

AI-GR P19 07.15.24 Mirza and Ali

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Yeah, and I remember it being kind of a whirlwind week because we got access to the technology and so I played around with it over the weekend. I took a look at how you could upload a sample and how it could reproduce my own voice. And then we talked about what kind of patient and what background of a patient that would make sense for trialing this technology.

And that's when we came up on Lexi. Lexi, yeah. So, this is a patient who, very young, only 21, who had a [00:01:00] vascular brain tumor compressing on the back of her brain stem and had to undergo a 10-hour surgery to have it be all removed. One thing that was very striking about this patient was when she was in the pediatric ICU and she was intubated.

She was actually texting at the time. I just vividly remember that on rounds seeing her, like nothing would stop her from communicating with those around her. And so, we talked about a few patients, I think. But Fatima, you were like, this is definitely the one we should approach and see if she'd be interested in trialing this technology.

Hi, welcome to another episode of *NEJM AI Grand Rounds*. I'm Raj Manrai, and we're delighted today to bring you our episode with Rohaid Ali and Fatima Mirza. Rohaid is a neurosurgery resident at Brown University. And Fatima is a dermatology resident also at Brown University. This was really an episode of several firsts for us at *NEJM AI Grand* [00:02:00] *Rounds*.

This is the first wife and husband duo that we've had on the show. This is also the first episode where we've had two residents join us together as guests on the episode. I was really struck during our conversation by the strength of their collaboration. We talked about several of their influential papers, including their study on surgical consent forms, where they use ChatGPT to simplify consent forms in the state of Rhode Island, and another project where they were able to help a young patient who had a brain tumor and lost her voice.

Using an AI model, create a custom voice that could be used with a text-to-speech model that the patient now uses. Also, this was the first episode where we were able to play a version of the newlywed game with our guests, which was a lot of fun. All in all, this was a very insightful and really, really fun and illuminating conversation.

The *NEJM AI Grand Rounds* podcast is brought to you by Microsoft, Viz.ai, Lyric, and Elevance Health. We thank them for their support. [00:03:00]

And now, our conversation with Rohaid Ali and Fatima Mirza. Well, Fatima and Rohaid, it's great to have you on *AI Grand Rounds* today. Thanks so much for having us. Thank you, we're really excited to be here. This is a question that we always like to get started with, and maybe we can go Rohaid first and then Fatima afterwards.

But this is a question that we ask all of our guests, which is, could you tell us about the training procedure for your own neural network? How did you get interested in AI and what data and experiences led you to where you are today? Thanks so much Raj, happy to be on the show. I was born and raised in Oklahoma.

I went to college at Penn and got my biology degree there. Then I went to Stanford for medical school and came over here to Brown for residency. I would say, of all the things that probably trained my neural net the most, it's probably been marriage. And having the privilege of being married to Fatima [00:04:00] for the past seven years, we've known each other since 2015, when my roommate in medical school introduced me to her.

And so, you know, it's been phenomenal. We've been getting to work together on all these projects and bouncing ideas off of each other. So that's how I am here where I am today. Oh, and I'm the Chief Neurosurgery Resident here at Brown. And next year I'll be starting as the inaugural Spine Fellow at Mass General Brigham at Harvard Medical School.

So, before we move on, we like to go back toward closer to initial conditions. So why medicine? How'd you get interested in medicine? What led you to doing medical AI? Could you take us through that trajectory? Yeah, of course. So, my father is a professor of public health at the University of Oklahoma where I grew up. And for a long time I was interested in health on a population scale as a result of that.

In fact, one of my more formative experiences was during college I was an intern for the U.S. Surgeon General where I was involved [00:05:00] in everything from ghost writing articles that would be sent out for the public in the public domain. Is this Vivek Murthy at the time? It was actually Obama's first surgeon general, Dr. Regina Benjamin.

And so that was a really great experience. But honestly, what was sort of missing for me in that experience was, the ability to connect directly with patients. And so, it tilted me then toward looking to medical school. When I was in medical school, one of the most enjoyable times I had was spending time in the neurosurgery service, rotating there, and the neurosciences in general, I think, just very much excited me for all the potential that it had within it.

In terms of how I got involved with AI, I mean, I think Fatima and I, it's fair to say, are relative newcomers to the space. We're just in awe of everyone who's come before us, including all the amazing work that you two have done. I think how we got into it was pretty organic. So, when ChatGPT was launched in November of 2022, [00:06:00] it just so happened to be around the same time that Fatima and I were studying for our board exams.

And so, what we found ourselves doing was while we were studying for the board exams, we were progressively using it more and more to actually study. Like just look up quick facts, rather than looking up keywords in a textbook, we were asking whole questions and found it to be very useful. And in the process of doing so, I think that's what started getting us interested into AI more generally.

In the process of doing so, we started to wonder, hey, how well do these tools work on our specialty exams? And so that's when we started doing our first studies into AI. Perfect, thanks. Now, Fatima. Yeah, absolutely. So, hi, I'm Fatima, I'm currently the Chief Resident, at Brown, for dermatology. I started my academic career I was at Harvard, I studied biochemistry and biophysics, and then I got my master's in England, U.K., in public health.

And [00:07:00] then I did my medical school at Yale, and now I'm here with Rohaid at Brown. And in terms of my interest in medicine, I knew from a young age that I wanted to be a doctor, that I wanted to help people, the same, clichés that most people have. But I also had a passion for medical communications and being able to have patients empowered in their care and their health by really understanding what can sometimes be very complex health messages.

And so, actually, that's part of what drew my interest to do my master's. Beyond that, when I was actually in England, I worked as a medical production assistant for the BBC, and I got to see how they took really complex medical thinking and were able to disseminate it to a larger audience. And so, I've always wanted to work somewhere in the intersection of taking care of patients clinically on the individual level because I find that incredibly rewarding.

