BCG
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The Future of Digital Health

2022 Health Care Innovation Predictions

Introduction

2021 was a year when we at BCG Digital Ventures–Boston Consulting Group's corporate innovation and business building arm–watched to see whether new hybrid models of delivering health care are here to stay or beginning to fade. The health care space, just like the workplace, has been adjusting to the "new normal" of remote and hybrid working models and solutions. Over the past year, we have seen strong global growth in the use of tools, solutions, products, platforms, and business models that crossed what had once been a digital chasm and made combinations of in-person and remote care increasingly the norm around the world.

Based on our collective perspectives, we made some key predictions in our 2021 report related to the future of digital health and beyond—forecasting, for example, that:

- use of telemedicine for outpatient care would continue to rise;
- use of remote patient monitoring (RPM) tools would be more common;
- in-home diagnostics would gain a stronghold;
- direct-to-consumer (DTC) companies would continue to flourish;
- private equity, VC firms, and the public markets would continue to pour money into population health tools.

Most of our predictions proved to be reasonably accurate, although rapidly changing market dynamics, unsurprisingly, meant that not everything unfolded exactly as we expected. To take some examples of predictions we made that were borne out: The COVID-19 pandemic did indeed, in 2021, cause use of telemedicine to continue to increase (although not as sharply as it did in 2020). The same was true of RPM tools. COVID also triggered an increased interest in home testing and diagnostics—companies like Cue Diagnostics are innovating in this area, with Cue delivering test results within 20 minutes. DTC business models continued to proliferate across the board, covering not only home health care products but also everything from prescription medications, to dental aligners, to eyeglasses, and more. Finally, the overall digital health market continues to see increased funding across the world. As a reference point, by Q3 2021 total investment in US-based digital health startups of $21.3B had already exceeded the previous annual record of $14.6B set in 2020, demonstrating a strong upward trend in investment dollars.

We believe that in 2022 we will see a continuation of the major trends we highlighted last year, with a greater emphasis on scaling existing assets and infrastructure with the goal of providing "care anywhere." This will result in developments impacting both the provider and patient experience, including the following:

1. continued increase in use of telemedicine, and greater usage of RPM tools and solutions within telemedicine;
2. continued improvement and scaling of home care services such as diagnostics and testing;
3. a continued uptick in the rollout of DTC models focused on a variety of services such as preventive care (e.g., by Care/of), dental care (Candid), vision (Marlo), and hearing (Lively);
4. emerging partnerships across traditional and non-traditional health care companies, especially around specific therapeutic areas such as mental health and women's, to name two;
5. technology players (Amazon, Google, Apple, and Microsoft) continued to provide options for supporting the health care ecosystem, enabling providers to focus on problems not platforms;
6. placement of larger investments in population health tools and services, to be used by self-insured employers (e.g., Fortune 500) or integrated delivery networks (e.g., UPMC, Kaiser Permanente) for care for their employee bases or networks, respectively.

We hope the following predictions from our multidisciplinary and global team of digital health experts will provide you with a valuable framework and insights for advancing health care innovation in the new year.

ASHKAN AFKHAMI
Managing Director and Partner
BCG Digital Ventures

Alice Wilson

LEAD STRATEGIC DESIGNER

Alice is a Lead Strategic Designer at BCG Digital Ventures who has worked on and launched multiple ventures across a variety of industries but specialises in designing digital health care products. During her time at BCGDV, Alice has led research, ideation, and product design across a variety of health care topics and markets, including chronic disease management (diabetes, COPD, blood disorders), nutrition and weight management, mental health, and wellbeing. Alice combines her experience in research and design with her expertise in behavioural science to develop products that have meaningful impact for all users in the health care ecosystem. Prior to joining BCGDV, Alice spent four years at SparksGrove, the experience design division of North Highland, where she worked with a range of FTSE 100s companies and startups to drive digital innovation, specialising in behaviour change.

Crowdsourced data will start to redefine health care strategies.

