

## Fixing Healthcare Episode 4 Transcript:

### Interview with Dr. Eric Topol

- Jeremy Corr: Hello and welcome to the fourth episode of Fixing Healthcare with Dr. Robert Pearl and Jeremy Corr. I am one of your hosts, Jeremy Corr. I am also the host of the popular New Books in Medicine podcast. I have with me my co-host, Dr. Robert Pearl. Robert is the former CEO of the Permanente Group, the largest physician group in the United States, responsible for caring for Kaiser Permanente members on both the east and west coast. He's a Forbes contributor, a professor at both the Stanford University School of Medicine and Business, an author of the best-selling *Mistreated: Why We Think We're Getting Good Healthcare--and Why We're Usually Wrong*.
- Robert Pearl: Hello, everyone and welcome to our monthly podcast aimed at addressing the failures of the current American healthcare system and finding solutions to make it once again the best in the world. We're very excited you have chosen to join us in this quest.
- Jeremy Corr: For 40 years, our nation's political and medical leaders have talked about fixing the American healthcare system. No one has succeeded yet. We need a hero. Our guests are the top leaders and thinkers in healthcare.
- Robert Pearl: The show's format is simple. Our guests will have 10 minutes to present a road map for fixing American healthcare's biggest problems, and I will probe deeply based on my experience as a physician and healthcare CEO. I'll scrutinize the plan, posing questions that challenge our guest and helping our listeners separate real solutions from hype. Then Jeremy will dive in from the patient's perspective, ensuring their concerns are addressed, making certain the concepts are clear for listeners, and helping to translate any medical jargon we may have used into normal conversational language.
- Robert Pearl: Unlike many other healthcare shows, we are not interested in hearing about a pilot project that worked in one location or a new device that a company simply wants to promote. We're searching for truly disruptive change, not just a few minor tweaks.
- Jeremy Corr: Our guest today is Dr. Eric Topol. He is the Founder and Director of the Scripps Research Translational Institute, Professor of Molecular Medicine, and Executive Vice President of Scripps Research. As a researcher, he has published over 1,200 peer-reviewed articles with more than 200,000 citations. He was elected to the National Academy of Medicine and is one of the top 10 most cited researchers in medicine. His principle scientific focus has been on genomic and digital tools

to individualize medicine, and the power that brings to individuals to drive the future of medicine. He has published two bestselling books on the future of medicine: *The Creative Destruction of Medicine* and *The Patient Will See You Now*. His new book, *Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again*, will be published in early 2019. Dr. Topol is recognized as one of the most innovative and forward-thinking minds in healthcare. Dr. Topol, welcome to the show.

Eric Topol: Oh, thanks very much, Jeremy. Glad to be with you and Robert.

Robert Pearl: Eric, consider yourself an applicant for the job of Leader of American Healthcare. You've been hired due to your experience and reputation as a visionary and innovator. You're being hired because after decades of talking about the unaffordability of healthcare coverage, nearly 20 years of lamenting lagging quality and over a hundred thousand deaths nationally each year from preventable medical error, our country is ready to make a major change. As I told the audience, we're not interested in small, incremental fixes, or simply trade-offs among cost, quality, and service, but instead believe that disruption is possible and you, Eric, are the right person to make it happen. The deliverables are significant in size and scope, but unless we can achieve this level of improvement, we don't believe that over the next five to 10 years the American people will be willing to move forward.

Robert Pearl: We would like you to provide a plan to achieve the following. Number one, increase life expectancy in the US from last among the 11 most industrialized nations, to at least the middle of the pack. Two, increase quality outcomes as publicly reported for organizations like the NCQA, the National Quality Assurance Committee, by at least 20%. Three, decrease costs by 20% of federally reported data. Four, improve service and convenience by 20%, patient recorded satisfaction. Five, improve professional satisfaction for clinicians by 20% of physician surveys. Dr. Topol, you will have 10 minutes to outline this system of healthcare you believe is capable of accomplishing all of these outcomes and the steps you will take in this role to get there. We can't wait to hear your plan. Please begin.

Eric Topol: Okay, Robert. Well, this is of course a challenge to come up with a plan that will address all your goals, but I do believe it's eminently doable. First, we have to confront that there are two big parts of the story. One, that the life expectancy in the United States being so poor, relative to all the other developed countries, and it's not just life expectancy, now we'll be three years going down, which is unprecedented, along with maternal mortality, childhood mortality, infant mortality, every metric is really a pathetic showing in the US. Now, part of that is due to the lack of access because of people of low socioeconomic income. Because the United States is the only country that does not provide healthcare to all of its citizens. That needs to be fixed. We can't address the reduction in these critical metrics unless we provide healthcare equitably among all US citizens, so that's step number one.