But also, being able to communicate things at a larger scale to be able to make [00:08:00] impact from a public health setting. Like Rohaid was mentioning in terms of our foray into AI, one of the things that I've learned throughout my time is, as new technologies emerge you can either get on board or you can be left behind.

And we realized that it was so useful as we were studying. So Rohaid was studying for his neurosurgery in-service exams, and I was studying for my dermatology ones. And it was so good at explaining these complex questions that when I would go to our textbooks, I would still be kind of struggling.

And so, I said, wow, this is really good at explaining really complex concepts to doctors or doctors-in-training. Can it do the same thing for patients? And so that's really where all of this started, and that's how we started our first project together. And, so let me, backing up to when you were both finishing medical school, clearly you both have matched at Brown, so you have solved the intractable two-body problem for medical training.

Could you tell us how you did that? [00:09:00] Tractable. Tractable two-body problem. Uh, sometimes, sometimes tractable. There may, there may not be, there may not exist a preference set that satisfies both bodies so it can be intractable. Fair enough. Fair enough. So, I, I think what I'm most proud about, about how we solved this two-body problem is we solved it on multiple levels.

So not only are we at the same institution, but we're in two different specialties that have different lengths of training, but somehow, we managed to wing it where we're both graduating the same year. So, we're perfectly aligned in that sense. I don't know, in terms of how it happened, I think we just got both very lucky.

Yeah. And we have incredibly supportive programs. Did you both graduate, did you both graduate medical school at the same time? No, so actually I graduated a few years before her. She is just, the college level was just one year behind where I was. And then she had gone off to do her master's and then had a year where she was doing research.

I was one of those that just went straight through the whole time, did high school in three years, [00:10:00] college, med school, all the way straight through, which is I think unusual in neurosurgery. But, fortunately, it made it such that our timeline synced up pretty well. Nice. But so, the couples match option wasn't even available to you, I take it.

Got it. No. Unfortunately not. But actually, and when I ended up taking my research here in medical school, part of what pushed me to it too was, hey, if we ended up matching at the same place, then we'll be able to graduate at the same time too. So, it all worked out. Awesome. Amazing. Alright, great. So, I think one of the things that Fatima said in her sort of initial remarks was the importance of simplifying messaging for patients and really communicating with patients as one of the main motivations for getting into medicine and then getting into the research that, that you both are doing together now.

And so, I think that's a great transition point to what we want to talk about for this initial kind of next part of the conversation about the work that you both are doing using ChatGPT, using other AI models. To [00:11:00] simplify complex messaging as I guess, one of the major themes amongst others in the work that you're doing together.

So, you publish this paper, and actually, just to give a little bit more context about the podcast, too. We started this podcast I think almost a year before we published the first papers. But always the sort of original vision and this is, maybe one of the first, if not the first conversation where we've actually realized this, was to have conversations like this with authors of papers that are published in *NEJM AI*.

And so, the two of you, and I think, Fatima, you're the first author on this and Rohaid, you're the last author on, on this. So, you guys work that out who's first, who's last on the paper. And it was this really interesting, very, very intriguing analysis of using ChatGPT to facilitate informed consent

in the context of surgery. So patients who are undergoing surgery at one of the largest, if not, I think the largest health system in the state of Rhode Island, which is the teaching hospital affiliated with [00:12:00] Brown and the title of the paper, "Using ChatGPT to facilitate truly" – I think that's probably the key word there, *truly* – "informed medical consent" was one of the first papers that we published as a case study in *NEJM AI* back in the early part of this year.

So, this caught our attention both when we were discussing and evaluating the paper and then it caught our attention again, when Greg Brockman, who's the

CTO of OpenAI tweeted it out before we published it. And I imagined you two were a little bit nervous about the publication timing there, but we thought it was cool.

And so, we retweeted it and, we were happy to see that it was getting some attention and that there was interest from several different types of folks in the work that you were doing. So maybe we could start with that paper, and you could tell us about the background, how you got interested in tackling that particular problem, what you actually did, and what were the key challenges that you had to overcome in conducting that research study.

Yeah, absolutely. You know, as residents, we often are at the front [00:13:00] line of interacting with patients, particularly when it comes to the consent process, whether that be in neurosurgery when they're doing neurosurgical procedures or when we're doing bedside procedures for biopsies and other things in dermatology.

And what I realized was so much of the consent process is really built on trust. And so, so much of it is actually being able to discuss verbally here are the risks, here are the benefits, and all of that. But what I realized when I actually was consenting a family and particularly a pediatric patient for a procedure was while mom understood everything that I was explaining to her in terms of the procedure itself. When she went to go actually sign the form, she said, I don't really understand what's written in front of me. And she actually shared with me, you know, this is a really overwhelming time for our family. I'm going to have a lot of questions and obviously we're always open to those questions. But when I'm here late at night [00:14:00] and I've had this sheet of paper in front of me, am I really going to be able to understand what we talked about and look at it?

And so that's part of what really inspired me because I was thinking this is the same consent form that we use across the hospital for all sorts of procedures. If this one patient and family is having this issue, then I'm sure it's more universal. We talked about that experience, collectively between the two of us.

We've had these consent conversations with hundreds of patients in our residency. And one of the ways that I thought about it happened to be because growing up in Oklahoma, we were one of the first states to adopt this AR Reading Club, Accelerated Reading Club, that looked at grade levels of books and made sure that every student was reading books at their appropriate grade level.

So, there were stickers on every book in our libraries and in school saying what grade level it was appropriate for. And so, as a student, you had to read books that were appropriate to your grade level and then hand in essays that were appropriate to your grade level. And so, to try to [00:15:00] put some structure around this problem, we started asking ourselves, okay, what grade level are these consents written at?

And what we found was that looking at consent from 15 different academic medical centers across the country, the average grade level was at that of a college sophomore. And then to make matters worse, looking into this problem further, we saw that over 40 years ago, this problem had already been highlighted in the *New England Journal of Medicine*, which means that despite decades of awareness, this problem hasn't gotten better.

