Focus

Roland Berger

Future of health 3 | Innovation boosted

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Future of health 3 / *Innovation boosted*

Innovation is transforming the world of healthcare. While this is not news in itself – breakthrough medical procedures, drugs and devices have always been a driving force behind the evolution of healthcare markets – we are now witnessing a new dimension of change. Two worlds are coming together, the "physical" (mechanical, electrical, biological and chemical innovations) and the "digital" (early detection, artificial intelligence, and so on). This convergence is giving a powerful new boost to innovation and will change the way patients experience healthcare in a multitude of ways.

The rapid pace of change in the healthcare sector confronts market players with a number of important questions. How are physical and digital innovations interacting with one another today, and how might they do so in the future? What is the impact of innovations on the market, and what is their financial impact? What will patients' experience of healthcare be in the future? And what are the strategic options for different players – from the pharmaceutical and medical technology industry to payors and providers – to expand their spheres of influence?

Our third Future of Health study, building on our previous investigations in 2019 and 2020, provides answers to these questions. Industry insiders are expecting digital to account for 12 percent of the healthcare market by 2026. Artificial intelligence, early detection, behavior-changing tools and a whole host of other digital innovations will represent a global market value of around EUR 1 trillion. New types of innovation, such as gene therapy and electroceuticals, will profoundly change the way we treat diseases. Different types of players will have different roles in driving the changes, and they should pursue different strategies accordingly. Industry players will continue to drive physical and digital innovations, while providers and payors will redefine their roles. Thinking in ecosystems and open innovation networks will be important for everyone.

With developments in the sector less predictable and plannable than ever before, players of all types would be well advised to consider different scenarios and hone their ability to react quickly and with versatility. As we discuss in the following pages, innovation in the healthcare sector, boosted by the convergence of the physical and digital worlds, means that players need to expect the unexpected.

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1 / Innovation in healthcare

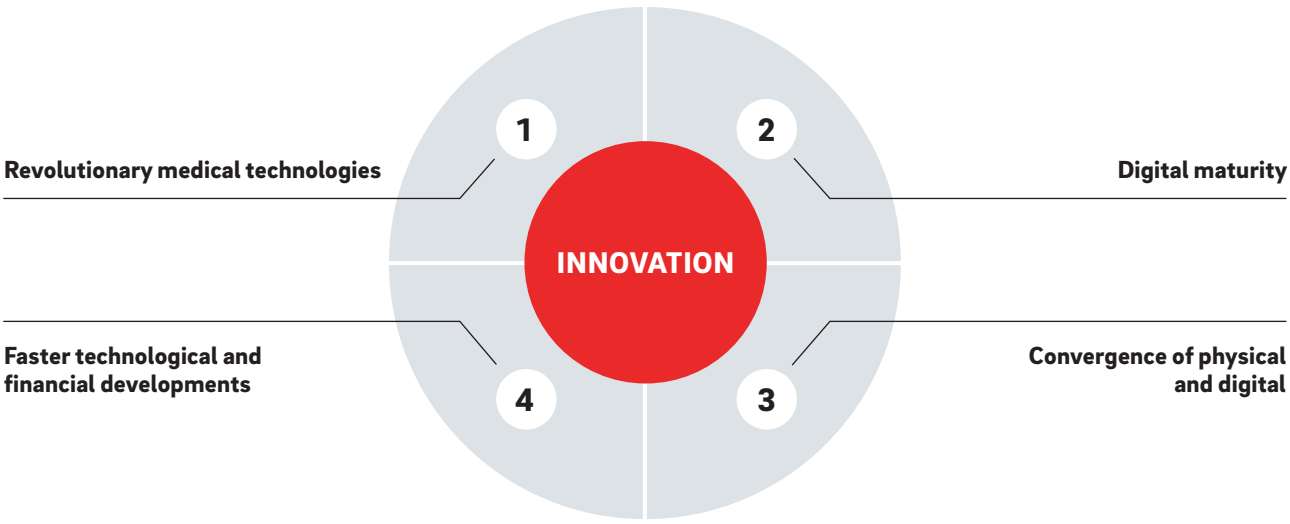
A NEW DIMENSION OF CHANGE

Each year, our Future of Health study focuses on a topic of special relevance for the healthcare sector. This year's study – the third in our series – looks at how innovation is transforming the industry. Of course, innovations in medical procedures, drugs and devices have long been a driving factor in the development of global healthcare markets. But now it appears that a new dimension of change has emerged, with significant implications for all types of market players.

Two distinct types of innovation can be identified in healthcare. On the one hand, there are the innovations that we could call "physical", including mechanical, electrical, biological and chemical breakthroughs. Examples of this type of innovation abound, from the first vaccines at the end of the eighteenth century and the introduction of antibiotics in the 1930s to the use of robotics in surgery in the late twentieth century. On the other hand, we have "digital" innovations, such as recent breakthroughs in early detection and advances in artificial intelligence (AI). What we are seeing today is that these two worlds, the physical and the digital, are converging, giving a powerful new boost to innovation.

Innovation opens up new perspectives in the future of healthcare. At the same time, it presents players in the healthcare sector with fresh strategic choices and a wealth of new opportunities. We identify the four key factors driving this new dimension of change below. → A

A: Innovation in healthcare
Four key factors



Source: Roland Berger

First, we are seeing growing numbers of revolutionary medical technologies appearing in the healthcare arena. Innovations such as mRNA vaccines and CGT (cell and gene therapy) are able to change structures and processes inside human cells in the immune system and thus open up a whole new world of possible therapies. These breakthroughs are revolutionizing medical practice before our very eyes: mRNA vaccines against Covid-19 entered use in 2020, for example, while CGT was first employed in 2019 in the United States and 2020 in Germany. The number of clinical studies in these innovation-rich areas is continuously rising.[1] Other technologies, such as minimally invasive robotic surgery and diagnostic imaging or lab diagnostics, are also gaining new momentum, as reflected in the strong 2021 stock price development of companies such as Sartorius, Healthineers and Intuitive.

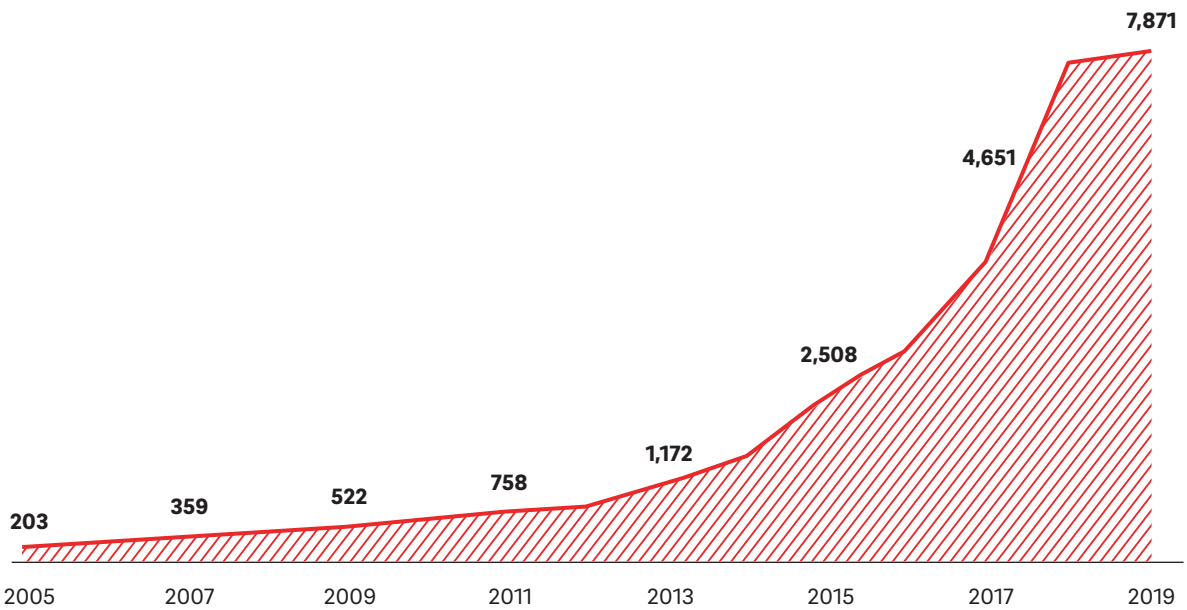
Second, digital as a whole is becoming more mature. The digital healthcare market is now home to numerous "unicorns", or privately held startups each valued at more than USD 1 billion. According to Holon IQ, 73 health technology ("healthtech") unicorns exist around the globe in 2021.[2] CB Insights reported that there were 46 healthcare unicorns in 2020 and 38 in 2019.[3] Many highly promising new approaches have emerged in areas such as early detection, lifestyle change and therapy choice. And as the digital competence of patients increases, so does the level of acceptance for such solutions. Interest in the area of digital has also exploded: The number of news articles mentioning the digital transformation of healthcare tripled between 2019 and 2020, and this is an area that continues to receive a great deal of attention.[4]