Eric Topol: Along with that, I believe that another side of this is the fact that we do so much for so many people that is unnecessary. The waste. There are many papers to substantiate that at least a third of the \$3.6 trillion a year in the US that is spent is wasteful, unnecessary, and harmful. That has to stop, so on the one end, we're talking about the people who can't afford healthcare that are getting unnecessary procedures and testing and treatments, and on the other we're talking about people who can't even get to this. It's really the two poles that have to be addressed systematically.

Eric Topol: Now, as far as how are we going to get the brakes on all the unnecessary things, part of that is due to the lack of a data-driven system. We have, increasingly, the problem of data flooding and lack of time that doctors have to look at not only the data, but to interact with patients, which is the most important part of all. The reason why clinicians went into medicine was because they wanted to care for their fellow human beings. The reason why today we have a burnout rate in excess of 50% in this country, along with the most extraordinary levels of depression, clinical depression and suicide that has ever been seen, is because doctors can't take care of patients because they're squeezed so much by administrators. We have far too many administrators who are making far too much requests of productivity among clinicians. The result of that has been that there's not just disenchantment, but we know that the doctor who suffers from burnout has twice as much rate of medical errors. We know there are more than 12 million serious medical errors in the United States every year and that number is not going down, but rather is increasing as the rate of burnout increases, so we need to make life better for clinicians and for patients.

Eric Topol: The way we can do that as far as handling this data and giving the gift of time, which is so essential, seven minutes for an appointment in a clinic is grossly inadequate and that's for a return visit. Twelve minutes on average for a new patient and doctor to consult is ridiculous. The gift of time can be achieved by using analytics. That is deep learning, artificial intelligence, taking data that's from, not just the electronic record, from sensors, from genomics, from all different sources and being able to process that data and put a investment in making life better. We've already seen how that can help a radiologist, pathologist, dermatologist, gastroenterologist, and across the board every single type of clinician will be affected by this. It can make medicine more efficient, improve the workflow, and give the gift of time to both clinicians and patients. That's something to work on, the promiscuous use, the unnecessary aspects of medicine that are well over a trillion dollars a year.

Eric Topol: The other big thing that we need to work on, because that will handle the human capital problem we have today, which is we keep throwing more labor, human resources, at our problem in the United States and it's just getting worse. That is, last December for the first time ever, the employment in the healthcare sector exceeded retail and it's a runaway train. By just putting in more human resources is a problem. That's not the answer. The answer is to use machine algorithms and reduce the need for labor, but most importantly is to address the hospital. The hospital is the number one line item if one looks at

facilities and, of course, the labor. Human resources is the number one of all, but if we work on these two ends, we can cut costs.

Eric Topol: Now, how can we reduce hospital costs because that's \$1.2 trillion a year and rising quickly? The way we can do that is get rid of hospital rooms. We're not talking about getting rid of the emergency room or the operating room or the intensive care unit or fancy imaging equipment, but the rest of the hospital should be gutted and these people should be at home to avoid the one in four chance of a serious harm or error that takes place in the hospital, nosocomial infections, and the ridiculous cost of a hospital stay in the United States, which is approaching on average \$5,000 a day. We have exquisite remote monitoring capabilities now and we should be using that, we should be developing that. Just like decades ago when we saw the big shift from inpatient to outpatient, we need to have the shift from inpatient, this is not the critical care people, but the subacute, the people in regular hospital rooms, from inpatient to home.

Eric Topol: I believe that through having healthcare for all and addressing the big items that are currently neglected, that is dealing with the hospital of the future, avoiding continued relentless investments in human capital, which is taking is nowhere and our metrics keep getting worse, and starting to put the brakes on and stopping all the unnecessary, wasteful, and harmful care.

Robert Pearl: Very exciting, Eric. Let me start by raising a very straightforward, but complex question which is you point out, as others have, as I have, that one third of what we do as physicians is waste. Physicians are smart, they're scientists, why do they continue to do things that add no value?

Eric Topol: Well, that's because in the United States, relative to other countries, there's incentives to do things that are unnecessary. Whether that's done at a conscious level or, more likely, it's done at a subconscious level. It's like the man with the hammer who has the tools for nails that need pounding, this is our problem in this country. We're set up to fail. Ideally, a different way to handle this would be all physicians would get a salary, you know, a reasonable compensation and there would be no incentives for this type of effort that's unnecessary, but short of that, there are, as you know Robert, there's hundreds of the Choosing Wisely guidelines that have been put out reluctantly by all the professional societies about all the unnecessary things that are done today that should stop. None of them have ever been enacted even though the professional societies have volunteered them. We could start today by saying all those things that have been volunteered as unnecessary, we're not going to do those anymore. This is the American Board of Internal Medicine Foundation that put this together under the pressure through all these professional societies, but all it did lead was to nice publications, but no action.