In fact, perhaps it's even gotten worse. And so, at the time, as we had mentioned earlier, we had been using ChatGPT to help study for the boards. So, we asked a flip question, could ChatGPT help patients better understand their medical information? And I think that's how the project started. So, we took the consents into ChatGPT and asked it the simple question [00:16:00] while preserving content and meaning, convert this consent to the average American reading level.

Yeah. So, your prompt was, preserve content and meaning and convert this to an average American reading level. Yes. Yeah. And it did so beautifully. Not only did it convert it to the average American reading level, but it also simplified the consent in a way where it actually shortened the length of the consent and was able to, I think, make it more approachable for patients.

Did you have to play with a lot of prompts to get that? No. Articulated? No. It was the first one. And, uh, yeah. Did you specify what the average American reading level was? I'm just wondering if there was an opportunity for ChatGPT to be super judgmental about the average American reading level.

You know, it's incredible. I think it's actually a hard number to exactly pin down, as you can imagine, it varies quite, quite significantly, county to county, state to state, but in general I think it's widely acknowledged that, uh, over half of Americans [00:17:00] don't read at above a middle school reading level.

And so, when we applied the tool to test it, whether it was at the reading level, we used something called the Flesch Kincaid score. Looking at this further, it's pretty interesting the way this first came about, the Flesch Kincaid rubric was initially designed by the U.S. military because what they found during the

Vietnam – A lot of psychometrics and this sort of evaluation of humans have military origins, right?

And yeah, it's, it's not surprising that this one does as well. So, with Flesch Kincaid, that was the primary way that you assess the sort of existing reading level for the current forms and then also the ChatGPT-modified version of the form as well. And did you look into like other ways to assess the sort of the reading level or like other potential rubrics?

I think that is the standard one, but I'm curious, what your thoughts are on how appropriate that is, and what even that rubric, even if it's standardized as it is, it might be missing for communicating things, making them accessible [00:18:00] to diverse groups of patients. Yeah, so I think Fatima can talk about how we engage stakeholders, lawyers.

Yeah, absolutely. So, when we first had the output, right, we thought, okay, well, this makes a lot of sense to us as the ones who are typically consenting these patients, but part of what was really important, particularly in rolling this out in our health care institution, was making sure that there was buy in and also expert oversight from many different aspects.

And so really part and parcel of what we did was making sure that there was an interdisciplinary team that really evaluated whether or not this consent form really stood the test. And so, part of that involved including people like patient advocates, including the leadership in the hospital, the surgical executive committee. Yeah, it was, it was really like everyone in the hospital, but I think in particular, being able to tell the surgeons that we ran it by a medical malpractice attorney and saying that they felt that the legal [00:19:00] content was the same was a big turning point because that was a source of concern early on, as you can imagine.

Yeah, you had plural humans in the loop here evaluating the form and it was used as kind of the ChatGPT. And I think this is what we're seeing over and over again, right? It's a way of suggesting, accelerating a potential different way of doing things, but the importance of having a human or in your instance, I think, and this is what was attractive to us in looking at the case study, too.

You had multiple humans in the loop here. And then I think you actually it got approved, right? So, everyone came to consensus. They approved, you said one prompt. Was this also the first model output? Or did you have to run it a bunch of times and find one that was like the one that you liked and then that was the one that moved forward?

Or was this literally the sort of the first output of the first prompt for ChatGPT? Yeah, so I think when I presented this to the surgical executive committee, one thing I was concerned about was that ChatGPT relabeled anesthesiology to sleep medicine. And so, I, ahead of the [00:20:00] meeting, I went to our lead anesthesiologist and asked him, hey, this said sleep medicine.

Don't worry, I changed it back to anesthesiology. He said, no, no, keep sleep medicine in there. Because when I introduce myself to patients before surgery and say I'm an anesthesiologist, half the time I get a confused look on their face. But when I mentioned I'm a sleep medicine doctor, that's when they get it.

And I was like, oh, wow. Okay. So, in reality, we really didn't have to change much of it to ensure that it was compliant with the information that we wanted to get across to the patient in that conversation. So, you got approval and then this became the form, right? You rolled this out in, I think, September of last year.

And so maybe you could give us an update on where lifespan is at. Is this still the form that they're using? Have you updated it, iterated some more? Where are we today? Yeah, so this form has been in continuous use since fall of 2023 and is used for more than 40,000 procedures that are done throughout our [00:21:00] health care system annually.

And actually, it's really inspired other changes within how our forms function and work, like chemotherapy forms, other patient information forms. And so, it's kind of taken off like wildfire and it's really been exciting to see that. And I think one of the things that was really exciting for us

throughout the whole process was we kept thinking, can we do this, right? If we've known about this issue for 40 years, why has it not been changed yet? And what I realized when we were meeting with all these people is when you put the patient at the heart of the issue and you say, we're doing this to make things better for patients, everyone gets on board.

And I think it's really been rung true by the fact that not only did we first roll out this procedural consent form, but now everyone wants to incorporate this. And that's been really exciting that it's taken a life of its own. Yeah, every intake form, every patient getting admitted to the hospital signs is now simplified.

Every oncology treatment form, radiation treatment [00:22:00] form, you're getting high risk medications. You're signing a form that's been simplified by

this process. Also, via ChatGPT, also with the humans in the loop, sort of the template that you built in this first case study. And I imagine other health care systems are also interested in doing this, too.

That was the really exciting part, that it wasn't just our health care system. For us, we really saw it as a proof of concept, and the fact that once this was rolled out in the largest health care system in Rhode Island, there was a lot of other institutions that reached out to us and wanted to follow suit.

And so, for us, that's really exciting because not only do we get to make a difference at the individual patient level, but it really does help us make a difference at the national and international level as well. Can I ask a question about why you think this was so successful? As you mentioned, the level at which consent forms are written has been a problem for 40 years.

