

The future of medicine means redefining patient care, treatment, and testing

From gene sequencing to sensors, scientific discoveries will mean better prevention and treatment.



SOMALOGIC LABS

BY JACQUELINE LISK | July 3, 2020

In medieval times, a common wartime strategy was to catapult flaming objects over an enemy's castle walls. In anticipation, kingdoms would assemble bucket brigades to prevent the fire from spreading. Dr. Roy Smythe, CEO of SomaLogic, says health care delivery is a bit like medieval warfare — focused on treating acute disease, rather than preventing it by better managing chronic conditions, which almost always lead to an acute disease event.

"The problem with this medieval warfare model? The burning objects just keep coming over the wall," says Smythe.

So how do you prevent the flaming objects from infiltrating your castle? Smythe believes you empower people to play a bigger role in taking care of their health by democratizing technology and data. Patients and medical professionals should work together to use personal data — including genomic and proteomic information — to assess risk, diagnose health problems, and monitor and improve people's conditions.

Let's consider the factors that are making precision medicine a reality, and the role you could play in managing your own health in the future.

Making health an equal partnership

"Ubiquitous health care" means quality health care delivered to anyone at any time by relying on data and emerging technology to remove constraints like location and time. "There is nothing magic about finding out you have a urinary tract infection using a home diagnostic, being given an AI-supplemented recommendation for the appropriate antibiotic (based on your genomic and proteomic information, as well as the characteristics of the organism), and you ordering the drug that is delivered by drone an hour later to your doorstep," Smythe explains.

He believes much of the technology and science needed to make ubiquitous health care a reality already exists. SomaLogic, for example, is a protein biomarker discovery and clinical diagnostics company based in Boulder, Colorado that scans the living data stream of human proteins — such as genomic, proteomics, physiologic, and other real-time monitoring — and translates it into insights. Its mission is to deliver individualized health-management information people can use to optimize their personal health.

"Empowering individuals with technology and information to self-manage will free up the time and incredible resources to take care of those who do need to be treated by an expert," he notes.

Like Smythe, Dr. Bertalan Meskó, PhD, who is known as "The Med-

ical Futurist" for his role as director of The Medical Futurist Institute, believes health care technologies will allow patients to have more of an equal partnership with medical professionals. Meskó has decades of experience analyzing how science fiction technologies can become a reality in medicine and health care.

"Digital health is a cultural transformation that, on the short term, creates an equal level doctor-patient partnership which is unprecedented in the history of medicine; and on the long term, leads to the democratization of care."

The short-term change is already happening, he says, noting countries such as Denmark and New Zealand have already "established policies that aim to make patients empowered with technologies and connected solutions." COVID-19 could speed up this transformation, as more people embrace telemedicine to reduce risk of infection.

As the pandemic has shown us, checkups and appointments can often be done via telephone and the internet. People no longer need to take time off work or travel for an appointment. These virtual appoint-

ments often cost less than in-person care, explains Jeremy Schafer, SVP, and director of the access experience team at PRECISIONvalue, a company that evaluates health care innovations to understand their economic and humanistic value.

The type of care we can deliver remotely is becoming increasingly sophisticated. "The emergence of new, safer therapies and improved drug delivery technology means that more patients on chronic infused drug therapy can be treated in the comfort of their home versus going to costly sites of care like the hospital," Schafer says.

For example, the University of Pennsylvania's Cancer Care at Home program uses careful patient selection criteria and highly trained oncology nurses to administer certain cancer drugs at patients' homes. Schafer says the program has grown markedly since COVID began.

He also references a specialty pharmacy that uses video conferencing to inspect the port injection sites for patients with hemophilia. "Before this technology was available, patients needed to go to the clinic. Now they can be assessed remotely, and staff can get in touch with prescribers to discuss therapy options if patient port sites exhibit any concerns."

In the future, fewer and fewer health care situations will force people to go to the hospital or outpatient center, predicts Schafer.

The genomic revolution and precision care

Precision care companies like SomaLogic tailor treatment and prevention measures to an individual's genome, lifestyle, and environment. Karen Madden, Ph.D., vice president of technology and innovation at PerkinElmer, a Waltham-based corporation, believes "the increased acceptance and implementation of precision medicine, direct to consumer genomics and applications such as regenerative medicine is, without question, the most life-changing scientific development of the last five years."

The application of sequencing technologies has dramatically increased, generating data that helps scientists and doctors understand variations in the human genome and what they mean for an individual's disease susceptibility and disease progression. "Sequencing technologies can uncover genetic predispositions for disorders of inborn errors of metabolism, neuromuscular disorders, and eye disorders," Madden explains. This data also helps clinicians make more informed decisions about the course of treatment.

