Dermatologically Tested podcast – Episode 18. Dermatology AI with Rubeta Matin

Matt Gass
Welcome to Dermatologically Tested, the podcast of the British Association of Dermatologists. Today is our last episode so I really hope that you've had a chance to listen to all the episodes this season. But if not, then you can go back and listen to those, we certainly would encourage you to do that. Today's episode is all about AI and dermatology.

We're going to be looking at what AI is and how it works. We're going to be talking about how it can improve the lives of both dermatology patients, but also dermatology professionals and we're going to look at the concerns around AI and using AI in a medical setting. So you know, whether that's privacy concerns, safety concerns, and the importance of good regulatory frameworks to ensure that patients are safe and getting the best treatment possible.

Our guest today is Dr. Rubeta Matin, a consultant dermatologist and chair of the British Association of Dermatologist artificial intelligence working party group. Rubeta, welcome. Thank you for joining us.

Rubeta Matin
Thank you.

Harriet Dalwood
Hi, Rubeta.

Rubeta Matin
Hi, thanks for inviting me.

Harriet Dalwood
So do you think you could start off by sort of explaining what we mean when we talk about artificial intelligence in dermatology?

Rubeta Matin
Sure. So artificial intelligence is basically when computers perform tasks that normally require human intelligence. It's when a machine or a system or a computer uses data, or rules to make assessments or predictions like humans would essentially. There are lots of different definitions for artificial intelligence and there are lots of terms I mean, we could probably spend the entire podcast talking about the definitions and all the different ways we could explain artificial intelligence.

To different people, it means different things but there are a few things, which I think, you know, people hear and talk about, and sometimes they're confused about what they mean. One of the things is, you'll have heard people talk about algorithms. Algorithms are basically like a formula if you like, or a set of mathematical instructions and so in AI, basically, algorithms are used to sort of analyse large sets of data.

So lots of information, imagine so, you know, in healthcare, we're talking about or in dermatology, in particular, we're talking about analysing lots of pictures of patients rashes, or lots of pictures of patients lesions, or maybe lots of information about patients. You know, what treatment they've had, or what treatment they're on, and so on and these are basically data sets, so these are sort of collection of information and for these algorithms to work, essentially, you need huge datasets, you need lots and lots of information so that these formulas can kind of train on this information.

The other thing I suppose to mention here is that people talk about medical devices now, particularly in healthcare and medical devices are basically where these algorithms sort of within software, and this software has capabilities for diagnosing or deciding on treatments and so on and when you've got a software that actually has this AI algorithm included within it, then this is classified as a medical device.

Matt Gass

Okay, well, that's really interesting. Do you think you could give us some examples of maybe slightly more typical medical devices that don't involve AI.

Rubeta Matin

We have lots of medical devices in dermatology already. For example, the dermatoscope, and many people who are listening to this will have seen that this is something that dermatologist use with these handheld microscopes. They're pretty straightforward devices, because they're basically a microscope with a light and that gives us a better magnification of lesions that we're looking at on somebody's skin.

Imagine if you had a minicomputer within that dermatoscope and then you also had a camera that could store a photograph, and then you had an AI algorithm that could then analyse that photograph, then you've basically got yourself an AI tool, essentially, that can make a diagnosis from that image.

Harriet Dalwood

So you mentioned there are many different types of AI, it would be great if you could touch upon the main ones we might be talking about today.

Rubeta Matin

Sure. One of the main areas of AI that has been applied for dermatology is machine learning. So machine learning is basically where a computer learns automatically from experience without actually you providing any specific instructions.

This usually requires lots and lots of data to do and that the original application of artificial intelligence was actually through machine learning where you had this system where basically you were trying to distinguish between two different things. So the most basic level, there was an algorithm that was developed to basically determine the difference between a cat and a dog. So what they did was they took lots and lots of images of cats and dogs that had been labelled and then they trained an algorithm to basically decide whether, if you showed this algorithm, a new picture of either a cat or a dog, it will correctly identify that it was a cat or a dog. This is a great if you wanted to know, if you suddenly had a picture of a cat, and you wanted to know whether it was a cat or not. The problem with that, of course, is then when you show this algorithm a different animal, so for example, a giraffe, and it's never seen a giraffe, the big problem there is that it has to decide between cat and dog. So it will just be a guess, between one or the other and of course, it will be incorrect. So you can imagine if you then take this type of learning, and apply it to skin, which is what a lot of people have been doing.