Presumably, we could have rewritten it by hand and come up with a more legible consent form. Was it the fact that this was the product of an AI that made people [00:23:00] excited about this? Whereas previously, this would have been a grunt work kind of task or like, what was the combination of ingredients that actually made this change happen?

So, this is a thing that's, I think, unique to the culture of medicine inside of a hospital. Maybe not unique, but it's very formalized in that you get consults, you consult other services for pretty much every issue. So as a neurosurgical service, we're consulting with our colleagues in endocrinology, psychiatry, neurology, medicine, geriatrics, other surgical services to take care of our patients.

And so, I think part of what kept this problem unresolved for many years, and there's still plenty of work to do to fix it, don't get me wrong, is that as clinicians, we're almost brought up in a system where we're taught to stay in your area of expertise and specialty. So, I'm not a lawyer, I'm not a risk analyst, I'm not a patient advocate, I'm not a finance person.

And so, do I really have the [00:24:00] authority to make these changes to a document myself? Do I have the wherewithal to get all these subject matter experts together in the same room? But then when you have something like ChatGPT create this for you, then it becomes like a template that everyone can then have a conversation around.

Rather than saying, oh, it's the doctor who brought this up, or oh, it's a lawyer who brought this up. It takes that part out of the equation. Interesting. Yeah, and

something that I think in the past would have taken a much longer period of time to do. You know, you put in a prompt and it gives you an answer, and yeah, you may need to change the prompt.

Luckily, we got it on the first shot, but at the end of the day, if you had a team of people initially trying to draft this, I think it would, you know, it decreases the barrier to entry, and I think that was really important. And then it was really easy then to have the discussion once we had at least some sort of draft in front of us.

One other question before we move on. I'm curious about your conversation with the lawyers. So, it seemed like, [00:25:00] from a legal perspective, it seemed roughly isomorphic to the original document. Was there a conversation about if there was something overlooked, and harm was done? Who was liable for that? I'm sure the hospital was, but that must be something that the lawyers went nuts over that if we do this new consent form and it comes from ChatGPT, we're still liable.

So, what were those conversations like? So that's actually a great question and something that we learned throughout the process. Because actually when the malpractice lawyers came to the table, they said, when you have these really complex consent forms and, you know, typically, if something goes to trial, right, you have a jury, and they read out these consent forms. A lot of the people in the jury say I don't know what that means. How, even if I sign that, like what does that actually mean for me?

And so actually simplifying it is more important because it allows them to be able to say this is actually understandable and something that is easily understood by patients. Yeah, I think people saw it as a protective thing rather [00:26:00] than as a harm because, quite frankly, because these are so verbose in how they're written, many people end up unfortunately not reading the consent forms, right?

But I think it serves two purposes very well. One, when a doctor sees that consent form written in plain English right before they speak with the patient. I think to a certain degree that primes them to speak in a similar manner and to speak in those terms. But then, yeah, secondarily, when a layperson on a jury is reading the consent form, I think it's a better defense if you just plainly state what the risks and benefits of a procedure are and then they can make a determination if you explain that information adequately.

That's interesting. I hadn't considered that there might be a legal benefit of clear language. I'd always thought protection by obfuscation was, um, how most lawyers like to operate. Or judged by a jury. Well, uh, one last question on this one, and then we want to transition to one of your other projects.

Has the human or humans in the loop side of this protocol, if you will, [00:27:00] for this initial consent form, has this changed at all since you first conducted this study? Like, are there more people who are involved who were not involved, or are there fewer people involved? You know, if you have, like, the chemotherapy consent form, or the, I can imagine even the, like, the handouts that go to the patients, right, to inform them about their condition.

Maybe those are already a little bit more accessible than some of these consent forms. But for these other parts of the hospital where there are also informed consent that you'd like to move into truly informed consent, has your sort of human side of the protocol adjusted or changed at all since you did this about a year ago?

I think for each forum that you approach, obviously you want to make sure you have the key stakeholders there. But I think the core team of people has stayed the same, because they have the same questions and the same issues that come up time and time again. But one of the really important things, for example, that you brought up is making sure that there's an expert particularly in that area.

So, for example, with chemotherapy, you would want to make sure there's like a [00:28:00] hematologist, oncologist, who's actually looking over it. But for the most part, the team that we built has actually stayed the same. Yeah. And if anything, I think the social proof of that initial form being simplified, in a certain sense, yes, more people are involved because specialists in the certain area that needs to be simplified are involved.

But the initial consent form, took dozens of people to cosign essentially in terms of being okay with it. Once everyone saw that this change was being implemented, I think it emboldened people and I think the level of scrutiny applied to these additional changes, though it's still there, it's not to the same degree.

And so, I think the social proof of actually implementing it, writing about it, publishing it, serves as a key vehicle to having this change happen in a much easier fashion later on down the road. Got it. Okay, great. So, we just want to spend maybe a couple of minutes talking about another one of the projects that you both are working on.

And this is the voice [00:29:00] recovery project with OpenAI. And so, I saw, I think it was a blog post from OpenAI that talked about this a little bit and some tweets. Rohaid, I think we've spoken about this just a little bit, and so as I understand it, you're now experimenting and piloting some initial studies with patients who have lost their voice.

And so, there was on the blog post from OpenAI, there was a young patient, I think with a brain tumor, lost her ability to speak. And you used a small sample of her audio that was actually previously recorded. From a school project or class project, along with OpenAI's voice engine to essentially create a custom voice that could be used alongside OpenAI's text to speech model.

This is a 15-second excerpt from a video from prior to the surgery where the patient was making a pasta salad. When you have all of your ingredients together, you are going to put the chopped broccoli and chopped banana peppers [00:30:00] inside the bowl, and now this is very adverse. You can use anything that you would like.

If you want to use cucumbers, you can chop up cucumbers and put this in here. This is her current voice after the surgery. Hi everyone, this is what my voice sounds like using OpenAI's new text-to-speech model called VoiceEngine. I was able to use just 15 seconds of a video I made for a class project to be a reference audio source for the voice you hear right now.

