Fixing Healthcare Podcast Transcript
Interview with Vinod Khosla

Jeremy Corr: Hello, and welcome to the Fixing Healthcare podcast. I am one of your hosts, Jeremy Corr. I'm also the host of the popular New Books in Medicine podcast and CEO of Executive Podcast Solutions. With me is Dr. Robert Pearl. For 18 years, Robert was the CEO of The Permanente Group, the nation's largest physician group. He is currently a Forbes contributor, a professor at both the Stanford University School of Medicine and Business, and author of the bestselling book Mistreated: Why We Think We're Getting Good Health Care—and Why We're Usually Wrong. His new book, Uncaring: How the Culture of Medicine Kills Doctors and Patients was published in late May. All profits go to Doctors Without Borders. If you want more information on the book and a broad range of healthcare topics, you can go to his website RobertPearlMD.com. Together we host the biweekly podcast Coronavirus: The Truth

Our guest today is Vinod Khosla. He is an entrepreneur, investor and technologist. He is the founder of Khosla Ventures, a firm focused on assisting entrepreneurs to build impactful new energy and technology companies. He previously was the founding CEO of Sun Microsystems. In a classic and frequently quoted article that he published in 2012, he predicted that technology would replace 80% of what doctors do today. Today we'll hear how he sees that same technology revolutionizing American healthcare in the future.

Robert Pearl: Good afternoon, Vinod, and welcome to Fixing Healthcare.

Vinod Khosla: Great to be here. Always love talking about it.

Robert Pearl: You're a passionate advocate for the positive role technology can play in healthcare. How do you believe it will be the solution for what ails the industry today?

Vinod Khosla: There's really two questions to answer. How does technology help in the United States in healthcare? And then how does it help the seven billion people on the planet in healthcare? Those are somewhat different questions. I'll try and constrain it to the US healthcare system in terms of my answers, but I think it's globally applicable and the solutions are the same, but with a different tilt and different cultural context. In the US, we have relatively better care, but it's expensive. My personal view, the most expensive part of the system is expertise, and expertise can relatively be tamed with technology and AI. So, not everybody in the world can get an oncologist. We can capture some of that expertise, so each oncologist can do 10 times more patient care than they would on their own without that help.

Vinod Khosla: That applies broadly. We can talk about the major chronic conditions and the main major expense conditions in healthcare. Happy to take them one by one or

more broadly, but I do think there's huge leverage in replacing expertise. There's also casting and other things that can be dramatically better and cheaper, but I'll let you go in any direction you want here.

Robert Pearl: Let's start with AI that you mentioned. AI can only be as good as the data that it has to work from, and in medicine today, outside of some of the visual examinations, like radiology or dermatology or pathology, but the majority of medical care, it's based upon the electronic medical record, which is not a very reliable source of data. How do you see this being solved going forward?

Vinod Khosla: You are absolutely right. All attempts at using medical data, which was really generated mostly in the United States for billing purposes or systems of record, not for clinical care purposes, is not going to help AI. I think if you take a couple of different areas in primary care, unless you capture the exact conversation between the patient and the physician and translate like Google Translate does, the language of the layman, maybe in many, many different languages, whether it's Spanish or English or others, into the language of [inaudible] in the healthcare system, that's step one. Observing that conversation becomes a training ground for it in primary care. At the other end, something like psychiatric care. Unless you capture the conversation between the patient and the psychiatrist, you're not going to get AI to help guide that system. Now, in each system, each of these, and that same paradigm applies to oncologists, to cardiologists, to musculoskeletal care, you pick it.

Vinod Khosla: These verticals are very, very important, but you're not going to get this through either what's called virtual care today, which is mostly telehealth, and video is just a very bad medium, or to capture this data you have to set up systems that learn from each interaction, from each text message back and forth, each conversational fragment back and forth. Very few of the tele systems or the electronic systems are designed to do this, and hence they're not really capable of AI learning. There's a few rules based systems, but I think those are inherently limited in what they can get to. Let me take psychiatric care. It's a really interesting example, because you have to capture the conversation, and there's a few companies outside the US that have very good data sets of the actual conversation between a patient and their psychiatrist. That becomes a learning system, and you can learn from that and the AI can learn CBT through conversation.

