



TECHNOLOGY

Can it deliver a more precise, individual and empowering approach to health?

Innovation in technology continues to influence society, and healthcare can expect both opportunities and challenges.

GENETICS AND PRECISION MEDICINE

Sixty years since the structure of DNA was discovered, understanding of the role of genes in health and disease has advanced enormously, alongside technologies that identify the genetic make-up of individuals.⁴⁷³ These advances could shift the healthcare model from treatment based on generalized demographics to precision medicine, which matches patients with drugs targeting specific genetic drivers. Leading pharmaceutical companies have doubled investment in precision medicine in the last five years and a further increase is expected in the next five.⁴⁷⁴ This would mean oncologists could use genetic tests to identify which treatments a tumor is likely to respond to, sparing patients from receiving treatment that may do more harm than good.⁴⁷⁵ In 2017, for the first time, the US FDA approved a cancer treatment based on a common biomarker rather than the location in the body where the tumor originated.⁴⁷⁶

An emerging debate, likely to continue as precision medicine becomes widespread, concerns the market dynamics of genome medicines such as gene editing and gene therapy, which offer the promise of a 'one shot cure'. How might business models need to change as advances move the industry from a focus on disease and treatment to prevention and cures?⁴⁷⁷

MACHINE LEARNING IS MATURE ENOUGH TO START ACCURATELY PREDICTING MEDICAL EVENTS—SUCH AS WHETHER PATIENTS WILL BE HOSPITALIZED, HOW LONG THEY WILL STAY, AND WHETHER THEIR HEALTH IS DETERIORATING DESPITE TREATMENTS. ”

Katherine Chou,
Google Brain team⁴⁹⁰

WEARABLE AND MOBILE DEVICES

Wearable devices are becoming a part of everyday life for some, collecting real-time data on biological and environmental changes.⁴⁷⁸ Some 20 billion devices are already connected to the internet, expected to grow to 50 trillion by 2045.⁴⁷⁹ How will having 20,000 times more digital information in 2025 than there is today impact health?⁴⁸⁰ People will be more aware of their health than ever, able to measure signs such as heart rate or body mass index as well as be reminded about interventions such as taking insulin or increasing movement. This could increase treatment adherence and efficacy, and spur more personalized treatment. Privacy and trust, already challenged, will be vital to ensure patient data is not exposed to unnecessary risk or discrimination.⁴⁸¹

Connected devices can also transform healthcare in lower resource settings. Mobile phones and mHealth solutions can extend care, new payment models, and health-related information to remote areas as well as monitor health services and consumption of vaccines and medicines.⁴⁸²

With wearables that may track symptoms, the pace of consumer engagement might accelerate. Social networks are poised to enable powerful customer engagement, allowing patients and health actors to interact in new ways. Information might be shared and disseminated through peer-to-peer support networks such as PatientsLikeMe and HealthUnlocked. How will consumer demand for transparent, convenient, and high-quality care grow challenge business models? Companies that offer meaningful and highly personalized solutions will succeed in this environment.⁴⁸⁵

ARTIFICIAL INTELLIGENCE (AI) AND SMART ROBOTS

When applied to data collected through connected devices, AI could benefit healthcare through increased productivity and improved product quality.⁴⁸⁶ AI enabled machines could also perform administrative and clinical functions such as medical imaging, risk analysis and diagnosing health conditions. Deep learning could identify patterns in large data sets, revealing new linkages between genes and disease more rapidly than its human counterparts.⁴⁸⁷ Some estimate that clinical health AI applications could save the US healthcare economy USD 150 billion annually by 2026.⁴⁸⁸ Recognizing significant opportunities presented by AI, actors across the health ecosystem must also assess the appropriate roles of technology and establish standards to manage what to delegate to machines.⁴⁸⁹