Robert Pearl: Well, the Choosing Wisely, if you look at the orthopedic one that was created, the most commonly done operation, as you know, is arthroscopy with cartilage trimming which has been shown first in Canada and now in JAMA to have no value and yet the most commonly done operation didn't even make their list.

We're not even talking about individual physicians, we're talking about the national specialty societies. As you know as a cardiologist, the same thing's true very much for some of the stenting procedures in patients with very stable coronary symptoms. Any thoughts about these societies?

Eric Topol: Well, I view the professional societies as trade guilds. Basically, their role as they've shown is largely to preserve the reimbursement of their constituents. They're not interested in fixing these problems. They don't have any role and that goes not just for the AMA, but across the board, in dealing with the waste and unnecessary procedures and testing and treatments and on and on. That's a problem. We can't rely on professional societies to lead the way because they've shown us for decades that they are not part of the solution.

Robert Pearl: Let's move on to something that you're an expert in, but I think is really a crucial question for us to address, which is the electronic health record. We know that they slow doctors down, we know they frustrate physicians, we know that they are created around billing, not patient care, and yet we seem to have very little progress in moving towards the 21st century type of tablet or other type of device.

Eric Topol: I couldn't agree with you more about that. This is one of the most absurd aspects of medical care in this country that our electronic health records are proprietary systems by the likes of Epic and Cerner and Allscripts, and many other companies that have a lesser proportion of use in the market. These systems, as you said, are set up for billing and they're also business to business. That is, to sell to hospital systems. They have no real interest in the patient. This is the problem is that electronic health records, which no one in this country has all their data from being in the womb through the present time and they all should. They should be their data, they should own their data, and it's just the opposite of the way we're set up here. That has to change.

Eric Topol: The companies that are basically controlling this without any government oversight and regulation to demand standards, to demand seamless interoperability, that's not working and we have thrown tens of billions of dollars to this to get nothing out of it. My solution there is that we forget the whole idea of the current model. That we need to reboot, that every individual should have their medical data, all their medical data because they obviously go to many different providers and they need to have all that data in the new world of artificial intelligence to eventually lead them to coach them for various medical conditions. When no one has that data, it's essential because it's homeless today and that's what I mean is, it's sensor data and increasingly people are going to have to generate their own data and it has nowhere to go. It could a heart rhythm, it could blood pressures continuous, it could be glucose, and on and on. Sensor data, no place for it to go. Then you have genomic data, which is just the beginning of the biologic layers of data, but now people have either DNA high throughput genotyping or they'll have genome sequencing. They'll have their gut microbiome and many other layers of biologic data, has no

place to go. It's certainly not going to go in the electronic and medical record of a health system.

Eric Topol: We need a model that incorporates all these different sources of data for each person from in the womb to the present time that's seamlessly updated, not requiring any person's active work to bring in the data. It has all the raw scans to avoid the 10% of people in the United States have unnecessary duplication of medical images and lab tests because they can't get to the data that's sitting in some electronic health record somewhere. This is another source of billions of dollars of waste and, moreover, it's a violation of a civil right I believe. Everyone should own their data. This is inevitable, it's a matter of when it's going to occur. We've already seen it take place in other countries around the world, even places like Estonia, where each person owns their data, sits on a blockchain format. All their data seamlessly updated. It can be done, but no one is taking the initiative in the United States.

Robert Pearl: To get that data, the large manufacturers are going to have to open up their API's, the application processing interfaces. You talk about this as being a human right, a citizen's right. Will Congress act on it?

Eric Topol: Well, they should. I don't believe that Epic and Cerner and the rest of these companies have a place in the modern electronic medical world that we live in and unless they are forced to all play ball and we see no evidence that there's going to be any government teeth to bring this to light, then we need to come up with a new solution. They're a big part of the problem and I just mentioned all of the unnecessary testing just because doctors can't get to the data, patients can't get their data. The recent report from the Yale Group of how even though there are laws for people to be able to access their medical data, they have all sorts of information-blocking that's pervasive. That can't be tolerated.

Jeremy Corr: When patients own their own healthcare data, what does that, from their perspective, what does that look like and how does that work?

Eric Topol: Well, it's total control. I mean, first of all, all your data is shareable, searchable, any portion thereof can be given to a doctor or part of a research study, so you basically are truly controlling it. Some of it will be co-owned because a doctor that you have a relationship with, you'd want that doctor to have at least the relevant part of your record. The point being is nothing like today where you have to beg and grovel to get pieces of your data. When you own your data and any medical interaction you have, whether it's a sensor you're wearing, whether it's a genomic test you just had done, it goes in seamlessly. That's what's essential, that it doesn't require work and that all that data is there and it can be analyzed. It's exciting, it's inevitable, it's the ultimate democratization of medicine in my view. It will happen. Despite the intense efforts to suppress the consumer, the patient, and the persistence of medical paternalism, that will end some day in the future.