A third significant factor driving the new dimension of change is the increased coming together of the physical and digital worlds, a trend that we discuss in detail in Chapter 2. This convergence has resulted in the development of many innovative solutions. For example, Oxford Nanopore Technologies uses nanoscale holes embedded in high-tech electronics to perform precise molecular analyses, while biotechnology company Caris Life Sciences is developing individual cancer therapies with the help of AI. Indeed, in the United States alone, the FDA has approved more than 60 medical devices based on AI and machine learning.[5] Other areas of innovation include electroceuticals and robots. As digital and physical research converge, the number of studies on machine and deep learning and their application in the area of healthcare has increased exponentially.[6] → **B**

Finally, we are witnessing a speeding up of both technological and financial developments. This affects not only digital innovations but also new biological and diagnostic technology. Oxford Nanopore Technologies' gene sequencer, for instance, is available from about USD 1,000 and can decode 70,000 base pairs in just a few hours, while analyzing a bacterium takes no more than a few days with the help of a device not larger than a USB stick.[7] Similarly, in the area of DNA sequencing, processes that previously cost in the region of USD 1 billion and took more than a dozen years to complete,

[1] CB Insights (2021) State Of Healthcare Q2'21 Report: Investment & Sector Trends To Watch, p. 16
[2] Holon IQ (2021): Global HealthTech Unicorns: The Complete List of Global HealthTech Unicorns
[3] CB Insights (2020, 2019): State Of Healthcare Report Q4/2020/Q2/2019: Investment & Sector Trends To Watch, p. 26
[4] CB Insights (2021): State Of Healthcare Q2'21 Report: Investment & Sector Trends To Watch, p. 12
[5] Roland Berger (2021): Trend Compendium; Nature, npi digital medicine (2021): An infographic about the 29 FDA-approved, AI/ML-based medical technologies. Johner Institute (2019): Artificial Intelligence in Medical Devices
[6] TMF, PubMed, Roland Berger
[7] Der Innovationsblog.de (2015): Innovation in exponentieller Geschwindigkeit; https://nanoporetech.com/
[8] National Human Genome Research Institute (2020): DNA Sequencing Costs: Data
[9] Deutsches Ärzteblatt (2013, 2016): Gendiagnostik: Das "1000-Dollar-Genom"
[10] TechCrunch (2017): Illumina wants to sequence your whole genome for $100

B: Steep rise in research in machine and deep learning
Number of studies on machine and deep learning on PubMed, 2005-2019



Source: Roland Berger

now cost less than USD 100 and in some cases take less than an hour.[8,9,10] This drop in price has triggered a methodological upheaval in human genetics.[11] It is accompanied by an abundance of available capital, which enables faster scaling of business models. According to CB Insights, a total of USD 31.6 billion was invested in healthcare equity funding in just the first quarter of 2021. In addition, 96 funding rounds with a value of more than USD 100 million took place. In 2020, health innovation funding worldwide grew by 50 percent, from USD 14 to 22 billion.[12]

This boost in innovation in healthcare presents players with a number of questions. How are physical and digital innovations interacting with one another today, and how might they do so in the future? What is the impact of innovations on industry players, providers and payors? And what are the strategic options for players in reaction to these changes? We suggest answers to these and related questions in the following chapters.

[11] Health Europe (2020): Investments in innovation to transform the healthcare sector
[12] CB Insights (2021) Startup Health Insights, 2021 Midyear Report, p. 7

2 / The shape of the future

TWO WORLDS CONVERGE

To answer the questions outlined above, we investigated three sources of insight. First, we gathered the views of those working within the industry or in closely related areas, with a survey of more than 400 experts from around the globe – the third of our annual Future of Health surveys. We validated our survey findings and obtained further insights by carrying out a number of one-to-one interviews with international experts from different fields, representatives of payors, providers, the pharmaceutical and medical devices industry, startups and healthcare platforms. Finally, we performed extensive desk research and collated information from scientific research and trend studies.

2.1. A BROADER SPECTRUM OF INNOVATIONS

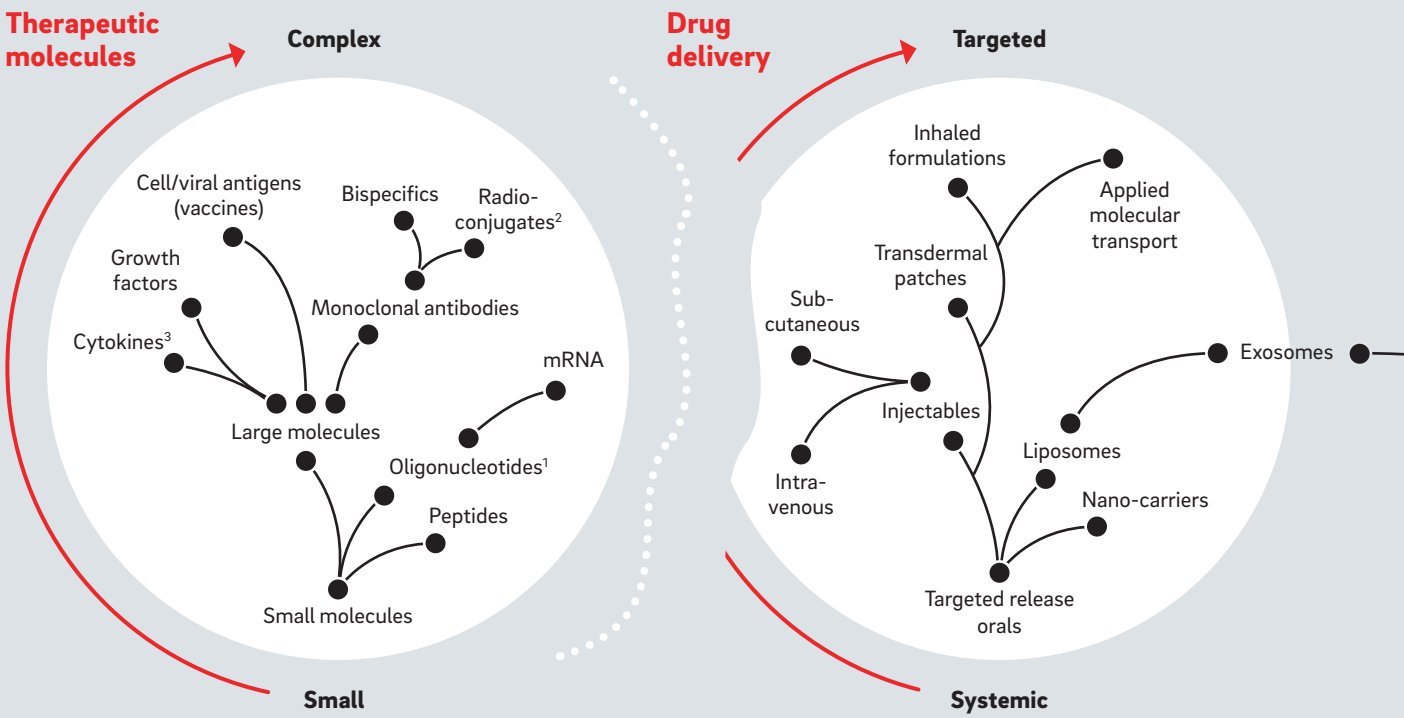
The results of our investigation shed some important light on what is going on in innovation in healthcare. Most strikingly, the spectrum of innovations is widening. Thus, in the area of physical innovations – mechanical, electrical, biological and chemical – we are seeing a broad range of developments, such as new research tools from systems biology, technological advancements (nanotechnology, robotics), increased domain know-how and understanding (immune-oncology and immunology proper) and even novel modalities (CGT,[13] mRNA[14] and novel drug conjugates). Particular progress is taking place in areas such as miniaturization, biomaterials science, automation and connectivity within the "medtech" (medical technology) and device realm. On the therapeutics side, we are seeing numerous breakthrough innovations around five core innovation clusters: (1) therapeutic molecules, where innovations range from innovative small molecules, such as tyrosine kinase inhibitors (TKIs) for the activation of proteins in targeted oncology therapies, to novel radio-conjugate biologics (radio-immunotherapies) and bispecific antibodies in immune oncology; (2) drug delivery, ranging from advanced liposomal carriers for mRNA to applied molecular transport technologies for oral biologics; (3) cell therapies, from novel autologous cell therapies, such as first-generation chimeric antigen receptor T cell (CAR-Ts), to engineered allogeneic cells employing iPSC (induced pluripotent stem cell) technology, in which the stem cell that can be generated directly from an adult somatic cell); (4) genetic cell engineering, with breakthrough technologies around CRISPR-Cas making it possible to equip cells with improved safety features and efficacy-related traits; and (5) gene therapies, ranging from gene augmentation applications around viral vector capsids to in vivo genome editing approaches. These innovations will enable future medicine to move away from treatments centered around disease symptoms and more fully into the world of regenerative medicine. → C

The spectrum of physical and digital innovation is widening! They interact in multiple ways and increase the speed of change.