We will start to see the power of the organized health community, supported by AI. The huge amounts of data generated from people's first-hand experiences of certain conditions or drugs was previously accessible only after trawling through hundreds of forums. This is changing, with several startups starting to make sense of this data. StuffThatWorks already has 2.3M members and has analyzed over 63.9M data points on 562 conditions to showcase the most effective crowd-sourced treatments. The Lowdown, a "trip-advisor for the contraceptive pill," is a similar concept, with its user base and data collection growing fast. In 2022 we will see the first examples of this crowd-sourced data starting to influence treatment pathways and broader health care strategies.

The first wave of telemedicine providers will be forced to evolve.

The telemedicine space is starting to become crowded, and the winners will be those that prioritized experience and recognize as quickly as possible when face-to-face care is needed. This will happen in response to a small (but growing) number of cases where conditions are being missed virtually, as well as in reaction to frustration from users about very 'transactional' interactions. Expect to see some significant evolution in this field in 2022, as new players strive to offer another level of personalization to their users.

Innovative health financing models will emerge.

As health care systems recover from the COVID-19 pandemic, many will struggle with huge waiting lists–at time of writing the UK faces a backlog of over 7M patients. There will be an opportunity for private medical providers to offer new financing or payment models to those who previously would not have been covered by private medical insurance, particularly in markets where systems are predominantly state-run.

Companies will begin to respond to demand for eco-health products and services.

Mounting environmental concerns have seeped into nearly every industry. Following the COVID-19 pandemic, it will be the health care industry's turn to experience a new wave of demand for "eco-friendly" products and services. We have already started to see signals around this in the area of menstrual health, with an abundance of innovation attempting to reduce the amount of single-use sanitary products. There will be opportunities to both enable the creation of new products and facilitate circular economies across the health care system.

Behavioral science will be adopted even more widely in digital health care design.

The health care field has seen an explosion of health and wellbeing apps, for which both engagement rates and drop-off rates have been high. Many of these apps are trying to help us change elements of our behavior to make us healthier, but many are also failing in this respect. Despite an abundance of behavioral insights from the academic world with practical applications, most of these apps and programs do not apply them in product design, as highlighted by a 2019 report on the topic. However, when health care and wellbeing apps do leverage behavioral science—as do Noom and Oviva, for example—they are able to make a huge impact. We can expect to see more health care companies adopting this behavior-centered approach.

André Heeg

MANAGING DIRECTOR AND PARTNER

André Heeg is a Managing Director and Partner at BCG Digital Ventures. A medical doctor, he has vast experience in the health care industry as a maxillofacial surgeon, tech entrepreneur, pharma executive, and company builder. André is an expert in digital venture building and innovation, with a focus on digital health care and D2C models. At BCGDV, he has developed tiered and community-driven mental health support for older women; built a patient-physician platform and engagement tool in immune thrombocytopenia; and developed a concept for telemedicine implementation for a large hospital chain. Prior to joining BCGDV, André was CDO at Sandoz International (Novartis) and VP of Sales for ZocDoc, the largest health care professional appointment booking platform in the US.

The massive adoption of telehealth services and offerings during the pandemic will put focus on reimbursement policies and issues of equity across populations.

Telehealth is no longer a new business model but a tool that patients expect to be able to use. However, reimbursement policies for telehealth services and modalities remain inconsistent across geographies. The final verdict on whether live video or audio-only telemedicine can be reimbursed will influence the degree to which providers embed telehealth within their services.

There will also be a need to address health inequities when adopting telehealth models, with younger consumers with higher incomes and higher education levels driving the highest rates of telehealth adoption. Digital health innovators will need to understand and target specific populations to overcome disparities in telehealth utilization.

Digital women's health ("femtech") is emerging as an underserved and under-acknowledged area that will continue to get more attention.

Only 3% of the 2,728 US digital health deals since 2011 have focused on women's health, despite the fact that women make 80% of health care decisions in the US and spend 29% more per capita on health care than do men. Most of the funding that has been provided has focused on reproductive health and fertility, keeping the multidimensional complexity (and opportunity) of women's health out of the picture. This leaves a lot of white space for innovation and investment that address intersectionality in femtech—cutting across socioeconomic backgrounds, race, gender, and, specifically, the LGBTQ+ community.