Vinod Khosla: There's also another large advantage. Part of it is, how do you introduce these systems? It's not like you develop the system and start using it. My general view is these systems, whether they're in primary care or oncology or cardiology or psychiatric care, improve about ... let's pick a nominal number, I'm making this up, 1% a month for 60 months in a row and get substantially better and cheaper over that time. So, we have to have tolerance for this kind of learning system. We also have to know how to introduce it. So, in psychiatric care, for example, you wouldn't want to start doing CBT day one, or talk therapy day one, but you could use it as a preliminary screening mechanism to see who needs the most urgent care and bring them to a psychiatrist. So, screening diagnosis, the

classification of urgency, those kinds of things will be done first and the systems will learn from that.

Vinod Khosla: And then when they get more data, they get better and better in helping the psychiatrist. They may begin beyond just screening initially, or initial determination of urgency of care needs. They may actually help in summarizing for the psychiatrist at the end of their session, or guiding them on possible findings or diagnosis and using them to suggest directions for the psychiatrist to explore. So, they may take an okay psychiatrist and make them much, much better in partnership. But in the end, if seven billion people have to have a psychiatrist 24/7 available to them when they need it, whether it's at 9:00 AM or 3:00 AM, this is the way we will have to go. The same example applies to primary care. It will have to be done this way.

Robert Pearl: The visual AI has made tremendous leaps forward. We now know that deep learning can do better than doctors when it comes to interpreting mammograms and difficult to read X-rays specific to pneumonia, and yet we're not using it in clinical medicine very much outside of research facilities. How are we going to be able to go from where we are now to making AI a powerful tool in the practice of medicine?

Vinod Khosla: Yeah, so previously I was just in psychiatry or in primary care or cardiology, I was talking about the interaction between the patient and the caregiver or the clinical care provider. In imaging, which is a very different beast, I would say today the technical problem or the technical question, it was 10 years ago I said, "Any radiologist not using such a system will in fact be killing people every day." Unfortunately, that is still happening through misdiagnosis or missed diagnosis, rates are pretty high, but it is starting to be used in orthogonal ways. It's important to keep in mind, if physicians don't want to change their workflow to leverage what they're doing, you're not going to be able to introduce these systems easily, but in this particular example of imaging, a company like Caption Health can in fact train anybody to take a cardiac echogram in a few hours in a FDA-approved manner.

Vinod Khosla: Why? Because the AI is doing the driving. Now it becomes much easier to do an echocardiogram in a primary care office without having a specialist present to do the echocardiogram, and you can do it with a handheld small ultrasound device. So, using it in a way where training a person becomes easy and then taking the echocardiogram becomes a non-specialist function, will reduce the cost of an echocardiogram done in a primary care office by 70 to 80% quite easily. It's the same AI imaging thing, but it's not being used to deliver the diagnosis, it's being used to train to essentially take the echocardiogram. That's an example. The next step, and one of the problems in our system is the big providers, the Ds of the world, have been very slow to introduce these technologies in ways that are acceptable to radiologists or others. In an imaging, whether it's an ultrasound or a MRI, you could highlight the findings quite easily.

Vinod Khosla: But most of the systems being used today are older systems, and these traditional movers are very ... slower, but there are small exceptions emerging. So, hardware has CMRI, a cardiac MRI that can be done in 15 minutes instead of an hour and 15 minutes. It's a single button press on the MRI machine. Your typical CMRI exam is over a hundred button presses by a specialist MRI technician. If you can reduce it to a single button press and no expertise needed in taking the CMRI, then it gives you more information, it can be used as a routine screening exam for cardiac conditions instead of going to more invasive procedures, which is the alternative or a more expensive procedure that may cause four or five times more time in the machine itself. It is being used at the edges, but I think we have to keep in mind anything that disrupts cost disrupts somebody's pocketbook, it disrupts habits, the way workflow happens, the way people do their habits.