What do you think? This is what the text-to-speech model was able to produce. Hi everyone, this is what my voice sounds like using OpenAI's new text to speech model called VoiceEngine. I was able to use just 15 seconds of a [00:31:00] video I made for a class project to be the reference audio source for the voice you hear right now.

What do you think? This is what the text-to-speech model creating an output that allows her to order at a drive thru. Can I please have a number one with large fries and with a strawberry shake?

I thought that demonstration was pretty powerful, honestly pretty amazing. I was wondering, maybe you could tell us again, as with the other paper, the background for this, how you see this as physicians taking care of patients, where your interest in this area got started, and maybe also update us on the status of that project and how you see this moving forward.

Yeah, I think just on a practical level, how this started was we had done this initial work with consent forms and ChatGPT, and that caught the attention of

OpenAI, as you mentioned, Greg Brockman tweeted about it, and it just sort of spurred into some natural organic conversations between us and OpenAI.

At one point, we [00:32:00] came to them and said, hey, we have some ideas for projects that could be accomplished, maybe not with existing models, but we can imagine here are some models that you could very likely be developing that this would be well suited for. And one of the projects that we'd come to them with was this notion of recovering a patient's voice.

I don't know a single doctor who doesn't know a patient in their practice who has some voice issues. There's almost 20 million patients in the United States who have voice issues according to the NIH and when we initially spoke with them, they had a smile on their face and they said, we think we may have something that.

So, at this time, you didn't know about VoiceEngine, right? Because I think VoiceEngine wasn't public, it's still not publicly available. That's correct. I think they're very cautiously, we're in an election year thinking about how to deploy this and technology to generate synthetic voices at scale.

But okay, so you had these early conversations and, so you were actually just exploring potential different [00:33:00] areas. And there happened to be a technology that they were building that aligned pretty perfectly with one of the major areas that you highlighted. That's right. We got an email from James Donovan from the strategic partnership team at OpenAI who really connected the dots in terms of our idea and this new emerging technology in the company and said to us simply: Do you know any patients who could benefit from this?

And that really kickstarted Fatima and me talking about this project and getting it off the ground. Yeah, and I remember it being kind of a whirlwind week because we got access to the technology and so I played around with it over the weekend. I took a look at how you could upload a sample and how it could reproduce my own voice.

And then we talked about what kind of patient and what background of a patient that would make sense for trialing this technology. And that's when we came up on Lexi. Lexi, yeah. So [00:34:00] she's publicly identified herself and wants to share this, her experience of using this with the world community because I think she really gets and understands, you know, how her leadership in this regard could help normalize the technology for others and really advance it for social good.

So, this was a patient who, very young, only 21, who had a vascular brain tumor compressing on the back of her brainstem and had to undergo a 10-hour surgery to have it be all removed. Due to the nature of the tumor, it left her with speech deficits due to damage to lower cranial nerves, um, and also had some issues for a period of time with swallowing as well.

And so, one thing that was very striking about this patient was when she was in the pediatric ICU and she was intubated, she was actually texting at the time. I just vividly remember that on round seeing her, like nothing would stop her from communicating with those around her. And so, we talked about a few patients, I [00:35:00] think, um, but Fatima, you were like, this is definitely the one we should approach and see if she'd be interested in trying this technology.

Yeah, and so we, um, asked her for a sample of audio, and she happened to have a school project from prior to the surgery where she was making a pasta salad. So, we got that video and then we took 15 seconds of audio from that, and I was able to upload it into the model and I remember I was doing this in between patients, and we got on a call together and I said you got to hear this output.

I mean, this is this sounds amazing and we knew that there was something here and it was really exciting because then we got to send it over to Lexi and she was so excited about it as well. But at that point, you know, it was just on the computer. And so, we really wanted to make sure that there was a way to bring this technology into the hands of patients.

One of the things that Lexi shared with us was she wanted to use it [00:36:00] in a drive thru, like a fast-food setting. And you really can't take a MacBook with you through a drive thru, right? And so, we approached OpenAI and said, hey, I think to make it more practical for our patients and patients in the future, you should turn this into a mobile app.

And thankfully they got together a team and were able to make a bespoke app for her that just has her voice and she's able to type into it and speak using that, using that voice. I think that with this technology, there's a broader concern about its potential for abuse, like you mentioned, this being an election year.

And I think somehow through this process, we have found a way of potentially responsibly deploying this technology. In a sense, almost having doctors prescribing these technologies to patients and confining it to bespoke models, bespoke versions of the technology. Such that they could utilize it in a secure fashion.

And so, for example, for her bespoke app, when she types [00:37:00] in and it produces speech, it's only tied to her voice signature. You can't put another voice signature on there. And so, it was really exciting because I think a lot of the work that we've been doing in AI is thinking about how to responsibly deploy

these technologies and what guardrails need to be in place. And it's been really exciting to be able to work with patients and with everyone else to figure out exactly how we can, while understanding the risks, not make that be the reason why patients can't benefit. That's fantastic. And I think that's amazing context, too, on where this came from and even how it's evolved and how the team has built a bespoke model that, that she can actually use.

Just combining the two threads here, right? Informed consent, ChatGPT, this new technology. Could you tell us about what type of approval either at the hospital or human review process you had to go through to even trial this, [00:38:00] get this started, get this off the ground? Cause I think you're really solving a lot of these incredibly important problems around how to do this responsibly, how to do this safely.

And it's problems that I think otherwise, turn a lot of people who want to do things like this away because they don't know how to solve it. They don't know how to even approach it or think about it. So, like with ChatGPT, you have the humans in the loop, the multiple levels of approval, consensus, iteration.

What is the sort of equivalent here? How do you think about this, right? Like, where's the data going, privacy, security, whether this is okay by the hospital? How did you navigate that? And just as a reminder, you both are residents, right? So, you're navigating this while also being full time residents and working within the teams at the hospital, all the dynamics there.

