

Annals Q&A With Dr. Eric Topol

Eric Topol, American cardiologist, geneticist, researcher, and author, met with *Annals News & Perspective* editor Truman J. “TJ” Milling Jr., MD, to discuss his new book, *The Creative Destruction of Medicine*.

Annals: You’ve published thousands of peer-reviewed articles. What made you decide to write a book?

ET: Well, here is a unique time in what I’ve been seeing in 3 decades of medicine, where in order to actualize this sea change whereby we can get high definition of each individual through these various tools, biosensors, DNA sequencing, imaging. It wasn’t going to happen to the medical community in any reasonable time period, so here was the mission: to educate and activate the consumer base and hope that they could help drive this. So I thought I better write a book for consumers so I can achieve that goal or at least try to.

Annals: You noted in the book that the ACA (Accountable Care Act) again left patients out of the loop. How do they get back in the loop? The health care reform law still doesn’t put them in the driver’s seat.

ET: Really the ACA didn’t get into the issues I tried to address. In that bill, there’s hardly a word that gets into individualized medicine. What it pertains to is health care reform and access, which are obviously important issues, but it doesn’t talk about how we can make medicine much more precise, get rid of the waste, and have much better outcomes for what are potentially much lower costs. We start to respect the fact that each individual is unique, and we now have tools that previously we didn’t have to characterize them, to ensure they get the right drug,

dose, screening, or prevention. These are things for which we just didn’t have the ability to gather the data and information until recent times.

Annals: You talk about more targeted medicine and individualized care; how does that reconcile with reducing costs? It seems that the more targeted it is, the more expensive it would be.

ET: A perfect example would be Holter monitoring, which has been around since the 1940s. You would send someone home with this contraption. They would have a hookup fee, and then you would have to come back in to get it taken off; well, now you can just mail them a little strip to put on their chest for a week or two. You would get all those data for less than \$100, considerably less than a Holter monitor. Another good example is sleep medicine. It’s very expensive, \$3,000 a night, to get a sleep study done, and how can anyone sleep in a hospital? It wouldn’t be a physiologic sleep. You can get all that information at home for less than \$100. So there are a lot of sleep disorders, but we are spending much too much on that by not being able to acquire data in the person’s own home and putting them in a hospital setting instead. There are lots of opportunities to match up the individual to the appropriate sensors, imaging DNA sequence, etc. We spend more than \$300 billion a year in this country alone on prescription medicines, and more than \$100 billion is considered waste because we mismatch patients to drugs that they don’t respond to or that have serious adverse effects that ultimately require that the patient be hospitalized. By genomics, even with some of the most common drugs today we know how to ensure a response or prevent very serious adverse effects.

Annals: You mention the V scan (portable pocket-sized ultrasonographic ma-

chine) in the book. We use them for bedside ultrasonography, but getting our radiology or cardiology colleagues to agree to that is sometimes challenging. Their argument would be, you would get false-positive results, poor image quality, or errors in interpretation that would lead to more tests anyway.

ET: This is like 1816, when the stethoscope was invented by Rene Laennec. It took 20 years for physicians to embrace the stethoscope. Now we are in the same boat. The stethoscope, for example: why would you listen to the heart when you can see everything? And the same thing with doing an abdominal examination when you can image everything to pick up things you would not be able to see in a regular examination. . . . It’s a community we both work in that’s highly resistant to change, unfortunately. . . . The digital revolution that we saw in the last decade; what it’s done with devices like Smartphones and tablets, social networking; it has changed the world. But the medical community is resistant to all that. I think we really need some plasticity, and hopefully it would be great if we got the medical community to be more receptive. This is what I believe to be the biggest shakeup in the history of medicine that’s about to unfold, if we let it. It’s a good thing for patients. Clearly a lot of these tools have to be validated, but there are really remarkable opportunities that lie ahead.

Annals: What do you think about (author physician) Abraham Verghese’s counterpoint that medicine, by virtue of all these devices and imaging modalities, has lost the human touch?

ET: Abe is right [in that], if we get carried away, this could be a digital dystopia in medicine where we treat more the genome sequence or the physiologic data and we ignore the actual person, or we get distracted by data and don’t understand we are dealing with human beings and that the person needs to be fully connected with. We can’t trade off more technology for less individual connection.

It's all part of the package for precise individualized medicine. I couldn't agree more that this has been the tendency that physicians zoom in on digital information and miss the critical part of understanding the person they are looking after.

Annals: On the other hand, I have had a few meetings with people in prescriptive analytics about the IBM Watson health care collaborative. They think Watson can replace us.

ET: There was an article by a venture capitalist about [whether] we need physicians or algorithms. Frankly, this is crazy; we need both. We need supercomputers because they can read 200 million pages of content in 2 seconds, and we don't have any physician who can do that. If you have a complicated patient, wouldn't you like to plug in the key points to a supercomputer to digest the entire world's medical literature up to the moment to get the readout of what could be going on? WellPoint has figured that out. Now we have leading cancer centers plugged into Watson, including Cedar Sinai. Someday we'd like to have access to supercomputers for all patients in the right circumstances. It's not a common thing to need those types of data to sort out a patient, but it would be great if we ultimately had that type of support.

Annals: We're not answering Jeopardy questions, though. Analytics, Watson software, it will take in all medical literature. How do you keep it from being garbage in, garbage out, with so much literature being, well, bunk?

ET: That's a key point. The basis of evidence today is much shakier than most physicians will acknowledge. On the other hand, for diagnosis, there's fairly good support in literature. It's the treatment part where things start to get much less solid. But for making a diagnosis on

a complex patient . . . for example, the wave of the future in cancer will be you get sequencing of the tumor and the native germ line DNA . . . before treatment is even started. That's a lot of information to digest. We're talking about 6 billion letters in a DNA sequence. . . . Here's where you need a lot of computing power. It's inarguable that you need help with analytics, and it is something no person can do on their own. We really need much better analytical support to be better physicians in the future and get better outcomes.

Annals: What about Harlan Krumholz's study¹ on home CHF [congestive heart failure] monitoring? It didn't work, did it?

ET: Oh, Harlan, so he did a study about how telemonitoring didn't keep people out of the hospital for heart failure. In fact, telemonitoring where you just get a person's weight and ask them if they're short of breath over the telephone, that's not exactly high tech. But when you start to get measurements of filling pressures of their heart or noninvasive means like a sensor outside the body where you can get a handle on what's going on with the heart physiology, then you start to move toward a whole new capability. For example, there was a study in the *Lancet*² where there was an implant in the pulmonary artery to monitor pressure, which led to 40% reduction in hospitalization related to heart failure, which is the number 1 reason for hospitalization in the [United States], where almost 50% of the patients are readmitted with heart failure within 6 months after the initial hospitalization, which costs billions of dollars each year.

Annals: About personalized medicine, translational research, and the future of medicine: What is the most im-

portant message you would want to get through to emergency physicians today?

ET: Medicine can't change and improve from its current state until we realize that each of us [is] unique biologically, physiologically, [and] anatomically, and we have the tools to depict high-definition [data for] individuals for the first time. The message is that we have this opportunity. Are we going to drive this as physicians or rely on another force, consumers, to lead the charge? Are we going to partner with our patients to help usher in this new form of medicine and get away from this "one size fits all" notion of medicine that I think is no longer acceptable?

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