Vinod Khosla: That changes slowly. My particular view of AI in clinical care will be it'll enter at the edges, like take an echocardiogram easier, faster, cheaper in the primary care office, or do a CMRI instead of doing an ultrasound first and then go to a cath lab, do more comprehensive stuff because it's both cheaper, more acceptable to the patient because it's 15 minutes in a MRI machine, rather than 15 minutes. So, I think those kinds of things are happening at the edges, but the healthcare system is fairly slow to change their ways and adapt it. So, the critical question becomes other than these peripheral entries of AI into clinical care, how else will it happen?

Vinod Khosla: I am pretty optimistic that the most expensive conditions take diabetes, cardiology, musculoskeletal will be done in verticals outside of the healthcare system. Can you use a Livongo or a Hello Heart to reduce blood pressure by 20 millimeters without drugs? Could you do weight reduction by 8% with a digital first offering? I think that's starting to happen, and these plants generally develop for enterprise, self-insured employers are going into the plants and reducing their costs by handling 80% of the conditions, and in mental health, almost all the subclinical conditions remotely from the home with vertically specialized solutions for the chronic condition are the acute condition like physical therapy.

Vinod Khosla: That will start to reduce the cost, and then specialists will only be needed when the condition is severe or exceptional. When it is, it'll become a learning opportunity. I think we see this happening in mental health, some obviously in diabetes, in hypertension, Sword Health is doing a great job of AI driven muscular skeleton care, and we can go into the specifics of what exactly each of these are doing. AliveCor doing a great job with remote cardiac care, but it is happening. It is happening slowly and it'll start outside the system, maybe take away the most profitable parts of these chronic conditions, which are the most expensive parts of these chronic conditions away from traditional providers, and in some ways, hollow the system from outside in as payers and insurers go to these vertical solutions to handle deep conditions, do them mostly remotely and over time, much more driven by AI.

Vinod Khosla: Introducing AI in these verticals, whether it's primary care or musculoskeletal care or cardiac care is much, much easier because the companies doing that are training new physicians or their physicians in the new workflow and building a good partnership between the AI and the physician and letting the physician do much more, much more accurately, and with much higher standards of quality and in the process also training the AI. So, imagine 10 years of learning by an AI, almost like a numerical intern would learn. I think that's happening.

Robert Pearl: Let me focus on a different question related to the same AI functionality that bothers me greatly. You mentioned earlier a application that allows EKGs and a rhythms strips to be created, and the application is very accurate. It creates the rhythm strips very well, but the last thing any physician wants is to receive hundreds of rhythm strips or EKGs from a patient. Hiring nurses or someone else to interpret them is very expensive.

Robert Pearl: We have the technology today to tell the patient you're fine, or you're not fine, and yet none of the devices that I'm aware of has that level of medical presentation to the patient, because if we have that, we could shift the entire paradigm, which says, I only need to see you when you're having a problem. If your diabetes is well managed, I don't need to see you often, but if it's not, I need to see you right away, and this machine will answer that question. I can't find a company yet that has had the courage to be willing to step in there and provide that kind of information to the patient. Can it be done? Will it be done? What's it going to take?

Vinod Khosla: Yes, it can be done. It is being done. It is not widely known, but this is a great example. So, let me dig a little bit deeper than the shallow explanations I've been giving. Today, AliveCor can diagnose six conditions per FDA approved diagnoses. That means they do not need a cardiologist to diagnose these six conditions that you can read off an EKG. Today, AliveCor has a 2 lead and a 6 lead ECG available for self use at home. They will be introducing a 12 lead at home use device, so you get all the data, but it really won't be needed because hopefully soon they'll have a dozen conditions. If you look on the Wikipedia page for an ECD, the dozen conditions that could be detected, they'll want to do them all and they won't need a physician. Now, let me ask you, how many on average, so AliveCor has 110,000 subscribers that are self paying for a monitoring service. Let me ask you your guess on how many ECGS a year are these patients doing on average? Take a guess.