So this idea of determining what the diagnosis is, from a picture makes sense to us as dermatologists and to people who have skin conditions because you take a picture of your skin problem and you want to know well, what is the diagnosis? So it's not, Is it a cat or a dog? But is it, Is it a melanoma or a type of skin cancer? Or is it something very harmless, like a wart or something like that, or just a regular mole, for example. But the issues with this is that it's not quite so simple. There aren't just two options. We've got more than 2000 skin diseases. And then if you take that into consideration, it's a much, much bigger challenge to decide what skin problem you've got.

Matt Gass

Yeah, I mean, it's a fascinating area of work. It's being applied to all kinds of arenas at the moment, not just dermatology, not just health.

Rubeta Matin

It's not a computer mimicking a human, it's a computer doing tasks that humans can do. But it's not actually replacing a human and I think that's one of the things that people are worried about, or struggle with, is that, is this going to replace humans? Actually, it can't replace humans, there are so many aspects of human

behaviour that a computer will never be able to mimic and replace and so I think for healthcare, certainly, it is more about how we can work together with computers. How can we have a synergy with computers to actually make healthcare better? You know, how can we improve things for our patients, and computers will always find ways to work around, you know, they will always find an easier route. Humans do that to a degree, but computers will definitely have a quicker way to work that out.

Matt Gass
Yeah, definitely. I mean, it's really interesting. We've got an idea of the way these AIs work now, from what you've explained, but what are the areas that we think they're going to be working in? What potential does AI have for dermatology for improving patient care? And, you know, the lives of Dermatology professionals as well.

Rubeta Matin
I mean, I think the potential for AI in dermatology and in healthcare in general is immense and I think we've yet to see it really be realized in even in other specialties, where they're further forward than we are in dermatology in relation to AI. But I think the main areas that we're probably seeing AI being used is as a clinical decision support tool, so I talked about the synergy between doctors and computers, and how can AI actually support clinicians to do their job better. And I think that's, that's a big area at the moment that I think we're seeing a growth in dermatology.

The other area, which is pretty big, to a degree in dermatology, but more so probably in some of the other specialties is patient decision support tools. So this is where you've got everybody knows about smartphone apps, and they're using lots of apps. Many of these apps are now using artificial intelligence to help either to give people diagnoses, so either to help them manage their conditions or indeed give them ideas around lifestyle advice so I mean, in relation to dermatology in particular, there are a few things where we've got apps that allow you to take pictures of moles and then look at them again at a later stage.

There are apps that tell you about lifestyle changes, such as you know, using sunscreens and trying to prevent developing skin cancers or prevent aging of your skin and so on. There's quite a few that I think there's a big growth market in the patient support tools. The other areas, which are probably a bit less exciting is about administration and processes so basically, how do we kind of make things much more efficient in the hospital and anybody who's attended. The hospital will know that their processes are quite slow and that things can take quite a long time, and that we've got these sort of a combination of paper and electronic records, and how do we make all of this much more efficient and I think AI definitely has a massive role to help us do this and I feel like, that's where we can see the biggest benefits and also it will benefit both the clinicians.

It will also benefit the patients, because it will give the clinicians more time to actually speak to patients rather than worry about filling in forms, and looking up things on the computer, and so on. I think that's a big growth area, which I think we haven't really seen, but I hope will be an area that, you know, AI will really expand into.