REFERENCES

- 473 Imperial College Healthcare NHS Trust 'The future is personalised medicine', accessed March 2018 <https://www.imperial.nhs.uk/about-us/blog/the-future-is-personalised-medicine>
- 474 Forbes 'Drug industry bets big on precision medicine: five trends shaping care delivery', 2017 <https://www.forbes.com/sites/reenitadas/2017/03/08/drug-development-industry-bets-big-on-precision-medicine-5-top-trends-shaping-future-care-delivery/2/#7fdcdb097b33>
- 475 National Cancer Institute 'Precision Medicine in Cancer Treatment', accessed March 2018 <https://www.cancer.gov/about-cancer/treatment/types/precision-medicine>
- 476 FDA 'FDA approves first cancer treatment for any solid tumour with a specific genetic feature', 2017 <https://www.fda.gov/newsevents/newsroom/pressannouncements/ucm560167.htm>
- 477 Ars technical 'Is curing patients a sustainable business model? Goldman Sachs analysts ask', 2018 <https://arstechnica.com/tech-policy/2018/04/curing-disease-not-a-sustainable-business-model-goldman-sachs-analysts-say/>
- 478 EY 'How will new technologies make age-related diseases a thing of the past? Building an engaged ageing strategy', accessed March 2018 [http://www.ey.com/Publication/vwLUAssets/ey-how-will-new-technologies-make-age-related-diseases-a-thing-of-the-past/\\$FILE/ey-how-will-new-technologies-make-age-related-diseases-a-thing-of-the-past.pdf](http://www.ey.com/Publication/vwLUAssets/ey-how-will-new-technologies-make-age-related-diseases-a-thing-of-the-past/$FILE/ey-how-will-new-technologies-make-age-related-diseases-a-thing-of-the-past.pdf)
- 479 The Academy of Medical Sciences 'Improving the health of the public by 2040: Optimising the research environment for a healthier, fairer future', accessed March 2018 <https://acmedsci.ac.uk/file-download/41399-5807581429f81.pdf>
- 480 The Academy of Medical Sciences 'Improving the health of the public by 2040: Optimising the research environment for a healthier, fairer future', accessed March 2018 <https://acmedsci.ac.uk/file-download/41399-5807581429f81.pdf>
- 481 World Economic Forum '5 key trends for the future of healthcare', 2018 <https://www.weforum.org/agenda/2018/01/this-is-what-the-future-of-healthcare-looks-like/>
- 482 2030Vision 'Uniting to Deliver Technology for the Global Goals', https://2030vision.com/assets/pdf/2030Vision_Full_Report.pdf
- 483 The King's Fund 'The digital revolution: eight technologies that will change health and care', 2016 <https://www.kingsfund.org.uk/publications/eight-technologies-will-change-health-and-care>
- 484 Deloitte '2017 global sciences outlook – Thriving in today's uncertain market', accessed March 2018 <https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Life-Sciences-Health-Care/gx-lshc-2017-life-sciences-outlook.pdf>
- 485 Philips 'How the Internet of Things is revolutionizing healthcare', accessed March 2018 <https://www.philips.com/a-w/about/news/archive/blogs/innovation-matters/how-the-internet-of-things-is-revolutionizing-healthcare.html>
- 486 PWC 'Enabling better healthcare with artificial intelligence', 2017 <http://usblogs.pwc.com/emerging-technology/ai-in-healthcare/>
- 487 EY 'How will new technologies make age-related diseases a thing of the past? Building an engaged ageing strategy', accessed March 2018 [http://www.ey.com/Publication/vwLUAssets/ey-how-will-new-technologies-make-age-related-diseases-a-thing-of-the-past/\\$FILE/ey-how-will-new-technologies-make-age-related-diseases-a-thing-of-the-past.pdf](http://www.ey.com/Publication/vwLUAssets/ey-how-will-new-technologies-make-age-related-diseases-a-thing-of-the-past/$FILE/ey-how-will-new-technologies-make-age-related-diseases-a-thing-of-the-past.pdf)
- 488 Accenture 'Artificial Intelligence: Healthcare's new nervous system', accessed March 2018 https://www.accenture.com/t20171215T032059Z__w__/_us-en/_acnmedia/PDF-49/Accenture-Health-Artificial-Intelligence.pdf#zoom=50
- 489 World Economic Forum 'The age of robots could be a new Renaissance. This is why', 2017 <https://www.weforum.org/agenda/2017/10/ai-renaissance/>
- 490 Chou 'Partnering on machine learning in healthcare', 2017 <https://blog.google/topics/machine-learning/partnering-machine-learning-healthcare/>