Jeremy Corr: Where would that data live? Would it be on the patient's smart phone, in a cloud where they would always have access to that or where would that information be housed?

Eric Topol: Well, there's lots of models that have been touted. These digital wallets, it could be a blockchain, could be in the private cloud of that family or that individual. You have to think about the children and how would their data will be housed, but whether it's a private cloud or blockchain and it will obviously have to be accessible through smartphones and through the web, that's not the big question. It's the willingness to go there. There's no shortage of technical solutions, but we don't have a mandate from government, we don't have the all-out efforts and demand from the public yet to make this happen.

Jeremy Corr: What about the privacy and safety concerns of the patient then owning their own health data?

Eric Topol: Well, that's the solution to privacy and security. What we have today is we leak medical data like a sieve, we have over a hundred million Americans who had their data hacked, medical data hacked, and stolen. We have hospitals and health systems that are being held hostage, ransom. It is amazing and nothing's being done about it. If you talk to any cyber-security guru, the first biggest goal is to get data in lowest numbers of units, like one or two. That, then, eliminates the target capability. I mean, right now the cyber thievery and hackers are attracted because medical data is the most valuable form of data. Five-fold to ten-fold more valuable on the dark web than personal financial credit data.

Eric Topol: The whole idea is to get it off these massive servers where it exists today and the likes of these major breaches of tens of millions of people that we've seen, but get it down to the individual that they own the data and they share parts of it and they no longer become the target for cyber thievery.

Robert Pearl: Eric, you're an expert in artificial intelligence. Your book's coming out early next year. I tend to think of this as being in two categories. There's the pattern recognition, AI, the radiology, the pathology, the dermatology, and then, obviously, there's the AI related to the electronic health record. Focusing only first on the part that is pattern recognition. To the best of my knowledge, and you're the most knowledgeable person I know in the United States, but to the best of my knowledge, the machine's now about 10% better than physicians. Why do we still use physicians to do these tasks?

Eric Topol: I don't look at the data that way at this point. I look at it as the combination. There are some papers that claim that the machines algorithms outperform doctors, but I look at these papers carefully. Almost all are retrospective. There's only a handful that are prospective studies in a real clinical environment. The ones that are in the real clinical environment don't suggest that they're super human performance, but there's tremendous opportunities for synergy. As far as pattern recognition, what I think there is you see a tremendous opportunity to improve workflow, so that accuracy, reducing

expense. Deep learning algorithms, and whether that's applied to medical images or skin lesions for dermatologists, PAP slides, detecting polyps at the time of colonoscopy, across every type of clinician, echocardiogram readings, electrocardiograms, you name it, it has the ability of combining not just the algorithm that always will require human oversight in my view, but the remarkable improvement in accuracy because machines can see things humans can't.

Eric Topol: Humans get distracted, they get tired and they also don't have the magnification potential, the ability to assimilate the data, so they're complimentary, but I don't ever see the point where humans, doctors, clinicians are not required because often we're talking about critical decisions. I just don't see that the pattern recognition is great, it's sped up, it's far more accurate, but someone has to sign off on that before a patient is treated or misdiagnosed. I still believe that's where a doctor's going to come into play. Now, that might not be for minor, routine things like if there's a diagnosis that's highly accurate of an ear infection or a skin rash perhaps, perhaps, but for anything that's any more serious than that, it's really going to require oversight.

Robert Pearl: There's a lot of literature on algorithms from a variety of fields. Everything from length of sentencing in the courts all the way through medical care delivery. There's a lot of data, again, to my reading that says that algorithms will outperform individual physician intuition, which is slash variation and yet, so far, at least most physicians are not happy about following algorithms as though they have the database and success rates that they have been demonstrated to accomplish. What are your thoughts about the use of algorithms, the way Siri could help physicians, particularly in doing the more mundane or common and routine approaches and what do you see to be the next level, particularly as it relates to AI?

Eric Topol: Yeah, well, you're bringing up a really important point. The Siri is a weak hitter for voice recognition for natural language processing. We now have seen not just Alexa and other smart speakers, but this whole area is set up with now 20 different companies that are working on using voice during a medical visit to synthesize a note that's far better than the notes that are in current electronic records without any input except review by both the patient and the doctor or nurse. There we'll see in the years ahead getting rid of keyboards. That's a big advance. That's because now there is the clear capability of speech recognition to be so accurate and of course for each doctor it just gets better and better. It's autodidactic.

Eric Topol: With the patient review of their note, which they should be doing, isn't being done today, but it will be, it will be part of the normal routine because it's their note that they will own someday. Also, obviously, it will require sign off by a physician after that machine learning takes place. We're going to see not Siri, but a generation far better than that that takes over the keyboard function. The elimination of the keyboard in the office or on rounds to be in hospital notes is going to be a big plus to restoring the way medicine should be because that has



been one of the singular factors that's detracted greatly from the human side of medicine.