[13] Value in Health (2019): Estimating the clinical pipeline of cell and gene therapies and their potential economic impact on the US healthcare system

[14] PubMed, HHS Author Manuscripts (2019) mRNA vaccines – a new era in vaccinology

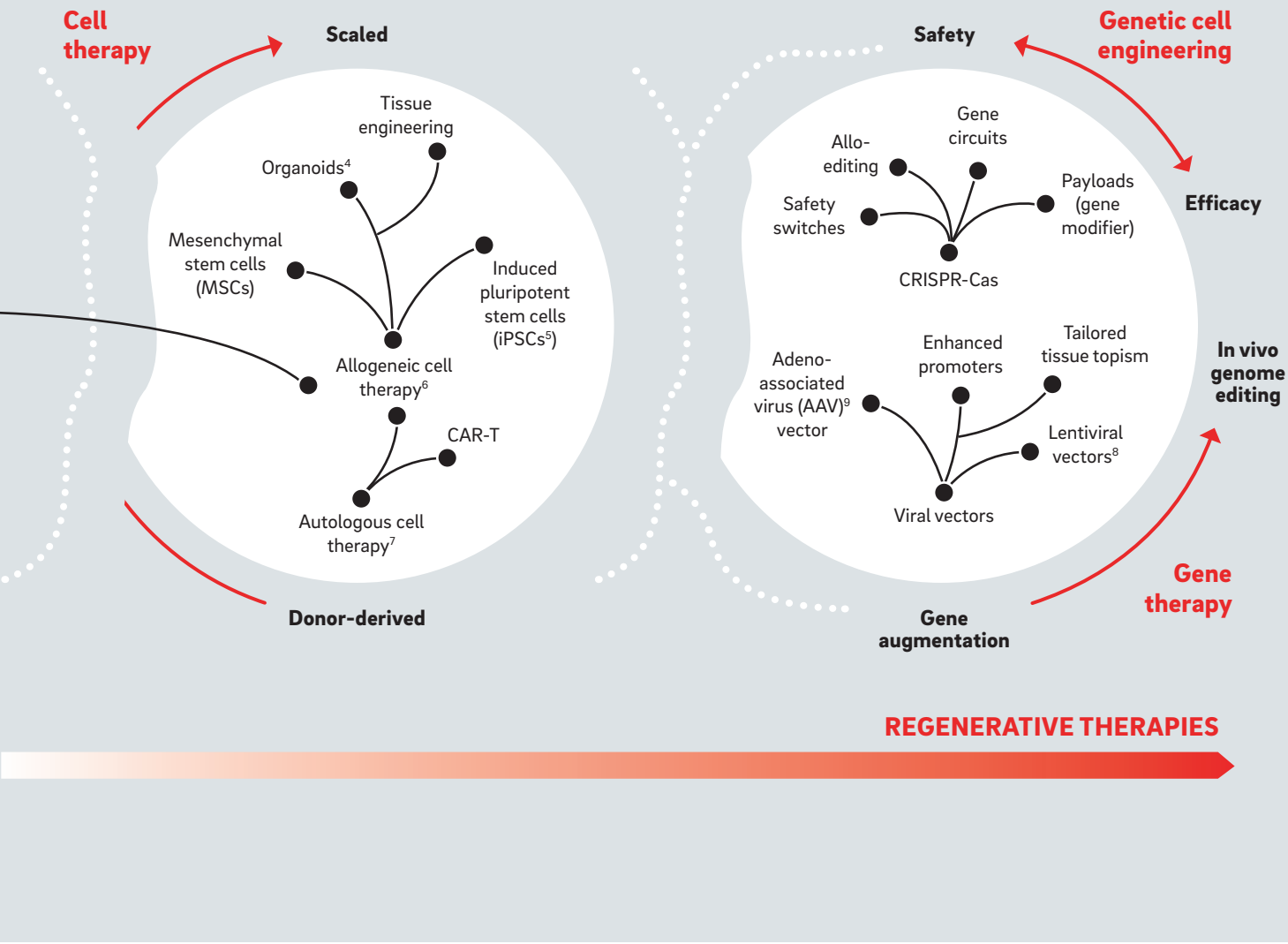
C: The broad landscape of physical innovations – pharmaceuticals as an example
Technologies and applications



ACUTE/CHRONIC TREATMENTS

[1] Short DNA & RNA sequences [2] Targeted radio immunotherapies [3] Short distance acting signaling molecules [4] Miniaturized and simplified version of an organ
[5] Stem cell that can be generated directly from a somatic cell [6] Universal cell therapies based on donor-derived cells to treat different patients
[7] Cells of a donor are harvested and re-infused to the donor [8] Method of inserting nucleic acids with lentiviruses
[9] Method of inserting nucleic acids with adeno-associated viruses

Source: Roland Berger


Cell therapy
Scaled
Tissue engineering
Organoids[4]
Mesenchymal stem cells (MSCs)
Induced pluripotent stem cells (iPSCs[5])
Allogeneic cell therapy[6]
CAR-T
Autologous cell therapy[7]
Donor-derived
Safety
Genetic cell engineering
Allo-editing
Gene circuits
Safety switches
Payloads (gene modifier)
CRISPR-Cas
Efficacy
Adeno-associated virus (AAV)[9] vector
Enhanced promoters
Tailored tissue topism
Lentiviral vectors[8]
Viral vectors
In vivo genome editing
Gene therapy
Gene augmentation
REGENERATIVE THERAPIES

Digital innovations are also now coming to maturity and finding wide application. One area where they are making a real difference to patients' lives is in enabling measurable **health behavior change**. For example, San Francisco-based Virta Health's "reversal treatment" prevents progression to type 2 diabetes in 97 percent of prediabetes patients, according to research.[15] Similarly, Quit Genius, which describes itself as a "digital clinic for multiple addictions", fights smoking addiction through a cross-section of treatments, including nicotine gum, counseling, software and a carbon monoxide monitor.[16] Noom, a subscription-based app for tracking food intake and exercise, "combines the power of technology with the empathy of real human coaches" to help users achieve lasting weight loss.[17] These innovations are backed up with good science, too: Noom's solution, for example, draws on published academic research in areas ranging from oncology, diabetes prevention and hypertension to diabetes management.

Another area where digital is making a difference is in **early detection**. For example, California-based biotechnology and pharmaceutical company Grail develops new technologies for early detection using the power of next-generation sequencing (NGS), population-scale clinical studies, state-of-the-art computer science and data technology.[18] Israel-based startup Binah.ai offers, in its own words, "real-time vital signs measurements using only a smartphone, laptop or tablet camera, from remote or on-premises, just by looking at the device's camera. The solution is delivered as a software developer kit (SDK) or a ready-to-use app".[19] Similarly, Lasarow Healthcare Technologies Limited's smartphone app "Mole Detect Pro" uses an algorithm to harvest the probability of a potential melanoma based on the ABCDE method by using photographs.

Digital innovation is also seen in the **use of AI in diagnostics and therapies**. For instance, the FDA has approved around 30 new devices powered by AI and machine learning in radiology alone since 2017, and 15 more in cardiology.[20] An analysis reported in the American Journal of Hematology shows that an AI-based model may facilitate selection of the optimal frontline tyrosine kinase inhibitor (TKI) therapy for patients with newly diagnosed chronic-phase chronic myeloid leukemia (CML-CP).[21] Augmented reality (AR) is also finding innovative applications in the area of pain treatment and mental health.

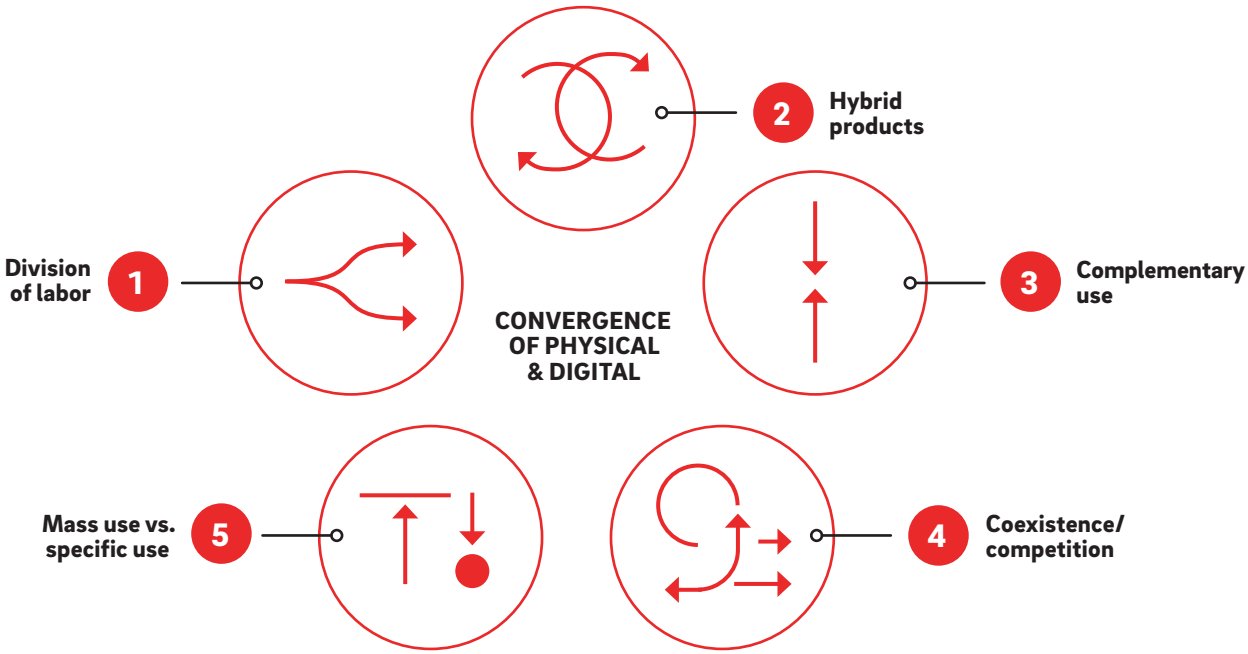
2.2 TWO WORLDS CONVERGE

As touched on in Chapter 1, we are increasingly seeing the coming together of the physical and digital worlds, resulting in innovations such as the parallel use of sensors and digital applications, biopsies and AI, and robotics/implants and digital applications. Multi-cancer early test Galleri, for example, is able to identify more than 50 different types of cancer by means of a simple blood draw and the use of AI.[22] Similarly, US biotechnology company Freenome is developing blood tests that can identify early-warning signs of cancer, including changes in immune system activity.[23]

