

# CUTTING EDGE TECH NEWS

By Bertalan Meskó, MD, PhD

The future of healthcare is shaping up in front of our very eyes with advances in digital healthcare technologies, such as artificial intelligence, VR/AR, 3D-printing, robotics or nanotechnology. We have to familiarize with the latest developments in order to be able to control technology and not the other way around. The future of healthcare lies in working hand-in-hand with technology and healthcare workers have to embrace emerging healthcare technologies in order to stay relevant in the coming years.

Be bold, curious and informed!

Are you afraid that robots will take over the jobs of nurses, doctors and other healthcare professionals? Are you scared that artificial intelligence will control the world within a couple of years? Do you have nightmares about virtual reality addicted kids and adults running around in their non-existent dream world? Are you frightened to have a genetic test because it might reveal the day of your death?

These are all half-truths, fake news and other imaginary dystopias. In a more fashionable way: alternative facts about the future of medicine. However, these all have one thing in common: the fear about the unknown place called future and what it might bring upon us.

But no matter how scary the future might seem at the moment, we cannot stop technological development; and sooner or later we will find out that whole areas of our lives have been transformed through various digital technologies. Thus, our task at the moment is to face our fears about the future with courage; to turn to technologies with an open mind and to prepare for the changing world with as much knowledge as possible.

## Technology and humans hand-in-hand for a better healthcare

I honestly believe that this is the only way forward. Technology can only aid and improve our lives if we stand on its shoulder and if we are always (at least) two steps ahead of it. But if we adhere to this rule, the cooperation between people and technology could result in amazing achievements.

In medicine and healthcare, digital technology could help transform unsustainable healthcare systems into sustainable ones, equalize the relationship between medical professionals and patients, provide cheaper, faster and more effective solutions for diseases - technologies could win the battle for us against cancer, AIDS or Ebola - and could simply lead to healthier individuals living in healthier communities.

But as the saying goes, one has to be a master of his own house, so it is worth starting "the future" with the betterment of our own health through digital technologies, as well as changing our own attitude towards the concept of health as such and towards medicine and healthcare.

And what does it all look like in practice? To serve as an introduction, this article will explore 10 ways in which technology is reshaping healthcare. For more in-depth analysis and further examples, I invite you to check the book I wrote titled *The Guide to the Future of Medicine*.

### 1. Artificial intelligence

I believe that artificial intelligence has the potential to redesign healthcare completely. AI algorithms are able to mine medical records, design treatment plans or create drugs way faster than any current actor on the healthcare palette including any medical professional.

Atomwise uses supercomputers that root out therapies from a database of molecular structures. In 2015, the start-up launched a virtual search for safe, existing medicines that could be redesigned to treat the Ebola virus. They found two drugs predicted by the company's AI technology which may significantly reduce Ebola infectivity.

More recently, Google's DeepMind created an A.I. for breast cancer analysis. The algorithm outperformed all human radiologists on pre-selected data sets to identify breast cancer, on average by 11.5%!

## THE FUTURE OF DIGITAL HEALTH

These are only two of the many examples of companies using A.I. to advance healthcare from designing new drugs to disrupting medical imaging to mining medical records. We've collected our favourite examples in a recent article. With all these tangible examples, imagine what horizons would open for humanity if early utilization of AI results in such amazing discoveries!

### 2. Virtual reality

Virtual reality (VR) is changing the lives of patients and physicians alike. In the future, you might watch operations as if you wielded the scalpel or you could travel to Iceland or home while you are lying on a hospital bed.

VR is being used to train future surgeons and for actual surgeons to practice operations. Such software programmes are developed and provided by companies like Osso VR and ImmersiveTouch and are in active use with promising results. A recent Harvard Business Review study showed that VR-trained surgeons had a 230% boost in their overall performance compared to their traditionally-trained counterparts. The former were also faster and more accurate in performing surgical procedures.

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The technology is also benefiting patients and has been proven to be effective in pain management. Women are being equipped with VR headsets to visualize soothing landscapes so as to help them get through labour pain. Patients suffering from gastrointestinal, cardiac, neurological and post-surgical pain have shown a decline in their pain levels when using VR to distract them from painful stimuli. A 2019 pilot study even showed that patients undergoing surgery lessened their pain and anxiety and improved their overall hospital experience.

### 3. Augmented reality

Augmented reality differs from VR in two respects: users do not lose touch with reality and it puts information into eyesight as fast as possible. These distinctive features enable AR to become a driving force in the future of medicine; both on the healthcare providers' and the receivers' side.

In case of medical professionals, it might help medical students prepare better for real-life operations, as well as enables surgeons to enhance their capabilities. This is already the case at Case Western Reserve University where students are using the Microsoft HoloLens to study anatomy via the HoloAnatomy app. Using this method, medical students have access to detailed and accurate, albeit virtual, depictions of the human anatomy to study the subject without the need of real bodies. Another promising company, Magic Leap, will also bring its slightly different, mixed reality headset to healthcare. Magic Leap has partnered with SyncThink for brain health, with XRHealth for developing a therapeutic platform and with German medical technology company Brainlab to bring its spatial computing technology to healthcare. However, no commercial products are yet available from these partnerships but we're bound to see them populate the healthcare market in the near future.