Robert Pearl:

Let turn towards the wearables for a second. I concur with you that the hospitals of the past will be dinosaurs in the future and certainly there's a lot of evidence today that quite a number of medical groups and organizations are able to treat relatively mild pneumonia, that we would have hospitalized someone for, at home administering antibiotics. I want to focus on the question of the wearables, at least right now. Not the theoretical ones a decade or two from now, but the short-term. When I talk to my hospital-based physicians, the ones who take care of the people in the hospital, and I asked them the following question. Who is in the hospital tonight that you normally would send home tomorrow, not that they should have gone home yesterday, but these are ones you expect by tomorrow morning will be fine, who would you send home tonight if they had extensive wearable devices, O2, blood pressure, pulse, maybe blood glucose, and to a person, what they say to me, "Almost no one because we don't keep people in the hospital to monitor them, we keep them in the hospital to treat them when the monitor shows there's a problem." How would you respond to these, I'll say reticent individuals?

Eric Topol:

Yeah, no. Actually, I don't really agree with that point. The reason people are kept in the hospital is because there's some uncertainty about their status. We can treat them at home. Obviously, patients get treated at home all the time now with antibiotics and other types of treatment. The treatment part certainly does not rely on in-hospital presence, but there's enough concern, there's enough worry to keep them in the hospital for observation or for some reason or other and we haven't invested. A lot of these things we're talking about Robert and Jeremy are things that could be developed to prove. There's no exceptionalism here. All these things have to be proven by rigorous studies, ideally randomized trials, but if we were to prove to the medical community that all these people in the hospital that are sitting in regular rooms, just sending them home without putting them in a regular room with appropriate monitoring, I think that would dispel the notion that you described.

Robert Pearl:

I concur with you that if we were able to do that we could drop hospital utilization dramatically. When I was the CEO in Kaiser Permanente, we lowered the days per thousand for Medicare patients to half of the national number. The question I'd like to pose to you is we would then need a lot fewer hospitals. How do you see that hospital consolidation and hospital closure progressing given how much resistance we see in every community when we talk about closing a local facility?

Eric Topol:

Yeah. I think we have already been seeing attrition of hospitals in the United States. At one point it was well over 6,000. I think it's now hovering closer to 4,000. I mean, it's really dropping down, but it's only just begun. What we've seen in centers like Mercy Hospital in St. Louis is the transition to a monitoring facility, so all those people that you send out and put on continuous vital-sign monitoring with algorithms that detect before there's a problem that they're a

person who's slipping and that potential problem is imminent, that has to be housed somewhere. I don't think it would be a national level or outsourced to another country. I think the ideal situation is it's in that community because there's continuity with the clinicians that care for the patient. That would be a likely way that the facilities today that exist, a lot of them have just been built and very costly, but they could still be useful because they would be the monitoring resources of the future with minimal personnel required because these stations would very much be data-driven, algorithmic with relatively limited personnel required.

Jeremy Corr: You talked about in your system of healthcare eliminating a lot of the needless administrative jobs. How do you plan to communicate to the public that you're planning on eliminating that many jobs?

Eric Topol: Well, I think that's obviously not going to happen overnight. It's a slow story, especially in this country, because our job economy relies on healthcare jobs now more than any other sector, so there's reluctance to reduce them. Really, what can be addressed is the continued growth, the steep curve of growth. If you look at the labor statistics from the USGov site, it's particularly worrisome, it's harrowing because that's how we're hemorrhaging financially, so I think what we need is this quantum jump in efficiency and productivity that we can glean from the world of AI. China is invested heavily in that. I'm working with the NHS in the UK to accelerate that and helping design that, so there are places around the world that are in tune. The US is not in tune so far with that potential.

Robert Pearl: Let's shift to another area of your expertise, which is genomics and we certainly have a moderate number of diseases for which genetics cause disease, but most of the areas that we are following, whether we're looking at the DNA database itself or looking at the various combinations leading to possible disease production, often are correlations, not causations. They'll tell you that the risk is higher, but they don't define the risk. Do you see this pattern changing in the future and if so, when and how?

Eric Topol: Well, we have a lot of genomics today that we're not using, particularly polygenic risk scores for most common conditions that include heart disease, breast and prostate cancer, type 2 diabetes. These are probabilistic, but if you have hundreds of variants from a low cost, high throughput genotyping that costs today less than \$50, it could be far less than that even, you could go into prevention mode. All these things are actionable, but we're not using them. Part of this problem is we have a lack of comfort among clinicians using genomics. We have 151 drugs today that are FDA approved with genetic labels and no testing essentially, none, in the US to guide the use of drugs that have these genetic labels. What we're doing is ignoring a remarkable body of data, which would make medicine less wasteful, less harmful for many, starting to get prevention mode going. It's really unfortunate that this doesn't get traction.