Genome sequencing benefits individuals, but also society. "Retaining sample information with the associated phenotypic [the composite observable characteristics or traits of an organism] insight can provide a wealth of genetic and environmental information that can be unlocked to better understand disease and health," she explains.

The role of sensors

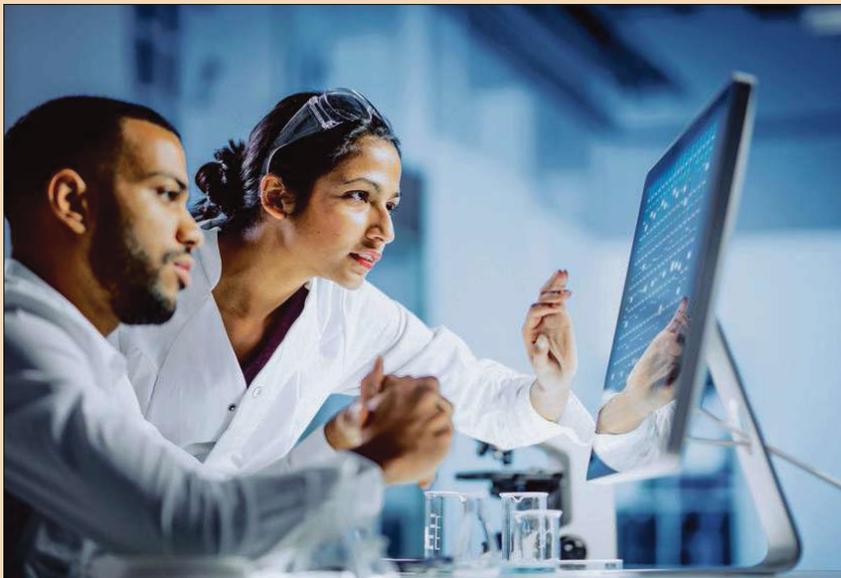
Sensors, particularly emerging models that can better monitor your heart rate and other key health metrics, will play a growing role in preventative care and wellness and continue to advance over the next decade, says John Sculley, a business leader, speaker, and author who served as CEO of Apple from 1983 to 1993. Sculley is a strategic advisor to Zedsen, a London-based health care technology company. Zedsen's non-invasive sensor technology can analyze any substance, material, or composition of human tissue. Use cases include detecting a dangerous breast tumor many months before a mammogram could, allowing the patient to start treatment sooner.

"The ability to look through skin and detect a tumor without a biopsy would have been thought of as science fiction less than a decade ago, and that is just a teaser of what happens when you bring together science and technology to address problems," notes Sculley.

The technology can also be used to monitor changing levels of glucose in the blood. The sensors can be incorporated into a smart phone or a wearable device, allowing patients to access vital and potentially life-saving information on their glucose levels with a simple finger touch. It is one more way patients can take control over their health, and doctors can customize their recommendations to lead to better health outcomes. To Smythe's point, rather than strategizing to control or put out a fire, we could stop it before it starts. ■

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Our healthcare system has holes. Data and AI can help us fix them



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Moore's Law states the speed and capabilities of computers will increase every couple of years, but their cost will continue to go down. John Sculley, a business leader, speaker, and author who served as CEO of Apple from 1983 to 1993, notes we live in a world in which biology is technology and, as such, is advancing with unprecedented speed.

Sculley is chairman of the board for RxAdvance, a digital health company headquartered in Southborough, Mass. that built an AI Robotic Automation platform with the potential to transform and simplify the health insurance and prescription drug reimbursement industries. It's one of a growing number of companies using science and technology to reimagine health care, to accelerate scientific processes, and to bring new treatments and prevention measures to light faster than ever before possible.

How AI is shaping medicine

McKinsey Global Institute estimates there is \$900 billion of waste, fraud, abuse, misuse, and avoidable expense every year in our US health care system. RxAdvance believes its platform could make a significant dent in that \$900 billion.

"If you could do that, you would be able to pay for the uninsured, and pay for better insurance for the underinsured — that is how big a problem it is, and how much of an impact smart process automation could have," Sculley says.

AI and automation are impacting nearly every aspect of medicine and science. In the life sciences, in particular, data volume and accuracy is increasing exponentially. It is now common to see a data scientist working together with a physicist or biologist — which you wouldn't have seen a decade ago, notes Sculley.