

*The Patient Will See You Now: The Future of Medicine is in Your Hands* by Eric Topol M.D. would have seemed like a science fiction novel before the smartphone. Dr. Topol, a cardiologist, and professor of genomics and director of the Scripps Translational Science Institute in La Jolla, California, compares the effect of Gutenberg's printing press on democratizing access to written literature to the ability of the smartphone to make health care accessible to all and lower costs. Smartphone enabled applications will allow both health care practitioners and patients access to an almost unimaginable number of data points on their health and fitness due to sensors such as breath monitors, sleep monitors, and microscopic blood-borne sensors capable of monitoring changes in blood chemistry.

With the advent of direct to consumer genetic testing by companies such as 23 and Me and Ancestry.com, Dr. Topol feels the focus in healthcare will move to genetic testing for prevention of disease as opposed to diagnostic testing. He cites the impact Angelina Jolie made when she went public with her BRCA 2 results and subsequent decision to have a double mastectomy. Genetic testing allowed her to make an informed decision about how aggressively she wanted to minimize the risk of future disease. According to Topol, the internet makes it possible for consumers to research their genetic mutations, read medical and research journals online and join patient groups for people with similar diagnoses to discuss symptom control and treatment options. He seems to discount the role of medical professionals in aiding patient synthesis of information as well as providing context and verification for accuracy.

Dr. Topol feels that the most significant roadblock to the rapid progression of technology in health care is the paternalistic attitude of many of its practitioners because of their insecurity with technology and with losing control of medical information. Barriers between the patient and their medical data make it difficult for them to participate in a meaningful discussion about their health and to be an equal partner in decision making. However, the ability to accumulate vast amounts of medical data can lead to problems with security and storage, as well as an understanding of who is going to track and evaluate this data. Market forces also contribute to the delay in integrating technology into healthcare and empowering patients. Medical practitioners have formulas and requirements for reimbursement and treatment, and many of these new technology models for healthcare do not easily fit into these models.

With the advent of genomic and precision medicine, large aggregates of genomic data will be needed to determine the significance, if any, of individual mutations as well as the interaction between the genome and modifier genes and proteins. The significance of a mutation is commonly found by reverse genetics, in which case an individual with a rare disease has their genome sequenced to identify a suspect gene. Familial genomes are needed for comparison and verification of the mutation, but it cannot stop there. The complexity of the genome makes it necessary for genomes from unrelated people with and without the mutation in question to be evaluated. The same argument can be made for pharmaceutical testing. Individual drugs are suspected of working on approximately 20% of the population with efficacy determined by individual molecular makeup of channels and proteins. Genetic studies are needed to determine which 20% of the treatable population a drug will work for and what modifications can be made to a drug to allow it to work in others. According to Topol, pooling genetic data is likely to increase progress in both diagnosis and treatment of disease markedly.

There are significant risks. Cybersecurity and privacy laws have not progressed at the same rate as technology use in health care. Dr. Topol argues that the White House Consumer Privacy Bill of Rights and the Do Not Track legislation desperately need to be made law. He advocates for individuals having

complete and unhindered access to their genetic data. He feels it should be illegal for any party to use genetic data or information obtained from genetic data without the owner's consent, and consent does not mean pushing a button to access an application after trying to decipher a disclaimer. Topol concedes that large amounts of data are needed to look for trends and to advance research. However, ultimately the ability to use artificial intelligence and biomedical and molecular sensors to predict disease is the goal. He ends his well-researched and thoughtful book by urging large companies to lead the charge towards more autonomous health care. It could negate the need to move their businesses offshore to cut costs.

ISBN 978-0465054749

393 pages