Robert Pearl: We see the same thing though in overall general recommendations for the public. We know that hypertension's controlled only 55% of the time across the US. We know that very successful things, like colon cancer screening, is only done 60%-65% percent of the time. How do you see the application of genomics being different than the overall population management recommendations?

Eric Topol: Yeah. Well, I think it could make us so much smarter. Right now, we treat everyone like a cattle herd. Everybody should have a mammogram, everyone should have a colonoscopy, everyone should have a PSA. I mean, this is ridiculous. We know that there's only 12% of women who ever will have breast cancer and we probably, at this point, can at least get it down to 50% of women having mammography ever. Then, also with the ones who are at higher risk, that would be the ones who perhaps would have a yearly assessment. Instead of everyone having colonoscopies and everyone having PSA's, every man, I mean, this is just crazy stuff. We are so much more intelligent, we have so much more data now to guide that. We're not using it and this is all part of that waste that I began with in terms of how we could get rid of the waste and not put people through unnecessary testing, which has all sorts of false positives. I mean, if you review the data, you would never allow mammography or PSA testing to be done because the net harm is so much greater than the benefit. This has to be rebooted as well if we're going to have an intelligent healthcare system.

Robert Pearl: You and I totally agree on the need to move from fee for service to capitation, but even in a capitated system, we need to measure performance of physicians. Physicians don't like to have the dozens to 50 to 80 to a hundred different measures of outcomes being in place. How would you recommend that we measure individual physician performance, particularly in the areas of quality and service?

Eric Topol: Well, the way we do it today defies any semblance of intelligence. We use guidelines that are not evidence-based, they're eminence-based and we ding doctors for the wrong things. Like, they didn't give someone a statin when in fact the patient shouldn't have had a statin. I mean, all kinds of things that are just really frankly ludicrous and the problem we have is these metrics that have been adopted for assessment are often wrong. They don't promote individualized medicine, they don't promote system 2 thinking. This is what we're missing here in medicine today. I don't favor their use until they're done properly and I have seen very few of these metrics that are used today that are useful. Obviously, we have issues of quality among clinicians and some being outliers, both positive and negative, but we have to come up with better ways to make that assessment if it's going to be meaningful and not have false illusions about what constitutes quality.

Robert Pearl: You and I both see a role for wearable devices. The role that I see is a little bit different from the one you described. What I see is the possibility of a patient having a lot of different measures being done, but then shifting care from being episodic to continuous. What I mean by that is that a software program embedded inside the confluence of wearables would tell the patient when

they're okay and when they're not. Rather than seeing the patient every three months, four months, six months, whatever it might be, we would see them whenever there's a problem and obviously not have to see them except for a very small, occasional amount of time outside of acute problems.

Robert Pearl: This actually happens with implantable defibrillators. One of the things that we were able to do is to shift from seeing people with implantable defibrillators every three months to saying we'll see you as soon as it fires. Maybe tomorrow or it may not be for nine months from now. When I've talked to the manufacturers of these devices, they're afraid to do it because, as you know, whatever algorithm you come up with will have a one in a hundred, one in a thousand chance of being wrong. It's just the way any system is constructed. How can we get someone, the NIH, your institute at Scripps, someone to create the algorithms, so that we actually can make American healthcare be continuous in the 21st century and not simply the way it was in the 20th when it was very much acute based and episodic?

Eric Topol: Right. Well, I'm with you that this has to be done. This takes purposeful effort, this takes investment of resources and people and trans-disciplinary work with app developers and data scientists and AI experts and on and on, but the point being is the one-off care and the one-off blood pressure measurement and the one-off everything is really crazy because it's very misleading. We don't even know what normal blood pressure is, by the way, because all of our studies were done with a doctor's office measurement. What does that mean? We need to develop this continuous or high frequency assessment, real world management where a lot of this the person is coached without the necessity of a doctor. That will be done. What you're bringing up is just a matter of time and we can accelerate that. We're working on these things right now in the areas such as in heart rhythm or such as for pregnancy where we have a serious problem in the US with maternal mortality and we want to get women who are deemed at high risk to have the sensors to preempt that type of morbidity or even fatality. There's a lot of work across the board for many specific conditions, ultimately for general health, but it's going to take dedicated effort, which there aren't many people working on this yet. There will be.

Robert Pearl: I concur with you around again maternal and child problems. The data I've seen shows that 7,000 deaths occur annually unnecessarily, so now we're not looking at the high risk patients who we've always known had a major chance of a complication or even a death, but we're looking at normal people. Listeners to this show right now and they get pregnant, they think it's going to be a great event and something happens, usually either from excess blood loss post-delivery or from a hypertension, so either hypo or hypertension. Hypo from blood loss or hypertension as a result of the pregnancy itself. What type of monitors are you developing? How do you see us using 21st century technology to lower this mortality?