Indeed, the physical and digital worlds are interacting in a number of ways – some of them startling – from an emerging "division of labor" between the two worlds to competition and potentially substitution. We look at five key areas of interaction below. → D

[15] Virta (2021): Virta Health's Reversal Treatment Prevents Progression to Type 2 Diabetes in 97% of Prediabetes Patients, New Research Shows
[16] Forbes (2021): Quit Genius updates smoking cessation for the modern user
[17] Noom (2021): Noom has helped millions of people develop long-term healthy habits through science and psychology
[18] Grail (2021): Detect cancer early, when it can be cured, 2021
[19] Video-based Vital Signs Monitoring – Binah.ai (2021): Vital Signs Monitoring for Everyone, Everywhere
[20] Nature, FDA, Johner Institute, Roland Berger
[21] Oncology Nurse Advisor (2020): AI-Based Model Made Optimal Selections of Frontline TKI Therapy in CML
[22] GRAIL (2021): Galleri multi-cancer early detection test
[23] Diagnostics World (2019): Could A Liquid Biopsy & AI Combo Cure Cancer? Some Think It's Worth Finding Out

D: Interaction between physical and digital worlds
Five areas of interaction

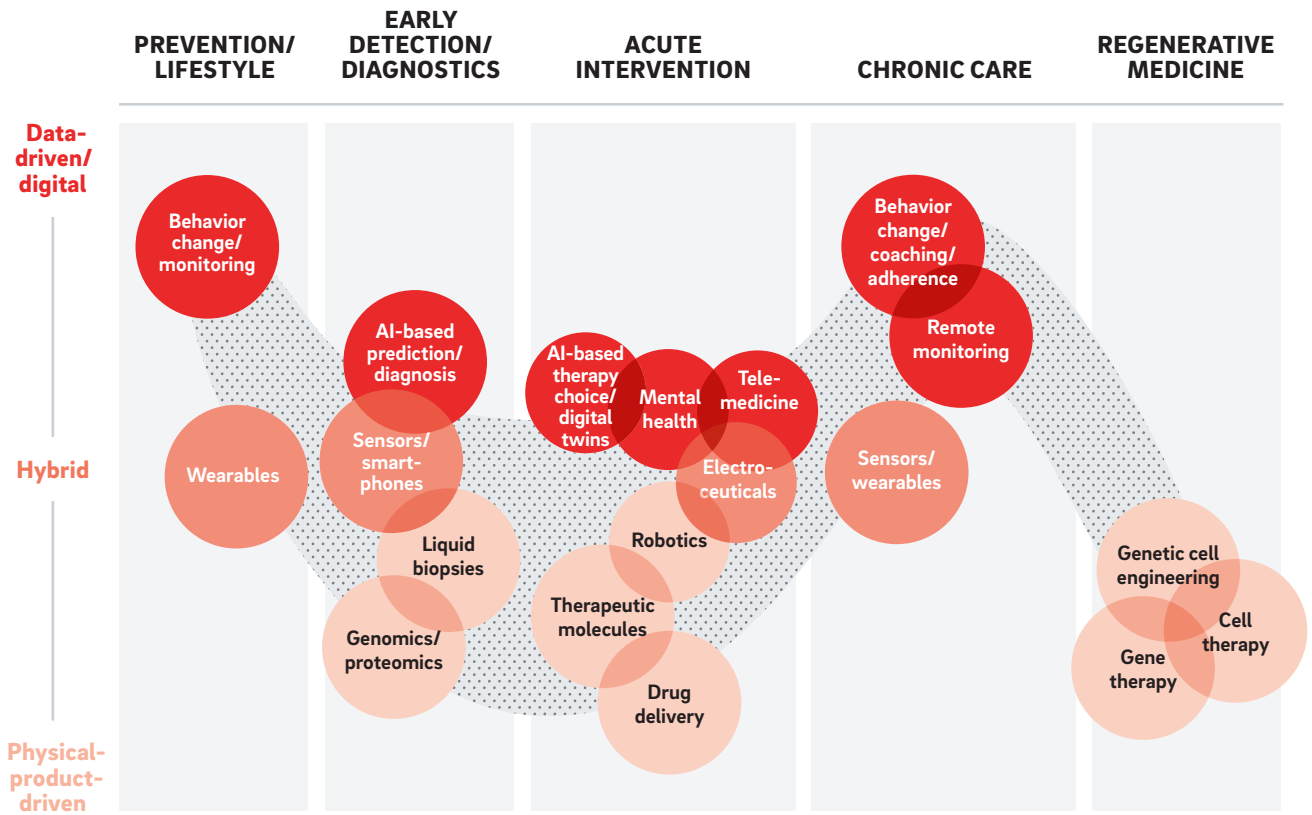


Source: Roland Berger

First, we believe that a certain **"division of labor" is emerging between physical and digital innovations**. In Figure E, we map digital and physical innovations along the treatment continuum to create an "innovation landscape". Digital and data-driven innovations, shown in the upper half of the graphic, occur mainly in the area of prevention/lifestyle, chronic care, and to some extent early detection/diagnostics and therapy, while physical-product-driven innovations, shown in the lower half of the graphic, dominate the areas of therapy and regenerative medicine. → E

In fact, this division of labor is not surprising. If something goes wrong inside the patient's body, you need to physically get inside them – using molecules, genetic material, reprogrammed immune cells, scalpels, chips, or whatever. Therapies are therefore unlikely to be digital unless they relate to the mind (mental health, Alzheimer's, psychosomatic issues, behavior change, and the like). The term "digital therapeutics" should therefore be taken with a grain of salt: What we are in fact likely to see on the market is actually digital companions and digital diagnostics. Our experts agree:

E: Division of labor: The innovation landscape
Physical and digital innovations along the treatment continuum



Source: Roland Berger

In the survey, 78 percent said that digital technology will play a significant role in prevention, early detection, therapy selection and supervision or coaching, not in therapy itself. It will, however, change the choice and use of today's therapies. → F

A second area where physical and digital are converging is in **hybrid products**, which combine physical and digital functions. Various gadgets for home diagnostics are now available that can be connected to a smartphone. For example, the Cue Health Monitoring System is a portable compact testing platform that uses molecular diagnostic technology to deliver reliable results in about 20 minutes.[24] Similarly, the Oura Ring is a physical device that continuously measures different body functions, its software interpreting sleep patterns and making practical recommendations. Hybrid products are also central to brain-computer interface (BCI) technology, which allows a human brain and an external device to communicate by exchanging signals, enabling humans to directly control machines without the physical constraints of the body.[25]

Third, physical and digital technology can be used in a **complementary or collaborative fashion**. For example, data generated by physical means, such as liquid biopsies or genome sequencing, can be evaluated using Big Data or AI, or AI can be used to help find or design an appropriate individual therapy for a complex disease. Hinge Health's Digital Musculoskeletal Clinic, for instance, combines sensor-guided exercise therapy with virtual health coaching to enable physical therapy from the patient's home.

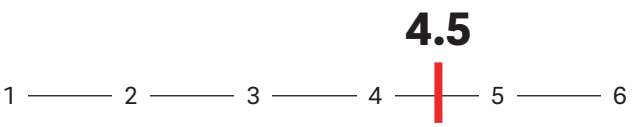
Fourth, physical and digital tools may **coexist, compete or even substitute one another**. For example, there may be competing physical and digital therapies for certain conditions, the ultimate choice depending on the patient's or physician's preferences or the suitability of different approaches in the case in question. For some mental health conditions, for instance, a choice may exist between traditional drug-based therapies and digital mental health programs. Similarly, some types of diagnostics may be carried out by either biological or digital means, and invasive measurements can sometimes be replaced by optical measurements, such as using a smart watch to measure arterial fibrillation or blood glucose levels.

Cost can also play a role in the choice between physical and digital tools. In many cases the self-service aspect of digital services makes them more affordable. They may also be more accessible for specific target groups.