Matt Gass
Resources in the NHS are so important and using your resources well, and one of the key resources, obviously, in dermatology, is the consultant workforce and one thing that we know really well at the BAD is that there's a big shortage of dermatologists in the UK, not because there's a shortage of people that want to become dermatologists or anything like that, but because of the demands elsewhere in healthcare, for GPs, for people in A&E, and so on, and so we get sort of a limited number of new dermatologists every year and so using their time more effectively could have a huge impact for dermatology. I suppose part of that is around taking off some of the administrative burden. A lot of people talk about the red tape in the NHS and the need to cut that red tape, which sometimes be a bit simplistic, but is generally a good thing.

Rubeta Matin
No, definitely.

Matt Gass

And then the other side, If we can improve referrals, I suppose that's something that we kind of touched on with the diagnosis side, you know, if we can support GPs to make better quality of referrals, then there will be sort of fewer, because a huge amount of dermatology work is looking at benign moles or otherwise harmless things and so I suppose if you can improve the percentage of people going through with genuine issues, then then obviously, that that would be great.

Rubeta Matin

So at the moment, I think that is the biggest area that AI is focused on is trying to help that referral pathway between GPs in the community and secondary here, specialist services. And I think one of the things around that is that in order to be really sure that you're making the diagnoses correctly, you know, I come back to this thing about having huge datasets and having lots of images, because many of the tools that we've got at the moment basically can diagnose 10 different skin conditions, for example, or a limited number of skin conditions and we know that there are 2000, more than 2000 that GPs will refer or we'll see and need to think about whether they need to refer in for us to see.

So you can imagine if you've got a system and you know, thinking back to this, the cat dog system where you've got to choose between one or the other, and if you've only got a choice of 10, then what happens to the other 1990 conditions? They have to either decide they're in one of the 10 options, or you just send those patients in, and that's not the best way to manage.

Matt Gass

Yeah,

Rubeta Matin

A referral system., and on the other hand, even if you have a situation where you can choose between 10 different things, or the don't know, option, the don't know, option is also not great for patients, they want to be told, actually, it could be one of these things, or it's something that we do need some help with, so I think there's a way to go with this but I feel like the potential for it is huge because if we can do that, then as you say, it's going to really help streamline the number of patients that need to come to hospitals and actually reassure people appropriately that they don't need to come to hospital and that they don't have anything that you know that they need to worry about.

Harriet Dalwood

Obviously, we touched on the positives and the massive potential that AI in dermatology does have, are there any concerns that surround AI being used in a medical setting? and it would be great if you explain what these might be.

Rubeta Matin

Sure, so I think for me, reliability is really the key concern and I think the use of AI to make a diagnosis or to predict what might happen is actually life changing implications, so this is really important that the reliability of AI is key and central to how AI is developed and how and where it's used, and this kind of falls into an area around data quality.

What I mean by that is the data on which the AI is trained is really important and so you have to almost take a step backward from what is the tool that you've got, but actually what was it trained on to get to the point that it has become a tool, if that makes sense, and the reason that people I think, are quite sceptical about the inner workings of AI is because it's very difficult to see, it's not visible, you can't kind of see it, and then it's just in front of you.

There is a lot of stuff that's going on in the background in a computer and so that I think, causes people concern, so I think, you know, going back to the data, I think there are lots of things around how you collect the data, who the data relates to, where did it come from? How was it collected? Who contributed to it? Did they give permission to give those images? And so on. For dermatology, in particular, did patients agree that they wanted to share these images to be tested on and for this algorithm to be developed? Also, what do we know about those patients? So do they really represent the people that you want to actually use this tool in, so for example, if we take the referral pathway examples so the patients that are seeing their GPs, with skin problems.

If you use a tool in general practice in the community, then you need to know that it was tested and validated, or you know that it was trialed on people who were in the community, there's no point in trying to roll out a tool which tested on just images from the internet, for example, because we don't know that they're real life images, we don't know who they relate to, and they're not necessarily representing the population in which you're trying to use this tool, and I think one of the most important things that's come out recently, across many specialties, but in particular, dermatology is that we know that the way that we collect data in healthcare isn't always representative of every individual, so it's not representative of all ages, it's not representative of all gender, it may not be representative of skin of colour and so what we really are looking for is, you know, was this dataset actually inclusive? Did it have everybody represented within it?