Robert Pearl: No idea, because some of them need to do one and some of them need to do 365. So, I can't tell you. Depends upon the risk of the patients.

Vinod Khosla: So, the average is closer to 365 a year than one. In fact, it's well over 20 a month. So, almost every day, these patients are taking ECGs, some multiple times a day, and it does create the problem you mentioned. No physician's going to take a single patient and do multiple reads a day. So, algorithms have to do it, and AliveCor does this very, very effectively. It's effective enough that these patients are almost all cardiac patients. Post diagnosis with cardiac

disease are taking these very, very frequently and doing this very effectively without swamping the cardiologist.

Robert Pearl: Let me ask you, Vinod, and this comes out of the self-driving car industry, and we can debate whether those cars are safer or not. My belief is they're going to be much safer than humans, and yet when a car crashes that's self-driven, people react as though it is a plane crashing from pilot error, ignoring all the mistakes that people make. Why won't the same phenomenon happen when AI does analysis of data better than humans, but why will patients forgive the AI when today they forgive the give the doctor, but not the machine?

Vinod Khosla: This is a serious problem, and in fact, a serious problem for Western AI. A friend of mine said to me, in China, if you have a self-driving car and it kills somebody, the government is very tolerant of it and will say, we want our technology to develop faster, so we'll take the cost of a few deaths. In the West, that's not how things are practiced. So, almost certainly, almost all AI for the next five, 10 years will be delivered mediated by a clinician licensed to practice at that level of medicine. If some things a registered nurse practitioner may do, but it'll be the highest quality that can be offered at the level of the license of the practitioner.

Vinod Khosla: I think it will be overseen by a human who can then do more. So, let me take the example. I went through some detail in the case of AliveCor. Very, very unlikely that clinician could do 20 ECGs per patient, per month or 30 for that matter because there's patients who do that. They can't afford it so they can't monitor closely, but if it is reduced and delivered to a cardiologist to intervene when needed, that's how this will happen. Take musculoskeletal care. What Sword Health does, it's a beautiful example of using AI.

Vinod Khosla: Post surgery, say a knee surgery, you want to do rehab and physical therapy is prescribed. Their AI does the therapy at home with the patient at any time of the day or night. This is a stunning statistic. Last Christmas day, 50% of the people on physical therapy, prescribed physical therapy, it's usually a six to 12 week program, post surgery, did their therapy on Christmas day. Think about it because of the accessibility, because anytime you are free, the AI is available, but here's the good part and the catch. The therapy plan post surgery is done by a physical therapist in consultation with the surgery who did the surgery. The physical therapist then monitors the plan after each session of therapy done by the AI and modifies it. So, a one hour task of watching the patient and saying, put more weight on your left leg, that task can be done by an AI, but the therapist reviews progress and modifies, adjust the plan, which goes to the AI, which can guide the patient.

Vinod Khosla: That's a classic example of a closed loop in which the human is spot spreading and the delivery of AI becomes safe and much more convenient, much more cheaper, and much higher quality. Patients are doing many more sessions when they can do it at nine o'clock at night when they got free, or when the football game ended, instead of saying, I need to schedule this physical therapy session

in the middle of my workday, three weeks from now when I don't know what emergencies I'll be dealing with, and that's why you get much more frequent therapy and much more frequent monitoring and the results are very clear in the case of Sword Health. The progress and the efficacy is better than if a physical therapist was doing full-time therapy for these 12 weeks with this postsurgical patient.

Jeremy Corr: Having grown up in rural Iowa, rural healthcare and access to rural healthcare for Americans is something I'm very passionate about. Many people in rural areas still don't have access to true high speed internet and often feel completely forgotten about. They struggle with food deserts, access to care, high poverty rates. As a venture capitalist, you probably watch innovation happening all across the world. I even recently heard of a company in Africa that delivers blood for blood transfusions over long distances and hard to reach areas via drone. Are there any innovations and technologies that you're seeing springing up in other parts of the world that could be used here to help improve rural healthcare, and if so, what?