With the rise of the health care platform plays, many stakeholders in the health care world will be thinking about how to establish a platform play in which patients and other stakeholders interact and find offerings.

Continuous disruption from startups and external players are pushing the health care industry to hyper-personalize products and services. This implies new data inputs, flows, and touchpoints, coming from different angles that can lead to more friction and pain points instead of a seamless patient journey. As a result, now more than ever, there is a need to reevaluate patient management platforms and coordinate an approach that enables knowledge sharing across new and different stakeholders and channels. Traditional health care companies will benefit from partnering with leading digital players to leverage the growing digital health ecosystem and better understand the continuously changing landscape. Once these partnerships are established, the focus will need to be on patient engagement and relationship management to drive efficiencies and cost savings in order to stay ahead in the health care industry.

We will see digital therapeutics (DTx) and digital care (DC) gaining more traction in areas such as metabolic disease (cardio, diabetes, obesity), mobility/aging, mental health (depression, addiction), and management of complex diseases in general.

As of July 2021, there were more than 250 digital therapeutics (DTx) and digital care (DC) products, 150 of which are commercially available. DTx is an evidence-based therapeutic intervention that incorporates high-quality software as a means to treat, prevent, or manage specific diseases and conditions. The increasing use of smart devices as everyday household items, coupled with the rising rates of chronic diseases such as diabetes and obesity, are driving the rapid expansion of the DTx market globally. However, as with telehealth, players will need to be mindful of their portfolio's target populations, as access to digital care is skewed towards younger, higher-income populations. While DTx aims to expand access to care by providing patients an avenue to self-manage conditions and diseases, it may potentially overlook populations with limited access to smart devices and/or live in areas with low levels of internet penetration.

Digital mental health offerings and/supports will become mainstream.

The COVID-19 pandemic has opened the public's eyes to mental and behavioral health issues. As of January 2021, US adults had reported symptoms of anxiety and/or depressive disorder that showed a four-fold increase from 2019. The rise of open conversations around mental health has ushered in a wave of digital offerings. While it may seem that the market is suddenly flooded with products and services that address mental and behavioral health needs, there are a lot of nuances in the space, providing an opportunity for new players to enter the market and for existing players to reevaluate their strategies—whether by providing care for general needs or by making specialized offerings available to address specific consumer demands.

Ashkan Afkhami

MANAGING DIRECTOR AND PARTNER

Ashkan Afkhami is a Managing Director and Partner at BCG Digital Ventures. He is an entrepreneur, strategist, and technology business leader with close to 20 years of experience in new innovation models, enterprise implementation, and partnerships, with further experience building innovative health care solutions. As Global Topic Leader for Digital Ventures and Digital Innovation in Health Care, Ashkan has worked on digital solutions in a variety of areas within the space and with different clients in BCGDV's MedTech, BioPharma, Payer/Provider, and Global Health sectors. Ashkan has been able to develop and launch a variety of solutions such as validated product development (including digital therapeutics and software as a medical device) and commercial, R&D, and G2M assets across marketing, sales, and pricing.

Remote patient monitoring (RPM) and telemedicine will continue to evolve.

As recently noted in a report by eMarketer's Insider Intelligence, patient use of remote monitoring in the US rose from 23.4M (9.0% of the population) to 25.8M (9.9%) from 2020 to 2021. It is predicted that use of RPM solutions across different therapeutic areas will increase to 30M users (11.2%) by 2024, and that by 2027 the global RPM systems market will be worth over $1.7B—a 128% increase over the present. As for telemedicine, a 2012 report published by the Board on Health Care Services of the (US) National Academy of Medicine indicated that "evidence-based models facilitated by [telemedicine services] can improve access to and quality of health care" to help close the "quality chasm" in the field. Ten years later, with use of telemedicine rising rapidly, we have yet to see convincing evidence for judging its effectiveness compared with in-person visits. As a result, we will increasingly see developments in telehealth like the 2020 merger of Teladoc and Livongo, which has brought telemedicine technology and remote patient monitoring capabilities together in a single company.