Because then you feel confident that actually, if that AI tool was trained on a representative data set, that it could then be applied to the population that you think it would work in. So I think it's it's about what it was trained on, and how confident are you that it was trained in representative population and that it is reliable.

Matt Gass
Yeah, absolutely. I mean, I think that's the sort of thing that is quite easy to take for granted that, well, it's a computer algorithm, it can't have biases, what you put in is what you're going to get out.

Rubeta Matin
Completely.

Matt Gass
If the data set that you put into the machine has bias built in, maybe you went to a football ground in Iceland, and got data from a load of Icelandic football fans, and then you try to apply it to a suburb in South London, you're not going to get good results.

Rubeta Matin
No, exactly, and it doesn't make sense and I think that's one of those things around, you know, if you want to use a tool in the UK, you really need to have tested it in a UK population, and that's where actually we don't have lots of big data sets in the UK that are available.

There are lots of datasets that are publicly available online, but they don't necessarily represent our UK population and so that's where I think we need to see some changes, and that is a concern, because I think what happens then is that you think that you may end up having a situation where patients are falsely reassured that they don't have something or that they are actually they are given a diagnosis that they have something quite concerning when actually they don't and then they become quite anxious, and they're having to go to hospital and have extra visits and interventions, like biopsies, and things like that. So I think it's really, really important that data are really representing the people that that you're using the tool in.

Matt Gass
Absolutely. So we've talked a little bit about this, I think that you've outlined some of the positives and the negatives there really clearly and I think that what is clear is that if you're going to use AI and have it, either in the medical setting, or accessible by patients directly, it needs to not cut corners, have the right data set, have the right permissions, respect patient privacy, and put the patient safety at heart of it and then you've

got the basis for what could be a good tool, assuming that all your research and all the rest lines up and it's accurate, and so on. So it does seem like there's a lot of hoops to jump through, but really important ones. so that's good to just understand that a little bit better. So can we talk a little bit about how it's actually used in dermatology at the moment? Is it used in dermatology at the moment or are we waiting still for the advent of proper AI in dermatology?

Rubeta Matin

So, I think, at the moment In dermatology, In my opinion, I think that AI is probably only fit for purpose in an experimental setting. I don't think we're there yet. I mean, it's difficult for people to understand that because actually AI is all around us, you know, everything that we do is actually already has some aspects of AI, so for example, you talk about things like Amazon's Alexa, iPhone's Siri, you know, these are all virtual assistants.

We've got chatbots, on loads of websites, for example, banking relies quite a lot on AI and things like detecting credit card fraud, and so on, so that it's happening all around us but I think in healthcare, it's slightly different, because, as you said, we need to really focus on patient safety, and we need to make sure that before we start using it, that we've really considered all of those things around risks to patients.

So I mean, the reason I say that, I think at the moment, AI is probably only fit for purpose in an experimental setting is, although we know that there is definitely evidence that algorithms can diagnose certain skin cancers, in particular, melanoma, I think what we really want to see is that algorithms are actually better than what we've got at the moment in every aspect, so just being able to diagnose one or two skin cancers is not sufficient, we really need it to be and maybe, you know, this is kind of setting the bar too high, but I think we really want it to be almost 100% accurate, we want it to be much better than what we've got at the moment and it needs to be equally as good as identifying, say, for example, melanoma or skin cancer, but it needs to be just as good as saying it's definitely not a melanoma, or it's definitely not a skin cancer.

That is, I think, quite a big ask even for a computer and so I think we've still got a bit of a way to get to that point, and I think the other thing is that we need more studies where these tools are really comparing to what's going on in a real-life situation. So that means that we're collecting all the information that you need to demonstrate that it is better than what we've already got, at the moment, because we've got some pretty robust pathways in dermatology already and I think, why would we take on a tool that's not going to actually improve that?