Vinod Khosla: Yeah. Frankly, all of these will apply to rural healthcare. I'm particularly excited about rural in India. Wherever healthcare depends on deep expertise, which is generally expensive, think oncologists or a brain surgeon, and you can do it remotely, care quality will improve and care costs will decline and accessibility will improve because a patient won't have to go from that small town in Iowa to a major medical center and travel for three days for an appointment. So, I do think that will happen and will be very, very beneficial. There's a beautiful health system in Alaska called the Nuka Health System, and because expertise is harder to get, they have broadened their primary care and their definition of primary care is much broader than anybody else's, but what happens as a result, their primary care may be on per member, per month, be three to four times more expensive than a typical health plan's primary care system.

Vinod Khosla: What they have found is the total cost to care for those patients declines and more is handled by the primary care physician. Now, imagine that health system where the cost of primary care is made cheaper by a company like Curai, one of my sub companies that Bob is familiar with, and it becomes $5 or $7 per member, per month, much more usage, three to four times the usage and broader than what Nuka provides today for $100 a month per member, and it has the downstream implications of reducing cost of care. That's really good news for rural healthcare remote healthcare, but also urban healthcare. The same will happen no matter whether you are rural or urban.

Robert Pearl: Let me go back to the electronic health record that you mentioned earlier. It's always seemed to me that if the large manufacturers of the applications would open their APIs, the application program interfaces, that third party developers could come in, could transport it off of the computer onto a tablet, could add applications. We're in an application world and mobile devices, and yet the EHR is still on large computers and computing systems. Do you agree that by opening the APIs, this could be done, and if so, what's going to take to make it happen?

Vinod Khosla:	Can it be done? Absolutely. Could a caption help algorithm term run on a Philips ultrasound machine? Absolutely. It's trivial. Could be done in a month. Now, it may take a little longer to go through the regulatory process, but once they're regulatory approved, they're approved on the terrace device, they're approved on other devices, it's pretty easy to add another device it works on. Now, what will happen and is happening is the major players like the Phillips protect themselves because they don't want to disturb their business, and I don't even think it's a smart business decision, but they're being very, very parochial saying we won't all open up our interfaces and that's a shame, but then their competitors are doing it. Butterfly's much more open than Philips, and so the caption software will run on a Butterfly handheld device and it's much more accessible. It's $2,000.
Vinod Khosla:	Maybe it's not the same quality as a $50,000 Philips ultrasound machine, but that is happening. That will put pressure on the Philips' of the world. Now, I can tell you that the hardware does CMRI algorithm work on Siemens machines and Siemens is helping them and has helped them open up their machines to run these algorithms. That is happening. It's happening slowly. We have to keep in mind seven years ago, when I wrote my piece called 20 Percent Doctor Included, nobody believed AI could do any imaging either. Maybe two or three years ago, people started to believe it, and then last year I remember JAMA, one of the JAMA editors had a quote, something like we are no longer accepting publications that claim AI algorithms are better than humans. That's proven. No more innovation in that statement, whatever the condition, whether it's brain imaging, cancer imaging, X-rays of the lungs, you name it, but it takes time after. JAMA said that last year, or the JAMA editor said that, you're starting to see movement from the traditional players.
Vinod Khosla:	Now there's a backlog of machines installed in it, offices, medical offices, and hospitals that'll take a long time to flow through the system. If you get a self-driving car today, it's only new cars that'll have this, and the old cars will be around for 15 years. The same is true of equipment in hospitals. Now, I do think the more innovative systems will take the help of AI in these vertical approaches and will do it outside the system at much lower price points, especially in plans like ACOs and Medicare advantage and others where the cost burden relies on them and they can get payback on these new investments very, very rapidly.
Vinod Khosla:	I think the business implication is it'll be newer players who adapt these technologies, disrupt the price points in economics and will slowly eat into traditional systems, and that will go bankrupt. This is the model that happened with bookstores and Amazon. The bookstores ignored Amazon for a long, long time as it slowly ate into sales with this new model. Later, they adapted this model, but mostly too late. Think of your favorite bookstores that have gone under. Barnes & Noble or whether they're big or they're small.
Robert Pearl:	Will the same thing happen to the electronic health record companies, the ones that refused to open up their application programming interfaces?