So maybe you could just tell us about that side of this. Yeah, it's certainly, uh, all those concerns cross our mind. It's our, part of our ongoing study of this to ensure that there's no off-target effects of any of this technology, right? That patients aren't having their recovery [00:39:00] from speech deficit be inhibited by the usage of this technology.

Ensuring that the data is private and secure. I think first and foremost, the person who has to agree to use this technology is the patient. And in this case, very enthusiastic, very willing. And so, the question becomes is you have a patient who is not able to express themselves as they would like, is inhibiting

their ability to interact with people at work, in their social life, and also in their family life.

And the question is, if you have a technology that could help ameliorate that problem, how can we get this technology to that patient in the fastest way possible and make sure that they could benefit from something that appears to be a social good? And so, we had the approval, I think, of the highest levels of the hospital in doing this and moving forward with this, a multidisciplinary review.

And I think the advice I would give to anyone who's trying to do this moving forward is think about the reasons you're [00:40:00] doing this, right? There's no money to be had with simplifying a consent form. I mean, maybe there is, I mean, that would be nice, but what we're ultimately trying to do is really enable patients to be as autonomous as possible, have the most fulfilling life as possible.

And I think as long as you use that as your guiding principle, we have found in our experience that people are incredibly responsive to that. Okay, so I think we're gonna move on to the next segment of the episode. I think as listeners you both know we like to play lightning rounds with our guests. We thought we would do a unique twist on this given your, uh, the special partnership that you have.

So, we're gonna play a variant of the newlywed game.

And so, the way that this works is I'm gonna ask one of you a question and you have to answer in the way that your partner would answer. [00:41:00] Um, and so I would also, uh, we'll see how complicated this gets, uh, like the partner who you're answering about to pre-register their answer by texting me. So when, if you're responding on the mic, uh, your partner will be texting me what their actual answer is, and then we'll compare the two.

How does that sound? Sounds good. Uh oh. Dangerous territory. Yeah, you didn't know, you didn't know that you were gonna have a secret, uh, relationship test on *AI Grand Rounds* today, did you? Yeah, yeah. I love it. Okay, so the first one is for Fatima. Okay. Uh, if Rohaid wasn't in medicine, what job do you think he would be doing?

I'll ask you to think about it, he'll be texting me, and when he has texted me, I'll give you the thumbs up and you can answer. That's a good question. I think, if Rohaid – You can answer. Oh, can I go ahead and answer? Okay, ooh. So, I

think if Rohaid wasn't in medicine, what would you be doing? [00:42:00] I feel like I can only see him as a neurosurgeon because that's all he's ever wanted to be.

But if he wasn't in medicine, I think he would probably do something in business. Maybe not far off. He said policy, but he also expressed doubt that he wasn't sure. Perfect. Alright, so our next question is for Rohaid. What is a frivolous thing or hobby that Fatima enjoys doing just for fun? So, Fatima, text Andy, and Rohaid, you have some time to think about it.

I'm watching where your eyes are now, Rohaid. No cribbing. Okay, we have an answer. Frivolous hobby. Uh, geez. Frivolous hobby. Um, that's dangerous, Andy. There's nothing that's frivolous with, uh.

It could be just for fun. Whether or not [00:43:00] frivolity is the correct adjective. Um, I'll give you a hint. This is a very common thing to do on the Internet. Okay, it just texted you the So, uh, you can say it on the mic. Uh, she's already texted me. Watching like Instagram reels. We'll give you partial credit. She said watching cat videos.

So, we'll go.

Um, Fatima, what is Rohaid's all-time favorite book or movie? Actually, let's just narrow it. Let's say favorite book so that you don't have to pick the category. Oh, I know this one. Um, when, *When Breath Becomes Air*. Yeah. Oh, I have to text, I have to text him. Oh, okay. Um, was that correct? Yeah. Yeah. I really enjoyed it.

That's a famous neurosurgery. That's an excellent guess. Yeah. That's a cop out. Alright. So, this question, Alright, now back to me, back to me [00:44:00] on the hot seat. Yes. This question is for, for Rohaid. What would Fatima say? Okay, so Andy scripted these questions, and he gave me all the ones that are, that are funny and a little bit awkward.

So, Rohaid, what would Fatima say is the most annoying thing you do? Oh, I'm just going to text you what I think she's going to text you. Well, so you, you are answering this. So, Fatima will, will text me what the actual real most annoying thing that you do is. And once she's texted me, you can say. Oh, what I would say is the most annoying thing is.

Okay. So, she, let me make sure that I'm not crossed up here. Wait, the thing that the most annoying thing I do, right? What is the most annoying thing?

Okay. So, I, uh, I think I texted you. Yeah. And what I think is the most, Oh, I mean, he's lovely, right? Like what could be annoying? Um, no, so I have to say, [00:45:00] you texted him what I think.

Well, so, I apologize for the confusing rule set here, let me clarify. Uh, Rohaid, this is your question, so you will answer on the mic. Fatima will text me the answer, and we will compare the two. Oh, okay. This is a new format here on *AIGR*, so. Love it. Okay, so. So, Fatima is texting Andy, what is the most annoying thing that Rohaid does?

And Rohaid will guess. After Andy gives the green light. Yes. This is going to be great audio, guys. Okay, you may answer. I think she says I go on too many tangents sometimes. That is essentially correct. She says, not focusing on the thing that we're talking about.

Alright. So, this one is for Fatima. So, she will answer and Rohaid will text me what he thinks. Does Rohaid think that AI will eventually replace [00:46:00] doctors? That's a good question.

I don't know. I don't think so. Um, I think we've always talked about how exciting it is for AI to help, but that doctors really fill a really important role and that it's so fulfilling, and it would be a shame. We love, we love working with patients. So, I want to say no. Uh, that is excellent. His answer was an unequivocal no.