Venture capital and private equity will continue to support population health tools and services.

Current industry reports are showing investment of more than $20B in digital health through the end of the Q3 of 2021, with a strong focus on how best to support specific patient populations across specific health systems through digital front door initiatives, disease management platforms like Amaze, and strategic partnerships like that between Bristol Myers Squib and Voluntis.

The proliferation of direct-to-consumer (DTC) health models will increase.

It is now common to see DTC models wholly or partially replacing traditional ones, creating what are essentially online health care providers. In the market for dental aligners, for example, Byte, Smile Direct Club, and Candid are all moving toward a DTC model that either complements, or eliminates the need for, in-office care. Hearing aid makers such as Lively, Hear.com, and even Bose have been pushing to gain customers through DTC approaches that, in some cases, bypass the audiologist.

"It is now common to see DTC models wholly or partially replacing traditional ones.

Technology players will provide their own services or create extensions that can be leveraged to deliver ancillary solutions.

Following the launch of Amazon Care in the summer of 2021, tech players are taking a stronger interest in health care and related services that promise to provide easy-to-use "care anywhere." In the case of Amazon, they plan to be in 20 states by the end of 2022 and all 50 in the near future. Microsoft is taking a more structured approach, bolstering its infrastructure and pouring money—$16B to be exact—into AI. While Microsoft, at present, is predominantly enterprise-focused, speculation is that it may soon try to reach patients through a B2B2C model. Google seems to be the most diversified of the tech giants, given the presence of Verily, DeepMind, and AI-provider initiatives, among other things, in Alphabet's portfolio. Google has taken both an enterprise and a DTC approach to providing a range of solutions. Lastly, Apple's continued push into health care with Apple Watch and Health OS updates is now being complemented by the creation of strong plug-ins, through use of HL7 and FHIR protocols, for health systems to enable access to patient data. The question for Apple will be whether to jump with both feet into the health space or continue down the infrastructure and DTC path.

At-home diagnostics companies and preventive care will see higher adoption with the trend toward "the quantified self."

In 2021 we continued to see large investments ($235M) in incumbent players such as Cue Health. Everywell acquired two health care companies, forming a new parent company, Everly Health, and expanding its reach in the at-home testing space to cover everything from fertility testing, to COVID testing, to tests for food allergies and sensitivities. Ro made a big push in both in-home and preventative care this year with its acquisition of Kit. The key issue for such companies will be how best to tie in these home-testing solutions with a larger care model, especially once the sector begins moving farther up the cost curve into prevention. Anthem and other health insurers will continue to make strong pushes into the preventive health care space.

Austin Gispanski

PARTNER AND DIRECTOR OF VENTURE ARCHITECTURE

Austin Gispanski is a Partner and Director of Venture Architecture at BCG Digital Ventures. Austin joined BCGDV in 2019, and has more than 15 years of experience in the health care industry helping payers, providers, and new entrants launch digital businesses to drive growth and transform health care delivery. Areas in which he has helped launch new ventures range from provider engagement solutions, to ancillary digital health services, to new consumer healthtech platforms. Prior to joining BCGDV, Austin served in various consulting, engineering, and operational roles. There he developed a passion for using technology-enabled solutions to help payers and providers create novel sources of growth by improving patient experience and outcomes while also reducing operational waste and costs.

"Care anywhere" will be patients' preferred operating model.

COVID-19 completely disrupted the health care experience, and as patients have tested new models of care delivery—namely digital and home health care—they have developed preferences for access and availability. Companies will therefore need to find ways to redefine their delivery models all along the care continuum—starting from a patient acquisition process that removes friction and lowers barriers to entry early in the journey, and moving on to the implementation of multimodal tools for combining physical and digital offerings, as well as ongoing engagement that minimizes unnecessary in-person follow-ups while servicing new health needs.