Matt Gass

Yeah, that's interesting, because you do see papers come out from time to time that say, well, this AI can predict whether it's skin cancer or not better than these dermatologists and it's quite often the point there is that that's just a dermatologist, looking at a picture of a mole, which is not how dermatologists diagnose skin cancer on the whole in their day to day job, they see a patient, they take a patient history, they ask the patient questions, they look at the rest of their moles, etc, etc. And it's not as straightforward as just being like, if you look at this picture, this AI is better than a zookeeper at spotting the giraffe.

Rubeta Matin

I think that's a good analogy actually, because I think that's exactly the case that, we, as you say, as dermatologists, to be honest, because of COVID, have probably got a lot better at making a diagnosis from a picture, but before COVID, we would always be the best, the gold standard practice is that a patient comes in and you look at them and you examine them, and you take their history, and that's how you make that diagnosis. So, you know, I think we do have to get better.

I think COVID has taught us that we definitely have to start using images to make diagnoses and to decide what to do for patients and where they should be seen and how they should be treated, but I think you're right, that actually, if you just compare what the computer can do, to me looking at a single image, it's not surprising that the computer is better, I think that we would expect that. I think if you put it against somebody, and we've certainly seen some papers, where actually if you put the same algorithm against a

dermatologist in their setting, with the patient in front of them, actually the algorithm doesn't do as well as you thought it would and so that's what I mean about real life studies that you really want to see what is it doing compared to what's happening? What's actually happening?

Because, you know, that's not reality is that we're not actually just sitting in front of a computer looking at one little square of a patient and making your decision about whether it is or isn't a skin cancer,

Matt Gass
You say, why would we take on an AI in our clinics, if it's not as good as what we've got already? Do we lose anything by that approach in terms of, well, if we have them in the clinic and train them more and they're exposed to real life scenarios and people making them learn, well, then they'll improve the AIs quicker and we'll get to a point where we do have a really good AI in place, or maybe that's a false equivalency I have no idea, maybe they can still do that in the background. And but I'm curious about that.

Rubeta Matin
No, no, I think there is still value in that because at the end of the day, you know, people have different experience or expertise in certain conditions, don't they? So, some people will see lots of skin cancers all the time, and some people will be seeing lots of patients with eczema, for example and so I think there is definitely value in having at all, which is not necessarily better than the best or the most expert, dermatologists but actually better overall than the service that you're providing.

I think one of the things that we have seen, and I think needs a bit more work, is around how do we as clinicians interact with AI, so there was a study where they showed that, if you were really confident about your diagnosis, as a dermatologist, then if the AI didn't agree with you, you probably still went with your own diagnosis. Whereas if you were less confident, so if you were a trainee, for example, and the AI didn't agree with your decision, you tended to err on the side of the AI, and so in that scenario, if the AI is really influencing the doctor, you want the AI to be 100% correct because otherwise, this brings up another issue, which is, and this is another issue that's really, again, across all specialties, and particularly a real problem right now in radiology and that is, what happens if the AI tells you to do something, and actually, it turns out to be wrong? Who's responsible? It's a computer, and you're the doctor so where does that responsibility lie? I think ultimately will always be the doctor's responsibility, and so we need to feel confident and to feel that you can trust the AI, you need to know that it really is very reliable and it's, not going to give these false diagnoses or false outcomes.

Harriet Dalwood
Like you mentioned, it's all about patient safety at the end of the day, and that is the most important part, and yeah, if you are relying so heavily on AI, you do want to make sure is pretty much 100% really.

Matt Gass
I suppose also, you need to just, without being cynical, because there's a lot of very good people doing excellent research for all the right reasons. We also just need to be careful that commercial concerns don't trump good practice and patient safety because, there is a lot of money to be made for a company that can produce an effective high functioning AI that can revolutionize say skin cancer services, or eczema or whatever it may be. And so yeah, it's just getting that balance, right. But at the same time, we don't want to lose out on amazing developments.

Rubeta Matin
No, no, definitely. I mean, we don't want to lose out on these developments, and I think everybody, in general, dermatologists and patients with skin problems, really welcome AI, I think we really wanted to help to streamline our services and make things more efficient and I think there are some real benefits to be had.