Finally, digital and physical innovations **differ in both the breadth of their usage and the extent of their impact on patients**. Thus, digital innovations can be used widely but often only have a small to moderate effect on each patient, such as a limited behavior change. By contrast, physical innovations frequently have a narrow, focused

F: Future role of digital technology
Division of labor

Digital technology will play a significant role in prevention, early detection, therapy selection and therapy supervision/coaching – but not as a therapy itself



Source: Roland Berger

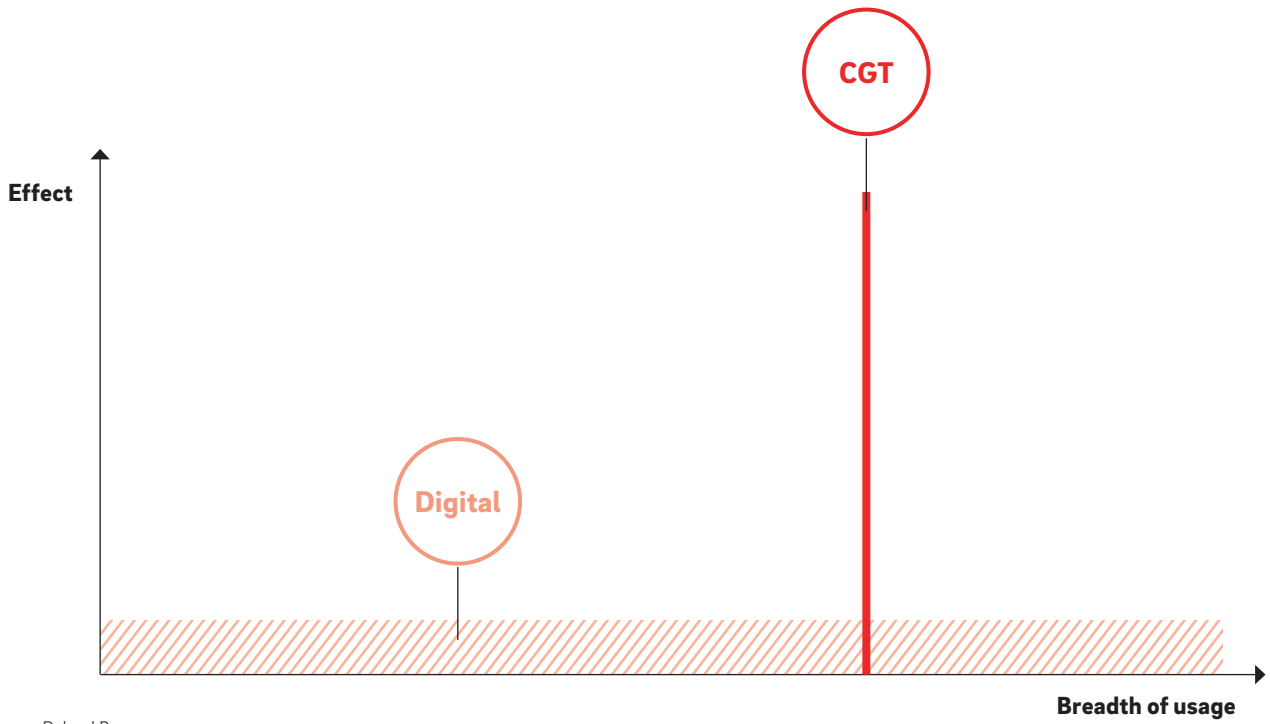
[24] Cue Health (2021): Ushering in a new area in healthcare
[25] Rand (2020): Brain-Computer Interfaces Are Coming. Will We Be Ready?

area of usage but their impact can be enormous. CGT, for example, can have a life-changing effect on patients but is currently only used with an estimated 0.014 percent of the population each year.[26] → G

Another result from our survey offers further evidence that the physical and digital worlds are converging. We asked respondents in which fields innovations would have the most impact by the year 2026. The top two answers were AI (52 percent of answers) and sensors in digital devices for continuous monitoring (50 percent). Overall, however, the experts saw innovations as impacting a broad range of fields. This reflects the broad spectrum of innovations that the healthcare system will adopt in the future. As mentioned at the outset, innovations in medical procedures, drugs and devices have long been a driving factor in the healthcare sector. What is new is the sheer diversity and range of novel types of products that are now beginning to have a practical impact on healthcare. → H

[26] Based on US estimations for the period to 2030. Value in Health (2019): Estimating the clinical pipeline of cell and gene therapies and their potential economic impact on the US healthcare system

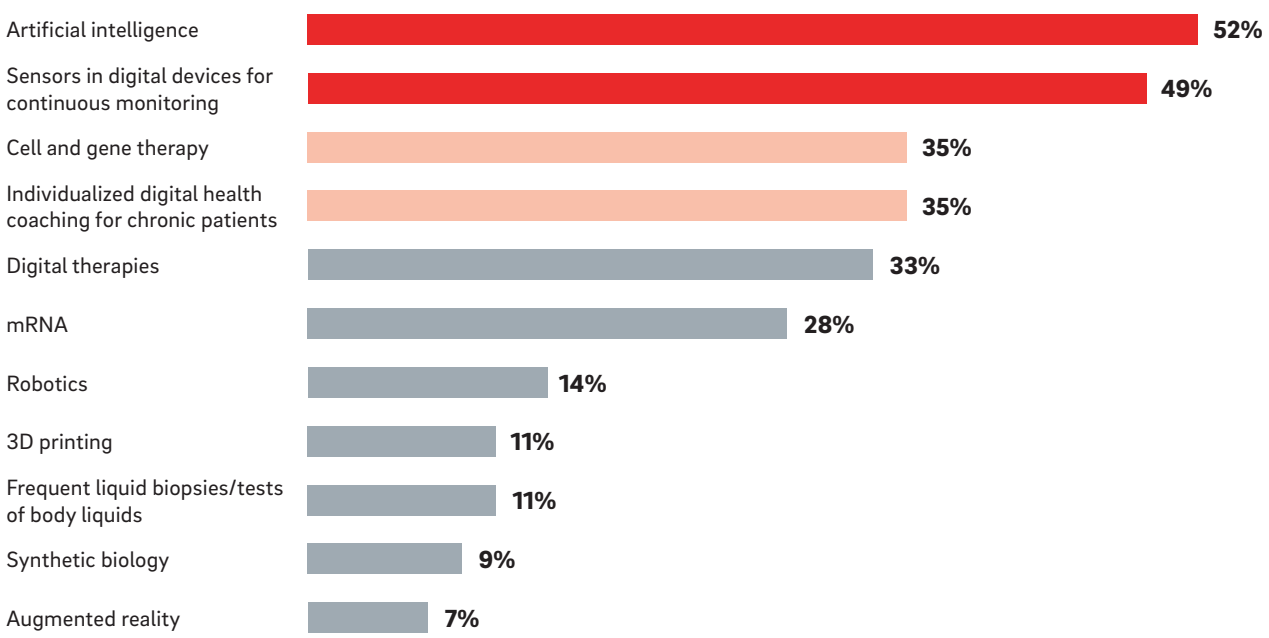
G: Impact on patients vs. breadth of usage
Difference between physical and digital innovations (schematic representation)



Source: Roland Berger

H: AI and sensors for monitoring lead the way

In which fields will innovations have the most impact by 2026?



Note: Percentage split. Multiple choices allowed

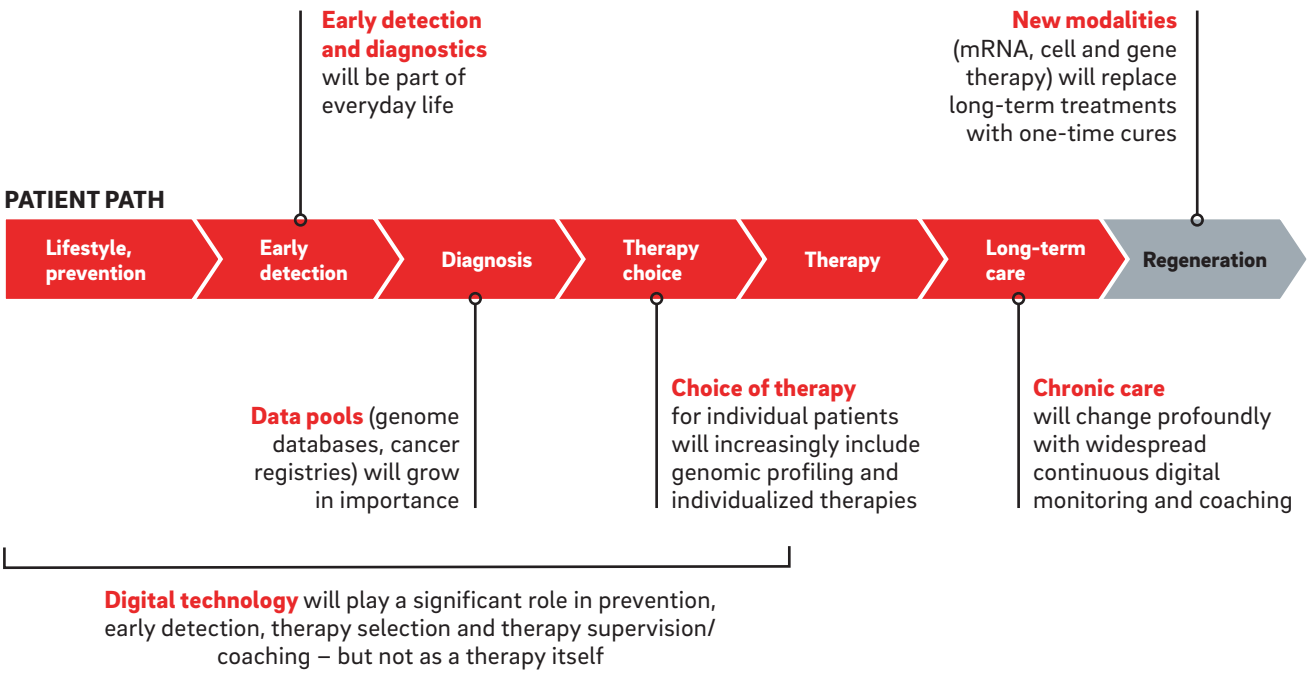
Source: Roland Berger

We asked the same question in our expert interviews. Like the survey respondents, our interview partners believed that AI and digital health applications (a key tool in digital health coaching for chronic patients) would have a major impact on the market within the next five years. They also saw a strong role for liquid biopsies, where they expected a greater impact than our survey respondents. Overall, the picture is clear: For almost all innovations, it is not a matter of whether they will be broadly applied in medical practice, but rather when. The answer to the latter question shapes our vision of the future patient path, which we discuss in the following section.