Vinod Khosla:	Well, there are clearly newer efforts in EHR companies, but EHRs are different because they're all billing systems and they're systems of record. They're not clinical care systems, mostly, and you of all people know the frustration of using those systems, but because they have so much legacy data, they have a lot of stick in there. So, I don't think they go out of business, or they get out of say UCSF or Stanford very easily. I think both use the Epic system. They may open up the interfaces, which will help a lot to add stuff on top, but you are starting to see systems that look like EHRs that are clinical practice systems in front of the clinician while they're with the patient during that interface. I think those may be working set systems, not systems of record, like an Epic is. There won't be billing systems, but there'll be the clinical interaction systems.
Vinod Khosla:	You're starting to see beginnings of that coming from the old model of scribes. Well, the need for documentation into these legacy systems has created demand for scribes. The scribes are much easier to augment or replace with AI systems and a company like Robin Healthcare is doing that, and that then introduces a new kind of intermediate health record that then writes into your Epic to the open interfaces. So, I think something like that will happen. There's other startups developing what I call working set systems without trying to displace or throw away the old systems mostly because they may have 20 years patient history in a system and you can't throw that away unless you can move it to a new system.
Robert Pearl:	I'm continually amazed that we pick medical students based upon their ability to take tests that require memorization of arcane facts. I understand that in the 20th century we did this because you need a 50 pound backpack to carry all the medical information with you, and it would take an hour to research it all. Now we have iPhones and applications sitting in our pockets. Should we choosing medical students differently? How should we train them differently for the 21st century?
Vinod Khosla:	Absolutely. I said this about 10 years ago, and I said, I wrote about it seven years ago in my paper called 20 Percent Doctor Included, which by the way is a hundred page document on not only what will happen, but how the transition might happen in stages. I say the following. Medical students are picked on IQ. If you want to get into Stanford Med School or Harvard Med School, you have to have IQ off the charts, and IQ often does not coincide with EQ. I think humans will be providing the human element of care, and that means we select people, students for their EQ, and we should adapt some of the techniques the USC film school might use in selecting students for high EQ because the IQ part more and more over the next 10, 15, 20 years, and in my document I painted a 25 year picture of the transition to seven or eight generations of machines and AI, the humans will be more and more left with the EQ element and we should change what we select.
Robert Pearl:	Last year, Vinod, $89 billion of venture funding went into healthcare startups. Most of it into care delivery, particularly care delivery systems using telemedicine. Is this exuberance justified, in your opinion?

Vinod Khosla: Yeah. Look, the venture business always over invests in hard categories. The characteristic of venture startups is most will lose money, but more money will be made than lost, which says a small percentage of these will win, but the winners will make more money than the losers lose. So, net-net broadly, if somebody's broadly invested, they'll do well and make money on their investment. So, imagine after 89 billion, 80 billion gets lost. That money gets lost as investments, but the 9 billion turns into 900 billion, creates another Apple or Google. That's the model of venture capital, and so more money will be made than lost, but most companies will lose money for investors.

Robert Pearl: So, what advice given that, do you have for people who want to be entrepreneurs in the healthcare space?

Vinod Khosla: I think there's lots of room to be entrepreneurs and every part of the system that is expensive can be disrupted. Almost every part. It doesn't matter whether it's care delivery as we mostly talked about casting, whether it's CMRIs, or cardiac MRIs or cardiac ultrasound or blood tests. You can do 20 tests for the same price as one test much faster and cheaper with a machine like the Genalyte or 20 should be available to a physician to use. He shouldn't say check your hemoglobin. Your hemoglobin's okay three weeks later after you do testing through Quest Labs, and then he says, I should check your PSA or something else. Why are you feeling so low energy? You should have all 20 because it cost the same delivered to you and a Genalyte can do that today. In fact, a Genalyte 10 minutes in the physician's office, before the physician's with the patient, can do 85% of the tests the physician might order prospectively and they can do it going at risk and take the risk the physician may not order any test, because the economics of it work because testing is so cheap.