Okay. Perfect. Well done. Alright, so this next one is a question for Rohaid. So, Rohaid, you will answer, and Fatima, you will text Andy. Um, what do you think Fatima's biggest concern, Rohaid, is with respect to AI and medicine? You know, I think she's probably most concerned about biases. Um, she's training to be a Mohs micrographic surgeon.

We recently did a paper looking at bias in text to image generators and [00:47:00] found that almost all frontier text image models don't represent females or minorities as being members of the surgical workforce. And I think that she's concerned about how it affects patients and people in the profession in general.

In case you can't tell from the adoring look that Fatima just gave you, you got that spot on. Excellent. I love this format. Yeah. I love it. It's really exciting. So, so you can take a deep breath. That was the last newlywed game question. You both did excellent. You're obviously, uh, very familiar with your significant other and, uh, are totally in sync.

Wait. So, who won? Hey, now. Whoa, whoa, whoa, whoa. You, you almost had it. So close. So close. Well, no, he knows who won. Who won? Yeah, you did. Yeah. Yeah. Yeah. There you go. Um, I think that's a natural transition to some of the big picture stuff that we wanted to talk about. So, um, I'm going to break the fourth wall here a little bit [00:48:00] and say that I also work with my spouse a lot.

Kristen Beam is a neonatologist here at Harvard. She and I have also written a lot of papers together, so I see a lot of myself in you both. And because I see that, I also know that having a very porous boundary between the personal and professional can be challenging at times. And so, I'm wondering, um, how you navigate this kind of duality, both in your personal and professional life where, I mean, we have argued about authorship before, uh, that is something about who's first, who's last, who's like listed last, things like that.

How do you keep that part of your relationship to be a feature and not a bug? I think one thing that, you know, as we've grown to know each other, what we've come to realize is that. There are certain gut instincts that she has, that she ends up always being right on, and I think it's fair to say that you think I have certain gut instincts.

And so, in that sense, we almost compartmentalize the work. So, I think that's one thing that we have learned as sort of a mechanism [00:49:00] to work as collaboratively as possible. But I think rather than being a challenge, I think the fact that we come at this with, you know, she's a dermatologist, I'm a neurosurgeon.

We're also just very busy. We're both chief residents. We have a baby coming on the way. Congrats. Thank you. Thank you. So that, that's all to say that we don't have a ton of time to do a lot of different projects. And so, what litmus tests that we almost always have with each other is if an idea is compelling enough to be relevant for patients she's taking care of in dermatology and in neurosurgery, then that idea is probably compelling enough just to pursue overall, because it means that it touches on some core aspect of medicine.

And so, with that sort of guiding philosophy, I think it's led us to kind of approaching, you know, big problems. Yeah. And it's really been lovely to be able to work together because it, we've actually really been able to verbalize like what are each other's strengths. And so, like Rohaid said, [00:50:00] when it comes to particular aspects of when we like execute projects, it kind of parts of it will just automatically get delegated to me or him, without us really even

realizing it because we know that this person can really do this part well and this person can do this part really well.

So, it's actually been really fun. Yeah, so for I mean the VoiceEngine project to take one example, patient had a brain tumor, you know, no shock in terms of who probably saw the patient first, right? But then she's great at coding. And so, the initial application that was on the Mac terminal, she was doing that part of it.

And so, and then she also had the judgment of who to pick first. Because we had a number of possible patients. And so, I think that when we compartmentalize like that and play to each other's strengths, that's how we work out maybe what would otherwise potentially be contentious. And there's always a moment in a project though where you have to, one coauthor needs something from the other coauthor, I'm usually the deadbeat I'll admit, and I'll get these [00:51:00] texts, if I get a text from her, I know it hasn't escalated, if I get an email saying, could you please read and revise this paper, then I know that I'm really behind.

So, there are still some things like that, even if there's natural division of labor. Uh, I think you have to navigate. Oh, 100%. We were just working on some revisions over the weekend, and it was very real. We almost have a rule that we can't be writing a manuscript in the same room at the same time because it just gets, it just gets too contentious.

So, we actually compartmentalize. I'll go in a different room, write up some stuff, then she'll review it. And that's how we keep things happy. Absolutely. So, like, you don't do the pair programming version of writing a paper where you're both sitting down collaborative, it's kind of like a revise and edit completely separate format it sounds like.

Yeah. It works for us. It works for us, yeah. Because we also have different schedules too, you know, um, in terms of when we can work on things, so. Yeah, I guess for two parts of, if I was trying to come up with two areas of [00:52:00] medicine that have diametrically opposed schedules, neurosurgery and dermatology might be the two that I would pick.

You're absolutely correct. Is it going to become more aligned during your fellowship, Rohaid, next year or not, not necessarily? Well, you know, we have a baby on the way and so there's no telling what's going to be aligned. I'm sure a lot of things will be misaligned, but thankfully, like, the further we've gone

along, the more we've grown closer to each other, and I think it's been really satisfying, honestly, just having a team member.

And to be clear, it's not just the two of us. It's a lot of people here. As I mentioned, like James Donovan from OpenAI. We have a close collaborator here. Uh, Haiyao, one of my co-residents. Cheryl, one of her friends. And James Xu, who we've collaborated from Stanford. And of course, our respective departments have been very supportive of this work.

Yeah, like Dr. Gokaslin, which is the chair of neurosurgery, and Dr. Qureshi, our chair of dermatology. Yeah, but so, it's not just that we work [00:53:00] well together, I think we're lucky to be part of a broader team, uh, of supporters. Awesome. Awesome. So, um, I think you've touched on this next question, uh, already, but I think it's worth just, uh, giving us some kind of big picture, concluding remarks here.

So, there's a lot of folks who listen to this podcast who are at various stages of their training journey, residents, fellows, med students, grad students, and you know, you both as residents are already having impact on medicine and in medical AI. And the question is, what advice would you have?

Parting wisdom. What advice would you have for other early career doctors who are interested in AI? Yeah, that's a great question. I think the best advice I can give is to seek out people who are both who think very much like you and who think very much opposite and that will really help spark really interesting questions and [00:54:00] conversations.