Harriet Dalwood

So with patient safety being such a massive component of AI in dermatology, and obviously there are a lot of mobile apps, which sort of claim to be able to diagnose or identify skin disease, and commonly skin disease like melanoma, and there are these applications reliable? Can patients trust what they say? Or would you say, go and visit a GP? In the first instance, always?

Rubeta Matin

Yeah, I think so. as you say, there are lots of mobile apps and I think sometimes it can be quite overwhelming for both doctors and for patients. I think one of the things is, we really need to think about. It goes back to what I was saying earlier around, what's the evidence that underpins the app and this can be actually quite difficult to sometimes find and often we don't really know where to look to find this information, and the reason I say this is because at the moment, we probably don't have a really robust regulatory system that actually guarantees the quality of the evidence that underpins these apps.

There are some questions that I think probably people need to think about when they start to use apps and I think probably the main one, I would say is, is the app actually doing what you want it to do? Is it actually solving the problem that you wanted to solve? Because sometimes apps will say they'll do something and then when you look at what they're actually doing, they're doing something completely different and also are the claims realistic? An app that promises the world probably won't be able to deliver and so I think that's one of the things to kind of really look at and scrutinize, and the other thing is, how's the app been tested in the past? Who was it been tested on? How was it developed?

These kind of things are really important, because then it tells you whether this would actually be appropriate for the problem or the question that you're asking and then coming back to this issue around privacy and patient data, so often, these apps will ask you to give images of yourself or provide some information about yourself, and I think it's really important that patients understand what's happening to those images, you know, what are they using it for? Where are these images going? Who are they being shared with, and so on. This is quite important to know, because sometimes I think people don't know where their images are going on how they're being shared, and actually, that can be quite dangerous.

I think it comes down to reading the small print. So you know, the most important information is often in the small print around whether this tool is actually something that is going to deliver on what it says it does. So people often use these apps to say, for example, apps that say well, I'm going to tell you what your skin problem is, for example, so I'm going to make a diagnosis, but if you look in the small print, they often say, actually, this is not a diagnostic tool, you should go and see your GP and if that's the case, we'll actually what's the point of using it? If you're worried about something and you want to know what the diagnosis is? Why don't you just go and see your GP, you don't need the app to tell you that, so I think it can probably come back to your question, I think, yes, at this stage, if you're concerned about a changing skin lesion, or you're concerned about your rash, or things are getting worse, better to just see the GP and get some proper advice, because I don't think at the moment that there are any apps that going to replace the GP certainly,

Matt Gass

Yeah.

Harriet Dalwood

Excellent. I mean, yeah, that checks out, I would say if someone is truly concerned at this at this point, absolutely.

Matt Gass

And also, it ties into what you were saying earlier in that it takes a brave GP to overrule an app that said, oh, this is cancer, even if they think well, this is definitely not skin cancer.

Harriet Dalwood
Yeah.

Rubeta Matin
Yes

Matt Gass
And, you know, we know that GPS can be a little bit cautious, understandably, because nobody wants to be the person that misses a melanoma, they can be a little bit cautious and over refer as is. And so you know, I think it puts pressure on GPs to refer as well,

Rubeta Matin
Well, I think if a patient is told this could be melanoma by an app, and then you go to see a GP who's not 100% confident, which is understandable, as you say, then, you know, GPs do not see as many melanomas as dermatologists do, then the patient will also put a bit of pressure potentially on the GP to be actually I want to see a specialist, you know, I need to I need a definite answer here. I'm not sure I can kind of hope for the best.

Harriet Dalwood
Absolutely. I know that you also mentioned briefly, regulation of AI, and how it can be quite challenging getting the balance right with that. Could you explain why this is?

Rubeta Matin
Yeah, so this is an interesting area, and actually very much evolving right now in the UK and that's because advances in the AI field happen very quickly and so, until relatively recently, it's been very complicated to understand how things are regulated. This is a complex area, both for people who are using these AI tools, but also people who are developing these AI tools. There are so many different agencies that were involved in regulating different parts of the development, then actually, it was difficult to know who you're supposed to go to, to obtain these regulatory approvals and so actually, what's happened in the UK very recently, which has been a really great initiative is this multi-agency advice service has been set up.