2.3 PATIENT PATHS ARE CHANGING

Innovation is not an end in itself: Specific innovations will change the future of healthcare in a number of important ways and have a tangible impact on the way we manage both our health and our interactions with the healthcare system. →!

I: Impact of innovations on the future patient path #1
Survey questions



Source: Roland Berger

The survey respondents shared their views on a range of questions relating to how the patient path will change due to innovation, summarized in Figure J. Thus, they believed that **early detection** will become a part of everyday life. Early detection can take two forms: It can be based on the use of smart gadgets such as smartphones, smart watches, patches or wristbands containing multiple sensors for continuous measuring; or it can be based on liquid biopsy, such as easy swabs for Covid-19 tests or test-at-home kits for other diseases. The combined use of these two approaches will put a large amount of data in the hands of consumers. This is especially true when they are used in combination with "symptom checkers", such as ADA health, which uses an algorithm to link thousands of symptoms to hundreds of diseases based on current medical knowledge, or K-Health, which tells users how physicians diagnose and treat people with similar symptoms.

Respondents in the survey saw the expansion of early detection as one of the most likely future trends. It will change how people understand their own health, how they interact with healthcare professionals, and how demand for healthcare services is triggered. However, this leads to two important questions: Who will facilitate these services? And who will patients contact in the first instance with any questions about their results? For payors, providers and private companies (pharmaceutical companies, medical technology companies, digital players), this creates an opportunity to establish a new kind of relationship with their customers or with patients.

Diagnostics and therapy choice will also include more and more AI, which will rely on large data pools. Such data pools are currently being constructed at several locations within the healthcare system. For example, the European Union is building a pool of one million genomes, and some health insurance companies are already collecting biological material. Electronic health records (EHRs), such as those already in use in some countries, combine many datapoints, allowing providers to screen data pools and identify the right diagnostics and therapy. Concerns remain around data security, however, with 73 percent of experts in our survey seeing data fears as the main potential roadblock to the diffusion of innovations. For players in the healthcare arena, other questions and challenges also arise, such as how to define the role of physicians in relation to algorithms. There is also the question of who will control and check the algorithms. Time will be needed for both physicians and patients to build up trust in the machines, and the ability to use them wisely.

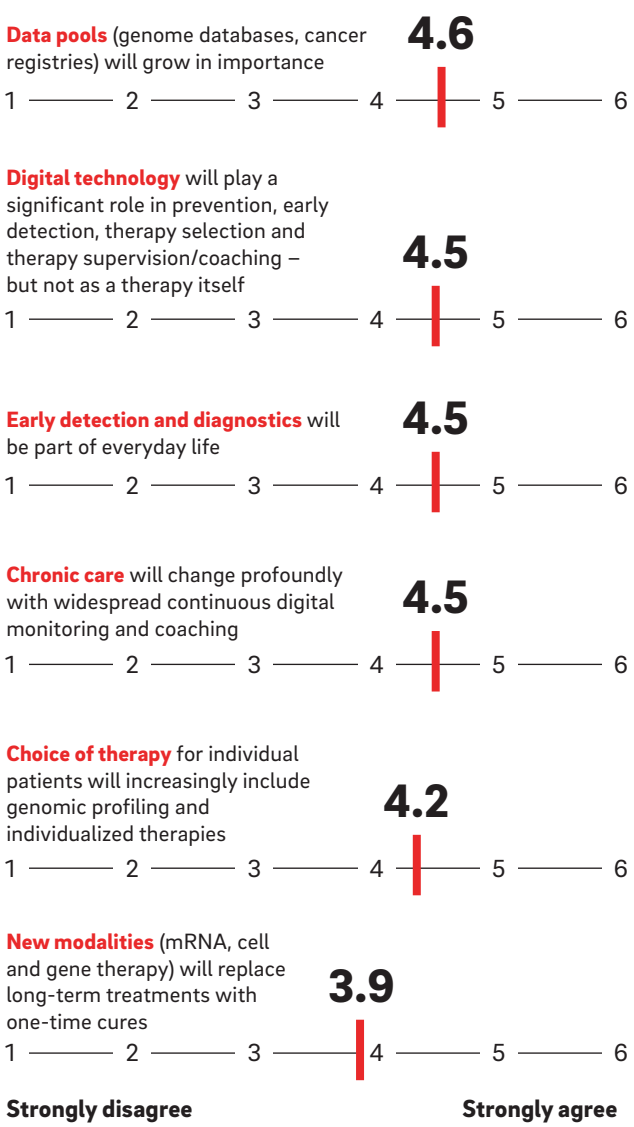
Choice of therapy will increasingly include genomic, metabolomic and even microbiomic profiling, ultimately leading to individualized therapies. This is particularly relevant for serious diseases. Physicians and patients will have to accept that an individualized approach is needed – and that in some cases a treatment, although available, may not be appropriate as it does not work for a specific gene profile. From the point of view of the healthcare system, the question will inevitably arise of how to strike a balance between cost effectiveness and such individualized treatments.

The changing patient paths create multiple opportunities for the players to establish a new kind of relationship with their customers or patients.

In the last part of the patient journey, **chronic care will integrate digital monitoring, digital care management and behavior change**. Apps can be used to improve adherence, induce lifestyle changes, optimize dosage, read sensors, answer patients' questions, and so on, steering and coaching patients between visit to their physician. The use of such apps for conditions such as diabetes is already

J: Impact of innovations on the future patient path #2

Survey questions



Source: Roland Berger

highly advanced. Continuous monitoring by smartphone is also possible in the case of cardiovascular conditions, lung disease, ophthalmic disease, skin health and mental health. For example, ResMed combines therapy devices and advanced data management solutions that can simplify the diagnosis, treatment and management of sleep-related breathing disorders, chronic obstructive pulmonary disease (COPD) and other chronic conditions. In addition, patients receive daily treatment via telephone. Similarly, Sharecare's Unwinding Anxiety® app helps patients suffering from chronic anxiety by means of a digital step-by-step program.

These examples could result in massive change, reducing the burden of chronic disease on patients, the healthcare system, and society as a whole. If these innovations can be reproduced at scale, the entire treatment of chronic disease – a significant part of today's healthcare – would be transformed. Payors could gain a large amount of influence in everyday life and, if they are able to strike a balance between costs and savings, enjoy huge competitive advantages. Other players may also try to drive these innovations – the startups and "grownups" that produce the innovations, the pharmaceutical companies that buy them, and the healthcare providers who supply them.

Overall, we see innovation as causing two distinct directions of movement: from **care to cure**, and from cure to care. By the movement from care to cure we mean that it will become possible to cure formerly lifelong diseases that required continuous care with one-time treatments, such as CGT. By **cure to care** we mean that one-time therapies will increasingly be supported by long-term digital programs for patient support, education, care management, lifestyle changes, and so on. → J

3 / Impact on the healthcare market

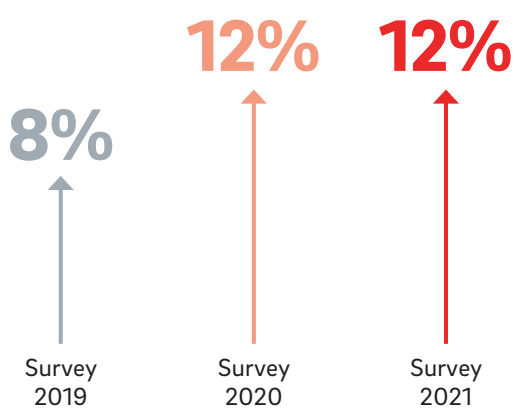
THE CONSEQUENCES OF INNOVATION

The digital transformation of the healthcare market continues to pick up speed, a trend that is likely to continue post-pandemic. During 2020, around 60 percent of healthcare organizations introduced new digital products and 42 percent stepped up the pace of some or all the initiatives in their existing digital transformation plans.[27] Organizations of all types need more and more powerful core systems in order to support the multitude of new applications and customer services. Our survey respondents believe that digital products and services will account for 12 percent of total spending in the healthcare sector by 2026, an estimate strongly in line with the findings of last year's Future of Health study. The market size for digital health is expected to reach EUR 1 trillion globally. → K

One potential consequence of the arrival of a wide range of digital and other innovations on the healthcare market is an increase in the rate of cost growth. This would be driven by the use of new, more costly treatments, the introduction of innovations as add-ons to existing treatments, and increased awareness and early detection of diseases and conditions. At the same time, digital innovations will in part replace older, more traditional approaches, and some costs may be avoided altogether thanks to better prediction and more intelligent therapy choices. Further savings could result from scalability and efficiency gains, for example by using platforms to identify patients with

[27] CBS Insights (2021) State Of Healthcare Q2'21 Report: Investment & Sector Trends To Watch, p. 12

K: Digital will account for 12% of the healthcare sector by 2026
Forecast share of healthcare spending and market size



In 2026, 12% of total healthcare spending will be on digital products/services

Source: Roland Berger

rare diseases or using low-cost digital treatments with chronically ill patients. Similar effects could occur with physical innovations, namely increased costs due to more treatments being needed as patients live longer, and at the same time decreased costs due to treatment no longer being necessary after patients are cured.