Vinod Khosla: A company like Opentrons, which is doing COVID testing is introducing a panel at four cheaper price than a Quest test. They will scan not only for COVID, but in the process also the top 20 respiratory diseases. So, just because you don't have COVID, you still want to know what you got, and that should be done as one panel for a cheaper price that you can get from a Quest today. This is just being delivered, which is why Opentrons is doing the vast majority of the testing in New York City, doing weekly testing in New York City schools because the cost is so low.

Vinod Khosla: They're doing full PCR, COVID testing at a higher quality than any of their traditional competitors at $28 a test for a PCR test. In that kind of a price, they haven't set pricing, you can also do all 20 respiratory diseases that might be in the patient sample, and that's what will happen. I think diagnostics will change. Same is happening and we don't need to go into things like drug discovery using AI, biologics through AI, antisense oligo design through AI. Also in cell therapy and others, AI is starting to pay a huge role, and I won't spend time on that today in the absence we are running out of time.

Robert Pearl: Bias and racism in healthcare have been well documented when it comes to people of color. How do you see technology being helpful and are there pitfalls that we need to be careful to avoid?

Vinod Khosla: Well, first thing you just acknowledge for me is bias is built into healthcare, but it's built into healthcare delivered by humans because humans are biased and we should acknowledge that. I think AI systems will capture these biases, but they will also surface these biases. Just because we have a company doing recruitment with AI, they discovered, learning from human interviewers of kids on campus for recruiting for a large corporation, that humans were very, very biased. Then because they discovered it in a quantifiable and measurable way, they were able to eliminate the biases. So, I think the AI systems will surface explicitly the biases, something that hasn't been surfaced. There is no practitioner I know who will say I'm biased against people of color, but it does show up in the data and hence it gives you an opportunity to fix it and it is being fixed in AI systems, and there's a lot of attention on it.

Robert Pearl: I agree completely. In fact, I wrote a paper about that, that the bias supposedly in AI is just the bias in humans, and that actually AI has that potential to surface it and to be able to correct it. So, let me ask you the following question, in December of 2019, before COVID came ashore, the federal government said that healthcare costs were going to arise five to 6% a year every year for the next decade, that's $2.5 trillion. If we just forget about the question about inflation and supply chain and all the issues that are out there, but just focus on the intrinsic healthcare cost increases, is your projection given technology that a decade from now, it will go up the amount that was predicted go up more or somehow go up significantly less?

Vinod Khosla: Okay. That question is obviously a very complex question needing its own podcast, but I would say the following: If the incumbents apply this technology, the incumbents have no reason to disrupt their revenue. So, costs will keep doing what they're doing. If new players disrupt the incumbents using new technology as I've described, then in fact, I think we can change that cost trajectory. Cost delivered through Sword Health will be 10 x cheaper than delivered with a traditional physical therapist for musculoskeletal. Care delivered by a AliveCor for cardiac care will be 10 x cheaper, and if it becomes the standard care for all patients and will probably be that for self-insured employers, payers, Medicare advantage programs, then those costs, pieces of costs will be declined. So, disruption of traditional players will be necessary for this to take hold. Otherwise, they have high cost structures and they have zero incentive to reduce their revenue, which is what reduced cost means to those players.

Robert Pearl: Vinod, thank you so much for being our guest today. Your insights into technology, entrepreneurship and the future of healthcare are wonderful. Our listeners will have much to think about and hopefully our nation can move forward in the ways that you described and make America once again the best healthcare system in the world. Thank you.

Vinod Khosla: Thank you.

Jeremy Corr: We hope you enjoyed this podcast and will tell your friends and colleagues about it. If you want more information on both the system and culture of Medicine, you can find it at RobertPearlMD.com. Congratulations Robbie on the success of your recent book. I know it will stimulate intense discussion and debate and improve healthcare for all Americans.

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Thank you for listening to Fixing Healthcare with Dr. Robert Pearl and Jeremy Corr. Have a great day.