There's the Mass, M, A, S, S and basically, it's a number of participating bodies, so it includes NICE, so the National Institute of Health and Care Excellence, the Care Quality Commission, the CQC, the Medicines and Healthcare products, Regulatory Agency, the MHRA, so they're the ones that regulate drugs, and then the Health Research Authority, the HRA, and they're the people who oversee clinical research in the UK. And what's happened is that this sort of cross regulatory advisory service, essentially, is providing a one stop shop for all people who are either developing AI tools or who are actually wanting to use these tools, so that you can provide one point of access to actually give guidance for regulation, and so on. The thing about this is that it will make it easier, but it will also mean that clinicians can be confident that these new technologies, as they're developed in the UK, in particular, and are adopted that actually, there has been a very rigorous process that somebody has really looked at the way in which these tools have been developed and tested and validated so that clinicians can be confident, but also patients can feel like, in the same way that patients feel about drugs that have been tested very rigorously.

The MHRA have a very robust system where you can actually you know, that the drug has gone through all of these stages of development, and that it's safe to use in people and so in the same way, I think that's what we need for AI really, and that's what this is aiming to do.

Matt Gass
Great. I mean, yeah, definitely sounds like it's needed. It sounds like it just about offering the clarity to everybody involved to ease the passage and just make it easier for developers to put patient safety first and

understand what they've got to do, and I imagine that not all of these experts are necessarily coming 100%. From a health background. I imagine it's a fairly mixed field.

Rubeta Matin
Yeah, I don't think many people that are developing technologies in this space are not healthcare background, I think a lot of people, now a lot of doctors, nurses, and clinicians, are involved in developing products and are supporting development of products but, historically, this has all been in the sort of computer scientists, mathematics field, machine learning experts. I think they have also struggled to work together with clinicians in order to develop these tools and I think what doesn't help then is that you've got all of these different bodies that have got all of these different guidelines that are trying to make sure that everybody is doing something which is trustworthy for patients.

Matt Gass
Absolutely. One last question, we've talked about the evolving regulatory landscape and how important it is. Do you think there's any important changes that you would like to see implemented? In an ideal world, it sounds like you think we're heading in the right direction, but do you think there's more we can do to improve the regulatory landscape around AI?

Rubeta Matin
I think at the moment the MASS service are soon to actually put out some guidance, so I think that will probably be, or I'm optimistic that that will help to make it easier for everybody, and also help us to guide patients when thinking about whether an AI tool is suitable or not and I think that having these kind of clear and transparent arrangements for regulation and access are really essential. I'm optimistic that things are changing.

I think it has been difficult over the last few years, particularly again, over the COVID pandemic, things have really accelerated in a big way, and I think that, we just need to be a bit more cautious around this and I think a lot of people, particularly in the tech world, and in the digital field, they want to run fast and break things. And of course, in healthcare, that's the absolute opposite of what we want to do, and I don't think any clinician or patient really wants to break things in healthcare so I think it's this, I hope, will just help us to not put a brake on it. But actually just, we want things to be fast and efficient, for sure, and we know that we can actually do things in a much more efficient way.

We've also seen that over COVID, we've managed to run multicentred trials internationally, in a very short time, which we never were able to do before that. I think there are big changes, but I think that the regulatory side needs to just help just pull some of this back so that we can actually do things safely.

Harriet Dalwood
Yeah, amazing. I just feel like I've learned so much in the last 50 minutes or so. Thank you for coming in.

Matt Gass
Thank you so much for joining us today Rubeta.

Harriet Dalwood
No problem at all. Thank you.

Harriet Dalwood
Thanks again to Dr Rubeta Matin for joining us today. It was truly a great episode and really insightful and an easy-to-understand look into what could have been quite a complex topic so we really appreciate her joining us, again, this is our last episode of this season but you can go back and listen to the live catalogue of episodes that we do have already recorded if you do miss us too much while we're off the air. Thanks again for joining us and listening in