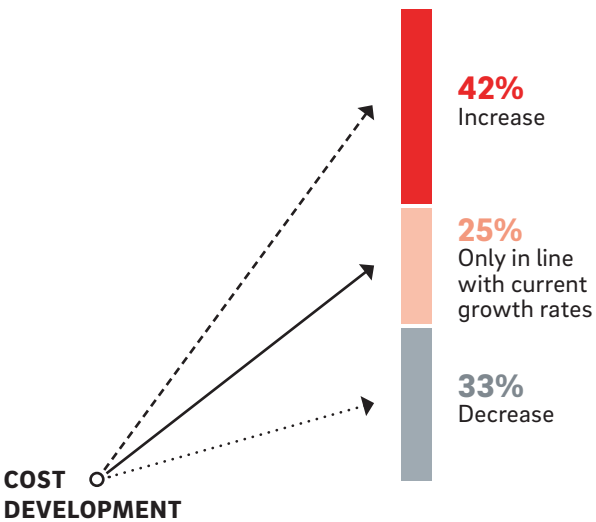
Which effect will be bigger? Our experts are divided. The largest share (42 percent) expect to see the rate of cost growth increase, followed by those who expect to see it decrease (33 percent) and those who think that it will continue at its current rate (25 percent). Within this, we find interesting differences in the answers given by different types of players, with payors and providers expecting cost growth to accelerate, and startups and tech platforms expecting it to slow. → L

Societies need to think about how they will cope with the higher cost of healthcare in exchange for better health overall. On the question of whether there will be higher out-of-pocket spending by patients, the survey respondents were fairly evenly split. It is thus equally probable individual citizens on the one hand, and healthcare systems on the other, will have to manage the higher costs of healthcare. Financial limitations may also act as an obstacle to innovation, a factor mentioned by 50 percent of respondents in the survey.

Societies would therefore be well advised to start developing scenarios for how costs will develop when new technologies enter general usage. New mechanisms will be needed for fair pricing that reward innovation while balancing profits and the economies of scale. Steering systems for prescriptions will be required, risk adjustment schemes have to be adapted. Furthermore, tough decisions will be needed with regards to whether existing therapies should be replaced with innovations, or the innovations be offered in addition to traditional approaches.

This development has specific consequences for the different players in the healthcare market, as we discuss in Chapter 4. Overall, however, we recommend that all healthcare players draw up scenarios for how the market and costs will develop in the future and identify any possible containment measures. They should also develop strategies for how they can tip the balance in their own favor and optimize either their market share and prices or their capacities in patient steering and negotiation. And above all, they must stay alert at all times: The emergence of new risks, such as Covid-19, has demonstrated that scenarios sometimes need to be adapted quickly and in ways that are difficult to foresee.

L: Will future health innovations increase or decrease cost development in the healthcare system?
Percentage split



Source: Roland Berger

4 / Implications for healthcare players

DIFFERENT ROLES

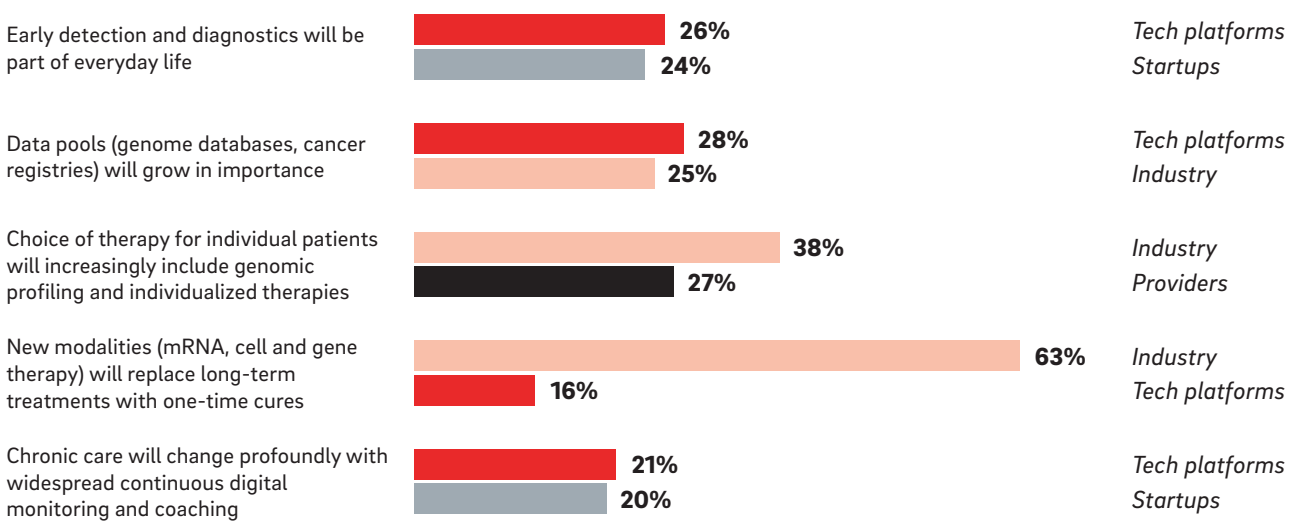
What are the implications of these changes in the healthcare system for healthcare players? To grasp the full picture, we need to look at two separate aspects of this question. First, which players will drive which changes in the future? And second, how should players react to the coming changes in the system? We look at these questions in turn below.

4.1. WHICH PLAYERS WILL DRIVE WHICH CHANGES?

Different healthcare players will play different roles in the changes taking place in the sector. We asked survey participants which players they see as the main drivers of the various trends: providers, payors, tech platforms, startups, the pharmaceutical and medical technology industry, government, or patients and other citizens. It is important to distinguish between these different types of players as the respondents do not think that everyone will do everything. For example, they believe that the pharmaceutical and medical technology industries will drive physical innovations, while tech companies will mainly drive early detection and data use, with a focus on ecosystems. This is a continuation of the traditional situation, in which private companies invest in innovations and bring them to market. The respondents further believe that providers and the pharmaceutical and medical technology industry together will drive the individualization of therapy choice – logically, as these players have access to the patients and hence the possibility to drive change here. → M

M: Who will drive which changes?

Percentage split, remainder distributed among other players (not shown here)



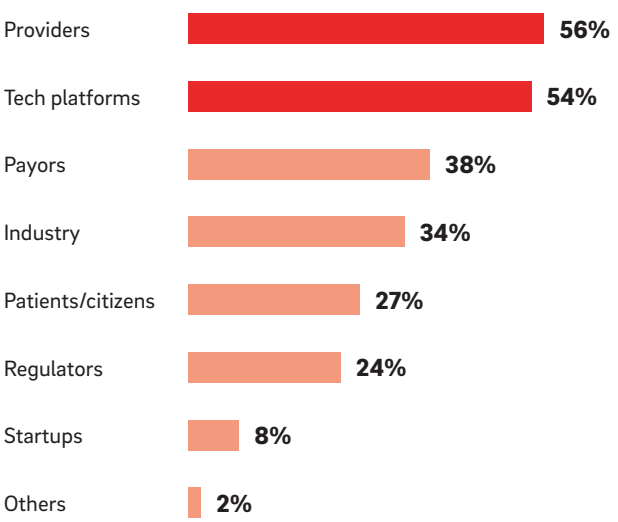
Source: Roland Berger

One specific area where we clearly see the roles of different players is in the development of large data pools. Governments and private companies are both working on this. Recently, for example, 13 European countries signed a declaration to enable cross-border access to their genomic information. The aim is to optimize understanding and prevention of diseases, leading to personalized medicine and targeted drug prescription. The collaboration focuses on rare diseases, cancer and brain related diseases.[28] Similarly, in the United States, large amounts of open-access Covid-19 data and computational resources are provided by federal agencies, including the NIH (National Institutes of Health) and public consortia.[29] Activity is also underway in the private sector, such as the connected research ecosystem Baseline set up by Verily Life Sciences. Within the ecosystem, technology companies, healthcare players and life science companies bundle their resources with the aim of optimizing technology, providing better access to real-world data and optimizing the efficacy of clinical trials.[30]

When it comes to accessing data, which forms the backbone for innovation, the survey respondents believe that tech platforms and healthcare providers will have the best access, followed by payors and industry. All players therefore need to develop strategies with regard to data, either to use their natural advantage in data access or, if they lack direct data access, to overcome the hurdles that they will face. → N

We also tested some specific hypotheses regarding the roles of different players. Perhaps the most interesting finding relates to the future role of Big Tech companies. More respondents than not believed that these companies will focus on technology ecosystems rather than offering digital diagnostics or therapies themselves. This is in line with a trend noted last year: Previous expectations that Big Tech companies will take over the entire healthcare sector are gradually declining over time. We also asked whether, in line with the shift from blockbuster pharmacotherapy to personalized treatments, value creation would also shift to some extent from pharmaceutical companies to providers – providers being the only group who can provide an individualized treatment. But here the experts were split. → O