Eric Topol: Well, I mean, I think some of it is related to the gestational diabetes, for example, where it isn't diagnosed or it's diagnosed erroneously. I mean, we still

use this glucose tolerance test, the oral load, which is unbelievable that we still use that because it turns out high glucose after a load or eating are not uncommon in non-pregnant women. What do we call, everybody has gestational diabetes? No. It turns out that is just a big miscue, but there are plenty of pregnant women who don't have good glucose regulation, who have high blood pressure, which we can now easily diagnose in the wild, in their real world, and that is harbinger of trouble. Either one of these, in fact, if you're real. Also, of course, sensors to monitor them, to monitor the fetus.

Eric Topol: I mean, there are many ways that we can be ahead of this whereby we can define risk prior to term and certainly after a lot of the adverse events are postpartum. It isn't just that once a person is using sensors that the moment of delivery the mother stops, but in fact it's continued for weeks thereafter. By the way, one of the questions that I got to early on is the equity in care that all citizen should have this availability. Well, what we're talking about here, sensors are cheap chips and this is Moore's Law, 50 plus years in. Giving people smartphones with broadband data coverage and sensors would be far less expensive than one emergency room visit, one night in a hospital.

Eric Topol: We have to start thinking that way and since we know that the mortality in mothers, expectant mothers and postpartum, is so high, especially in African ancestry, that's where, again, people who can't afford technology, we need to give it to them, so that we can get the monitoring done. That's part of the problem we have today is we haven't realized how cheap these sensors and the software can be. A data plan for years is cheaper than an emergency room visit or hospitalization.

Robert Pearl: If you had to guess five year from now, let's just pick a artificial number, how cheap could it be and how many functions could a single system, as you envision it, how many different functions would you see this basic system incorporating?

Eric Topol: Well, I think what we're talking about is condition by condition, so they'll be a system for blood pressure management, which as you noted properly, the number one chronic condition of man, 70 plus million Americans at least are affected. Who knows? Maybe far more and less than half of them being properly managed. A condition like that is well-suited for this. A diabetes or prevention of diabetes and just going across the board of all the common, chronic conditions, depression for example. Eventually, though it will take probably more than five years, but we'll have one just for all purpose promotion of health. We're going to see, we're starting to see right now, smart algorithms, not rules-based, not just your glucose is going up or down, which is what we have today, which is a dumb algorithm. We're getting smart ones where it incorporates into everything that you've had to eat or drink, your gut microbiome, your sleep, your physical activity, your stress level, and on and on. We have to get multi-modal data assimilated and extracted in real time and give the feedback to the person. Those systems will be developed. This is something that's just waiting to happen.

Robert Pearl: How soon?

Eric Topol: Well, it's happening right now in diabetes. These are being developed and tested and they just keep expanding the number, the levels of data, the layers of data. I think it's just a matter of how that gets refined and how many layers do you need before it's saturated for performance?

Robert Pearl: What are your views about the use of video, either for patients and physicians to communicate, physicians to communicate with each other? I see as a third of what we do in healthcare today could be better done, less expensive, higher quality, sooner, through video. What are your thoughts about that particular technology?

Eric Topol: I'm very much a proponent of telemedicine. I think it's a welcome addition to the ways that we can connect between clinicians and patient. The problem we have today though is that it's a video chat and that is much less than it will be as it builds within a data-exchange platform. The person with their sensor data, their lab data that they've done on their own, or whatever data, they will have to share and that will be part, whether it's during or before the visit is being done, to share with the doctor or clinician. That's where I think that this is headed. A much better, more meaningful, you might not be able to do a physical exam through the video, but you might be able to get a lot of objective data and even part of the physical exam, in fact. I think that's going to build and go beyond a chat because today the chat is just elemental and I think the other thing, of course the big trend of having doctors come to your home with these apps like Uber, which is big in California and other cities around the country now, I never would have thought that the return of the house call was likely, but that seems to be taking hold as well.

Robert Pearl: We pointed out earlier that the frequency of medical error is rising and a report out of Johns Hopkins talks about a lot of those being communication problems. I teach at the Stanford Graduate School of Business and when I tell my students that the most common way that doctors exchange information with each other today is through fax machine, they look at me and they say, "What is a fax machine?" How do you envision communication in the future that's being done between physicians?

Eric Topol: Well, I mean, unfortunately today we still have most American physicians unwilling to communicate with their patients through email or other electronic means, which is remarkable. If you ask them why don't they do that, it's just because we don't get reimbursed. Well, as you showed among the Kaiser Permanente physicians that in fact it makes things more efficient and that's the modern form of communication. Unfortunately, physicians have bucked that and everything's always like we don't get reimbursed. Why don't I use a smart phone ultrasound to be my physical exam and preempt the need for most ultrasound studies, which is over a hundred million of these studies a year, why don't I do that? Well, because I don't get reimbursed. Everything's I don't get

reimbursed, so we have to fix that model of reimbursement if we're going to make some headway. We've got some real roadblocks there.

