue to learn, right?

You're talking about what we, what we're pretty solid on what we know and that some of these findings we have to take with a grain of salt until more research is conducted and there's more data to be able to decipher through.

Um It's, it's I I find it fun and interesting, but I can imagine some people might find it frustrating and like, OK, why do I even care?

So um what do you see for the future of genetics?

Well, the future is a combination of the things that we already discussed in the past minutes.

Um I see that uh when the discoveries will continue to pile up and we will have more and more information, all this information will be used in everyday clinical practice.

You probably know that at present many hospitals in the US, but also in Europe and Asia and many other countries are using the so called electronic health records.

In the past, we used to write the paper charts of the patient that was typically quite a nightmare for us writing and for other people reading because doctors usually don't write very well.

So it was an issue that is going on since many years with electronic health record.

This is so but electronic health record is not just something that is comfortable and useful, reproducible and easy to find much easier than paper record, of course, but can be combined and therefore genetic is now starting to be included into electronic health record.

So the typical picture is that you go to a hospital and then the doctors can access your, of course, with permission, your electronic health record and they can see, ok, Mr Smith, I see that you had some surgical procedure, you had some pneumonia, whatever you had a depression two years ago.

And I see also that you did the genetic analysis and you are a poor metabolizer.

Therefore, I will prescribe you a lower doses of the antidepressant.

So this clinical situation is something that could not happen without genetic, without an electronic health record.

And it improves a lot the quality of the care because if you don't know anything, you have to start every time from zero patients, not always bring with them uh previous uh prescriptions previous also because they can get lost or they can be difficult to read or anything with electronic health record.

We can incorporate genetics for every doctor that is treating you.

And this is the very first important step.

And then there is a second one that is very common these days, everybody is talking on the newspaper that is artificial intelligence point is that uh um at present, the information is too much for us doctors.

You have to think that when a patient comes to a psychiatrist in a hospital or whatever, you have to look at all the clinical features, how are you, which is your mood, How do you sleep and so on and then you have to see all the medical aspects as well.

We are doctors and so you have to see all the blood analysis, some basic genetic analysis, you have to know all the previous medical diseases, person has diabetes or maybe had hypertension and information is a lot.

It's too much probably for a human mind and, and you don't have time or you can forget, I always tell to my residents, you have to ask everything, don't be shy, just keep a list on your desk because if you forget something and you don't know something, you can do some damage and therefore artificial intelligence could do this work for us.

So when you access the electronic health record, you talk with the patient, you collect your psychiatric information and then the system, the software tells you, oh, be careful because this person has hypertension.

You are prescribing, for example, vela and vela vaccine is an antidepressant.

It is increasing blood pressure.

Are you sure that you want to prescribe this.

It's just a warning.

It's not that artificial intelligence is substituting the doctor.

No, not yet.

At least, probably not in the next 50 years.

But artificial intelligence can underline something for you and to avoid you to do mistakes and, and in the future, the, the far future, of course, we can do this gene therapy that is already done in some hematological fields, but this is probably much further than, than we will live.

Wonderful.

Thank you.

Um As we wrap up, I wonder if there's anything else that you feel like is important for our listeners to know or understand.

Well, my suggestion is that first not to be frightened by things what I always see in 30 years that I am going around worldwide.

I see that some people are frightened.

No, no, it's genetics.

I don't want to hear about it.

Why?

It's something that can be useful.

It's not something that is terrible that is completely changing the world.

It's just one another, another piece of information.

So I would suggest people to be curious and then maybe to refer of course, to serious sources, not just to the first web page that you can find just to, to have some lay information that can inform you about what, what things are doing, like what we are doing today here.

It is possible to find the similar sources of information.

So don't be scared about genetics.

Um Don't be over enthusiastic about genetics.

It's just something, it's just a piece of information that can help people and, and, and doctors.

I love that.

Yeah, I really see how genes are our foundation for um health.

And there's so many different pieces, right?

We talked about the environment, we talked about lifestyle uh microbiome, like there's so much complexity in pieces of this puzzle.

And genes are a really important piece for us to know and understand moving forward and we inform more precision medicine in the future, which is exciting.

Exactly.

Exactly.

Your, your summary is perfect.

Well, I really appreciate you joining us today, Dr Satti, it's been a joy and I, I don't feel quite as overwhelmed and scared about jean.

So, thank you.

Thank you.

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