N: Who will have the best access to health-related data?
Percentage split

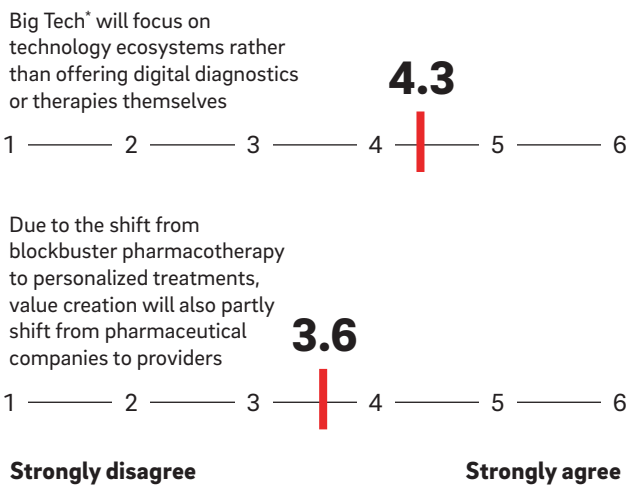


Note: Percentage split. Multiple choices allowed

Source: Roland Berger

[28] European Commission (2018): EU countries will cooperate in linking genomic databases across borders
[29] National Institutes of Health (2021): Open-Access Data and Computational Resources to Address Covid-19
[30] Verily (2021): Connecting research participants with studies and offering an end-to-end digital platform for clinical research

Q: Will the following statements be true in 2026?
Survey questions



* E.g. Google, Apple, Facebook, Amazon, Microsoft, Tencent

Source: Roland Berger

Lastly, there is one role that does not appear to be filled by anyone at the moment, namely that of educating patients and healthcare providers about the new technologies. In the survey, 55 percent of respondents said that reluctance on the part of healthcare professionals formed an obstacle to innovation. Education efforts should focus on providing information, reducing fears and demonstrating the advantages of the new technology and approaches to patients and providers in terms of both efficiency and costs. Given the lack of clear candidates for this role of educator, the opportunity arises for various players to enter this market, build up trust and gain access to potential clients – something that all players should be aware of.

4.2. HOW SHOULD PLAYERS REACT?

How should different types of players react to the coming changes in the healthcare sector? What should their roles be in the different types of innovation: physical, digital, and combined physical and digital? We look at the different types of players in turn below and examine what innovations could mean for them.

Pharmaceutical and medical technology industry

As major representatives of the life science industry, pharmaceutical and medical technology companies have long been the innovation engine in the healthcare market. For the new wave of physical innovations, this role will likely not change, as pharmaceutical and medical technology companies will remain the chief employers of researchers outside of academia, conducting fundamental research on disease mechanisms, platform technologies for therapeutics, and translational science to make therapies scalable and accessible for patients.

What will change, however, is the underlying technology platforms on which novel therapies and medicines are developed. These technology platforms are already rapidly expanding in both number and complexity. While traditional medicines revolved around molecules as the underlying physical agents, these physical agents are now expanding to include living cells, viruses and even mere genetic information. Pharmaceutical players have been keeping a close eye on the technology platforms underlying these novel medicines for some time, and leading industry players are now embracing such platforms fully. Furthermore, physical innovations are being combined with digital innovations, particularly by medical technology companies, but also more recently by pharmaceutical companies.

We are currently observing a trend in the life science industry towards external innovation, that is to say, innovation that does not originate within the company's own R&D department. To gain access to external innovation, companies have adopted a model of open innovation, embracing knowledge sharing and win-win models of collaboration. Large pharmaceutical companies are establishing "innovation radars" and using venture capital vehicles to acquire promising innovative assets. Often, they do not integrate these acquisitions right away but instead allow them to continue operating at arm's length, thereby preserving their innovation culture while carefully instilling functional excellence where needed.

Digital startups and grownups

Startups are another strong driver of innovation in all parts of the healthcare sector. In the future they are likely to partner with established players from the life science space, especially medical technology companies, providers and even payors, using these partnerships to develop and pilot their products and services. Their innovations will cover a wide range of areas, from general diagnostics via sensors (for example, using smartphones)[31] to health IT, AI, data analytics and robotics.

Some healthcare grownups – those which have proven business models and a client base, such as Doctolib, Caris Life Sciences, Kry, Noom, Virta Health and Babylon Health – have already become unicorns, while others have the potential to do so. Some of them are likely to be taken over by tech companies or other strategic players in the healthcare space; most, however, will not stand the test of time.

[31] Majumder, S. & Deen M.J. in Sensors, MDPI (2019): Smartphone Sensors for Health Monitoring and Diagnosis

Tech Giants

The tech giants will continue being a vital driver of innovation, but they are unlikely to attempt to do everything. Respondents in the survey considered it probable that they would focus on providing technology ecosystems (platforms) rather than offering digital diagnostics or therapies themselves. Increasingly, they will offer services for healthy people in the less regulated and "out-of-pocket" healthcare market. They may be active in areas such as monitoring and prevention. They could also have a major impact on early detection and diagnostics, as well as access to data. Credibility will be an important factor for them: Users will need to trust them enough to give them their confidential health data, although not necessarily their health records, for storage in the cloud.

Payors

Paying for innovations has always been part of the role of payors, including ensuring that innovations reach the right patients at the right price. Today, this task is more challenging than ever.

In the first place, health insurance companies must deal with the coming wave of innovations and the related costs. The innovations themselves will be driven by private companies, but payors can try to influence how they are used by patients and other stakeholders. For example, they can create patient pathways with precise systems for choosing the right therapy. They can also promote innovations that help save costs, such as digital solutions based on behavior change. While establishing clear cause-and-effect relations remains challenging, payors will need to monitor the market closely, develop scenarios and draw up strategic plans for how to deal with new forms of diagnostics and therapies.

The second challenge facing payors is that innovation may fundamentally change their role in the healthcare system. Innovations potentially place more power in

the hands of patients, and health insurers can leverage their proximity to patients to ensure access to more data and generate additional monetization streams, for example through up-selling. However, our impression is that insurance companies are still not taking innovation as seriously as they should. In many cases a change of mindset is required: Unless insurers understand the need for urgent action and begin steering patient paths, introducing electronic patient records, creating powerful ecosystems, venturing into new business models, and so on, then the pace of change will simply be too slow.

Payors also need to engage with the implications of increasing healthcare costs in a structured manner, achieving full clarity over the repercussions of cost developments for their tariffs and offerings. This is essential in order to secure their future role in the health system and ensure their long-term financial stability.

P: Will the following statements be true in 2026?
Survey questions

Source: Roland Berger

Providers

Providers – including all players supplying healthcare services, such as physicians, acute hospitals, rehabilitation hospitals and home care providers – will need to digitalize their business model, offering digitally supported processes for both patients and staff. Increasingly, they will offer therapies and treatments that are individually designed or adapted to the needs of the specific patient, potentially based on genomic profiling. Hospitals will act as bridge-builders between industry and payors, finding a broader role in high-tech medicine. They also need to prepare to become specialists rather than generalists, offering personalized treatments based on patient-specific diagnostics.

In addition, providers will need to move in the direction of providing permanent, long-term services, both to patients who are chronically ill and to those who are healthy. This will drastically change today's business model with its focus on episodic treatments. This shift towards permanent support will involve combining digital innovation with innovative treatments to form a new hybrid product. The combination of physical, on-site treatments with new digital solutions and services will enable them to achieve new service quality. Key to their future success will be specialization: Specialized providers will enjoy greater market share and potentially become pan-continental or even global players. → P

Conclusion

The results of our investigation are clear: The physical and the digital worlds are converging, giving a powerful new boost to innovation in healthcare. As a result of this new dimension of change, quality of care will improve and a large number of market opportunities will emerge, alongside significant cost threats – depending on your perspective. Patient pathways will change, and power will in many cases shift towards patients. In response, players will have to assess their options and in some cases redefine their roles. Successful players will develop new business models, or at least adapt their existing models.

Given the pace of change and the transformation of the different sectors that it brings in its wake, players will need to be on their toes. A bewildering jungle of possibilities is opening up and the path to success remains unclear. However, a number of basic recipes for success are beginning to emerge. Thus, we advise market participants to focus on platform thinking and collaborations, as new ecosystems increasingly become key. The ability to participate in open innovation networks will be a competitive advantage for everyone in the sector. Players should strive to enhance their physical products, services and business models by adding digital elements to them, as a way of improving their offering and remaining competitive. When it comes to innovation, we recommend that players pick their battles: It is not possible to fight on all fronts at the same time, and indeed being at the forefront of innovation in all fields is not always financially rewarding.

Innovation in today's world has become so complex and multifaceted that players need to invest a great deal of effort in understanding what is going on and how it may affect the industry. Players of all types would be well advised to consider different scenarios in their planning and hone their ability to detect upcoming events and react to them in a versatile manner. Innovation and the convergence of the physical and digital mean that the world is less plannable and predictable than in the past. In tomorrow's healthcare sector, players need to expect the unexpected.

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