Jeremy Corr: In your opinion, what are some of the most exciting patient-centric technologies that you see coming in the next five years or so?

Eric Topol: Well, there's so many. One that I'm enamored by is the potential to have an individualized diet. There's now clear-cut evidence of a large number of people have glucose spikes after they eat. I'm one of them. I learned by having a continuous glucose sensor in for a couple of weeks. I'm not a diabetic. There's been a lot written about this, particularly from the group in Israel, The Weizmann Institute, Eran Segal and Eran Elinav. More recently at Stanford, Michael Snyder published about this, but I think what we're learning is that each person has a unique response to their diet and we can find that data, what's driving it. It's often partly influenced by their gut microbiome, which today we don't know how to modulate, but that probably will change in the years ahead.

Eric Topol: The point being here is that we can be much smarter about what we eat and avoid glucose spikes, reduce the transition potentially from healthy to diabetic and so many other things that we know food is a really important part of our medical health future, but we haven't really done proper nutritional research or science to advance that field. I think that is an area that ultimately has a lot of room for improvement and to get insight for each person as to what would be their optimal foods to be taking, ingesting, and things that they might consider avoiding or reducing.

Jeremy Corr: What are some of the ways that artificial intelligence should or will be used in healthcare that you haven't already discussed?

Eric Topol: Well, I mean, I think we talked about for clinicians, but also for consumers, for patients, for healthy individuals, I've already talked about the coaching capability, that's going to be quite important. I think that's something that we should really be working on because we've already seen, for example, how people with serious migraines that a deep-learning algorithm for them can help them reduce or even eliminate migraine headaches. That's very promising because that's a major form of disability. Using data, apps, and algorithms instead of medications and other expensive treatments could prove to be quite effective and useful, but we haven't taken it nearly as serious enough as we could.

Eric Topol: Now, perhaps one of the best examples is what happened in Louisville when all the people in Louisville who had asthma were given connected inhalers, which would tell each other where the hotspots were, people are wheezing and using inhalers and having asthma attacks. A 50% reduction over the course of a year in asthma attacks and over 70% reduction in the need for inhalers in the citywide program. It's just striking. That's the kind of thing that we need to get out there across many medical conditions, not just for asthma.

Jeremy Corr: Well, Dr. Topol, we've taken up a lot of your time today. Can you please provide a closing statement with takeaways for both industry leaders as well as the average healthcare consumer? You may also ask them to follow you on your various social media channels.

Eric Topol: Well, thanks. I've enjoyed the discussion with you and the questions you've peppered me with. I'm at Twitter, @EricTopol. My closing summary would be even though it's hard to change medicine, especially in the United States, I'm still very optimistic. I've seen more ways in which we can radically improve healthcare in this country, both with respect to better outcomes and at lesser costs, with the tools that are before us starting with healthcare for all citizens. That's a must. We can't be the negative outlier for the rest of the world of all developed countries. Then, building on the ways that I've outlined that can get us to a much higher plane, health, which is the most precious thing in our lives, we can really improve upon in the years ahead.

Robert Pearl: Eric, thanks so much for being on our show today. It was a lot of fun. You're clearly the nation's leading thought expert around technology and there's much that we all can learn from you. I can't promise that your approach and recommendations will be the ones our nation embraces, but for any of our listeners who thought that solutions didn't exist before today, you've been proven wrong.

Eric Topol: Thank you.

Jeremy Corr: Next month, our guest will be Dr. Donald Berwick. He's the former President and CEO of the Institute for Healthcare Improvement and led the 100,000 Lives Campaign. He is the former administrator for CMS and has served on the faculty for Harvard Medical School and Harvard School of Public Health. He has written numerous articles, along with the books *Curing Healthcare* and *Escape Fire: Designs for the Future of Healthcare*. Dr. Berwick is considered to be a revolutionary in American healthcare.

Robert Pearl: Please subscribe to Fixing Healthcare at iTunes or other podcast software. If you liked the show, please rate it five stars and leave a review. Visit our website at [www.FixingHealthcarePodcast.com](http://www.FixingHealthcarePodcast.com), follow us on LinkedIn and Twitter @FixingHCPodcast, that stands for healthcare. You can find our personal LinkedIn and Twitter accounts on the website. For additional information on other healthcare topics, you can check out my website, [RobertPearlMD.com](http://RobertPearlMD.com). We hope you enjoyed the podcast and will tell your friends and colleagues about it. Together we can make American healthcare the best in the world.

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