### 4. Healthcare trackers, wearables and sensors

As the future of medicine and healthcare is closely connected to the empowerment of patients as well as individuals taking care of their own health through technologies, I cannot leave out health trackers, wearables and sensors from my selection. They are great devices to get to know more about ourselves and retake control over our own lives.

I personally use the Fitbit Ionic to monitor my sleep and track my workout. I supplement it with the Polar H10 to fine-tune my workout routines with my trainer so as to find the best exercises for my abilities. For meditation, the Muse headband helped me a lot to find the main things that I personally

need for a successful meditation session. Now I don't have to use the device to try to reach mindfulness!

No matter whether you would like to manage your weight, your stress level, your cognitive capabilities better or you would like to reach an overall fit and energetic state, there is a device for all of these needs and more! The beauty of these new tech-fuelled devices is that they really make patients the point-of-care. With the ability to monitor one's health at home and share the results remotely with their physician, these devices empower people to take control of their health and make more informed decisions.

### 5. Medical tricorder

When it comes to gadgets and instant solutions, there is the great dream of every healthcare professional: to have one almighty and omnipotent device, with which you can diagnose and analyze every disease. It even materialized - although only on screen - as the

medical tricorder in Star Trek. When Dr McCoy grabbed his tricorder and scanned a patient, the portable, hand-held device immediately listed vital signs, other parameters, and a diagnosis. It was the Swiss Army knife for physicians.

With the exponential progress in healthcare technology, we now live in a world where similar devices, which were once a figment of sci-fi enthusiasts, are available! The Viatom CheckMe Pro is one such palm-sized gadget which can measure ECG, heart rate, oxygen saturation, temperature, blood pressure and more! There are also other companies working on similar devices like the MedWand which on top of measuring multiple vital parameters, packs a camera for telemedical purposes. Then there's the FDA-cleared BioSticker from BioIntelliSense which, despite being tiny and thin, can measure a wide range of parameters like respiratory rate, heart rate, skin temperature, body position, activity

levels, sleep status, gait and more. Although the currently available products are a bit far from the tricorder, we will get there soon. You will see high-power microscopes with smartphones, for example, analyzing swab samples and photos of skin lesions. Sensors could pick up abnormalities in DNA, or detect antibodies and specific proteins. An electronic nose, an ultrasonic probe, or almost anything we have now could be yoked to a smartphone and augment its features. And we have to get ready for it!

### 6. Genome sequencing

The whole Human Genome Project cost approximately \$2.7 billion for the US government, which is an insanely huge amount of money. Especially if you consider that in January, 2017, DNA sequencing giant Illumina unveiled a new machine that the company says is "expected one day" to order up your whole genome for less than \$100. Last year, the company's CEO reiterated that Illumina is still

working towards that benchmark. This would mean that you might have a cheaper genetic test than a general blood test (for which prices vary between approximately \$10-150). Mind-blowing!

Such a test has so much potential! You can get to know valuable information about your drug sensitivity, multifactorial or monogenic medical conditions and even your family history. Moreover, there are already various fields leveraging the advantages of genome sequencing, such as nutrigenomics, the cross-field of nutrition, dietetics and genomics. Some companies such as the California-based start-up, Habit, are offering personalized diets based on genetic codes.

I also took the Atlas Biomed's genetic test which proved to be quite insightful. Its analyzes, despite some being difficult to understand, provided practical calls to action. It showed me that I should have a higher intake of vitamins A and E and iron, and that I don't have any lactose, gluten, or alcohol intolerance. In addition, it also revealed conditions to which I am at risk, which is informative so as to take preventive actions.

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**Virtual reality (VR)** is an artificial environment that is created with software and presented to the user in such a way that the user suspends belief and accepts it as a real environment. On a computer, virtual reality is primarily experienced through two of the five senses: sight and sound. (Exceptional for Educational/Medical/Emergency Services/Training).

**Augmented reality (AR)** is an interactive experience of a real-world environment where the objects that reside in the real world are enhanced by computer-generated perceptual information, sometimes across multiple sensory modalities, including visual, auditory, haptic, somatosensory and olfactory. (Exceptional as a Promotional Tool/BUSINESS/Commerce. Instruction Manual step by step instruction for your business. Great tool to display manuals and instructions on how to use any apparatus, As an ACCESSIBILITY tool)

**Artificial intelligence (AI)** is the ability of a computer program or a machine to think and learn. It is also a field of study which tries to make computers "smart". ... As machines become increasingly capable, mental facilities once thought to require intelligence are removed from the definition. (Exceptional Good Tool For Optimizing Virtual Reality and Augmented Platforms. Great way to enhance data bases to become self generating. (AI) is the new science being used in all commercial and industrial applications.

**Virtual Tours (360 VideoTechnology. VT)** Virtual tours are a link between two or more 360-degree panoramas that allow the viewer to move from one interactive photo to the other. This works on all devices, whether it's a desktop or laptop computer, a tablet, phone or a VR headset like Google Cardboard, Samsung Gear VR, and Oculus Rift. This is the most fun way to view 360 degree virtual tours.

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