And I know particularly at the residency level, what's been really important is having fantastic mentors behind us because they have worlds of experience more than we do, and so though we may come up with an innovative idea, they can be incredibly helpful in actually being able to execute some of those.

And so that has been really important. Surround yourself with really smart people, some who think like you, some who think not like you, and that's just going to be a recipe for something amazing. Yeah, I think so. We've been fortunate to have fantastic collaborators. I think don't make any assumptions about things.

If, if something feels off to you, trust that instinct. With the consent project, once we started seeing consents being written at too high of a reading level, it's just like hard to unsee it, right? Every time you update your terms of conditions, every time we go to the, uh, she goes to her perinatal visits for, for, uh,

pregnancy, I mean, you just see this often and sometimes you [00:55:00] can just get blinded by the normalcy of it.

And it's to look at these problems and look at them in a new light because truth be told we have now new technologies that allow us to look at it in a new light. And then of course do what you're passionate in and you know, just don't do it to check a box. I think What our story hopefully will show is that two people who didn't have a great deal of subject matter expertise in AI just using it naturally and kind of just falling into a groove, you know, hopefully that can inspire others to, you know, proceed into this field.

Yeah, and I think you're following, you know, there's some folks who really have been kind of leading the way and teaching us about how we might work with AI in the future. And one of the folks is a, is a professor at Wharton at Penn, Ethan Mollick, and he tweets a lot and he's written a book about this.

And I think one of the pieces of advice that he gives, which I think you're totally, totally, a great example of is that you're seeing how AI can get integrated into your existing [00:56:00] workflow and you're using your expertise and you're using your hospital and the existing processes that are in place there and your real domain subject matter expertise

to integrate AI safely and responsibly into that workflow. And I think it's not accidental. I think your success here because you're able to evaluate and appraise, like A, get things off the ground that other people can't because they're not situated in the same position, but then B, you're able to evaluate sort of where these things can go awry and really

put that critical human in the loop again, or those multiple humans in the loop to get it integrated and to get it off the ground. And I really do think that activation energy, that kind of being embedded within a system and using AI within that organization or within that context where you have so much expertise built up is where we've seen a lot of success.

So great to hear. I guess one follow on question is, are there any materials that you guys yourselves look at to learn about AI? As clinicians, as [00:57:00] residents, what is helpful? I mean, this is such a big space. What do you like to read to just stay up-to-date about what is happening in AI and really understand kind of what's underneath some of these models that you're using?

Um, everyone should subscribe to the *NEJM AI Grand Rounds* podcast. Um, Thank you. Excellent. Great interview. Now, um, and follow you guys on

Twitter. Uh, honestly, I would say X is a, or just following on like LinkedIn and X, I think it's really helpful because the algorithm just naturally curates to, uh, you know, what you're interested in,

and so, um, seeing that come up also is great for amplifying your work. You know, you mentioned Ethan Mollick. He was actually the first prominent person to really tweet about our work and it gained a lot of traction. Uh, we did some of the early work on medical hallucinations, a hallucination rate of these models, and that was widely disseminated and shared.

So, I think as much as possible, I mean, look, we work collectively between the two of us, we spend over 150 hours in the hospital each week, right? [00:58:00] And so we don't have a ton of free time. So, I think that's good in a certain sense in that we know really fundamentally what are the core issues that are the pain points for patients on a daily basis and for providers.

So, it's good, it gives us, you know, an avenue to find problems to solve. But, you know, as much as simplifying it, I think, um, uh, integrating, you know, your AI reading with your social media is not a bad way to go. Yeah, absolutely. And I think part of what's been so important too is just using AI on a daily basis.

Like, you're writing an email, doing something else, you know, you start to get an understanding of what are the limits of what the model can do and what it can't when you just kind of integrate it into your daily life. And so, I think that's been also really important. Awesome. So, I think, um, I'd like to just ask one more question and close this out.

On the show, we talked to like tech luminaries, we talked to AI researchers, we talked to like very senior physicians, and we like to ask them like, what do you think the next like five years of AI and medicine looks like? Um, but it strikes me that [00:59:00] they, uh, probably over or underestimate what the next five years will likely be.

But given that you are both early career physicians. You've done some leading work in AI. I'm very curious to hear your perspective on what the next five years looks like. What are you excited about? What are you fearful about? And yeah, just, we would love to hear that. I mean, I think from our point of view, the question really comes down to who is going to be able to get access to these tools and what that will mean kind of on a society level.

And what I mean by that is, I think as you've published in the journal recently, doesn't actually exist a lot of, for example, CPT codes for many of these AI tools, right? And so, what you don't want happening is all these cool technical advances taking place, but it's not adopted at large because most insurances won't pay for it, for example.

And so, then you get a scenario where people are paying out of pocket. And so, I think we just have to be mindful of that moving forward as a society, that we're ensuring that we're [01:00:00] aligning incentives and interests, uh, such that this technology can be widely deployed to people at large. I think both Fatima and I, and Fatima you can speak to this as well, are optimistic about what this technology will do for us.

I mean, both in obvious use cases and in non-obvious use cases as well. Part of what's going to be important for doctors to do is to thoughtfully and methodically implement these tools, study it, ensure that they're evaluating all safety outcomes, and then sharing it academically, and putting it up to peer review.

And I think that's been the really important part, right? Like, AI is here and it's here to stay. And it's either going to have the input of the people who really care about the patients or it's not. And so, what's been really exciting is that we get to be part of that conversation. And honestly, what is it going to look like in 10 years?

I think it really depends on how we shape that future. And I'm just really excited that we get to be part of [01:01:00] that conversation, and that we get to help bring patients to the table. Awesome, thanks. That was a great answer. Thanks. Alright, well, that was fantastic. Thank you both so much for joining us and thank you for being on *AI Grand Rounds*.

Thank you for having us. That was awesome. Thanks so much. Thank you all. Thank you, thank you.