Virtual mental health care will open access and treatment options.

This past year, mental health visits made up 60% of virtual care visits, thus contributing significantly to the continued growth in remote care spurred by COVID. For patients, virtual mental health care adds convenience, choice, and security, and has been particularly effective for serving children. For providers, a glimpse into a patient's home environment can offer important information. We will continue to see mental health spur the growth of virtual care through 2022, when patients will be looking for a variety of care options and specialty programs (e.g., family counseling, addiction treatment), improved choice and experiences, and, ultimately, affordable options that scale along with the entire virtual health care market.

New entrants will continue disrupting while partnering more closely with traditional health care.

New entrants are by now a familiar phenomenon in health care, but recent shifts have shown new entrants working harder to partner with incumbents, due to the economic and distribution challenges health care inherently poses. Companies looking to enter the health care industry should find ways to attach themselves to strong incumbent networks to reshape the system from within. Alternatively, new entrants can aim to introduce direct-to-consumer (DTC) offerings that will be independently viable, likely by the pairing of medical care with consumer and wellness offerings.

Robotic process automation (RPA) will be replaced by cognitive automation (CA) in both administration and care delivery.

Health care systems and payers still face huge cost burdens and slim margins that continue applying cost pressure. RPA has provided direct, bottom-line savings while forcing the continuing digitization of data. Yet since RPA has its limits as a tool for cost savings, CA solutions will look to leverage data offerings. Merck Healthcare, for example, is already using the latest medical CA technology (from Aera Technology) as a central part of the digitization and modernization of its legacy systems.

> We will continue to see mental health spur the growth of virtual care through 2022.

David Wilhelm

DIRECTOR OF VENTURE ARCHITECTURE

David Wilhelm is a Director of Venture Architecture with BCG Digital Ventures. He brings to the table 10+ years of experience in digital startups and venture builders across multiple industries and stages. Prior to joining BCGDV, David worked for one of the most successful European venture capital funds and the largest company builder globally. He successfully supported M&A deals as well as a large IPO. In recent years he has been a serial general manager for ventures at BCGDV and a driving force in our Health Care Practice Area in EMESA (Europe, the Middle East, Africa, and South America). David has led the build of an integrated digital health care platform with a health insurer and the acceleration of the virtual care products of a health care software company, among other projects. Combining his passions for health care, consumer, and ESG, he strives to generate lasting impact.

We will see a wave of consolidations in digital health.

The record-breaking amount of funding for digital health in 2021 ($21.3B at last count) demonstrates that there are many investors in the market with deep pockets and pressure to expand quickly to meet payer and patient demand. The amount of capital in the marketplace, combined with the fragmented markets for D2C and health care apps (there are currently more than 350k health care apps in the marketplace), cries for a wave of consolidations in the next year—likely resulting in a few more health care decacorns (valued at $10B). We saw the first signs of this trend in 2021 with Ro's acquisition of multiple D2C players and Babylon's buying spree. Ultimately this will benefit consumers who currently have a hard time deciding on the best solution via more integrated platform offerings.

Tech juggernauts will continue stirring up the sector in the competition to build the winning health care platform.

Big tech companies like Amazon, Microsoft, Apple, Google, and Salesforce have been continuously expanding their health care footprint in recent years. Microsoft acquired Nuance to expand its offerings in voice-based assistance for physicians and AI for clinical support (predictions), and Salesforce (SF) rolled out its cloud-based remote monitoring tool as another angle for competing with the different EHR companies. Lastly, Oracle—a fierce competitor of SF—made a strong push to acquire Cerner, an EHR firm, in efforts to play a strong role in the provider space. As the digital health care market matures—reflected in the 55% increase in the number of IPOs in 2021—and competition increases, these companies will further increase their focus on health care while leveraging their existing relationships and market access, thereby fueling the battle for the winning digital health platforms.

Health care reforms will give a go-to-market boost to digital health care solutions.

Historically, recessions have often yielded significant health care reforms, and COVID-19 has had a significant impact as well. In the wake of COVID, we have already begun to see faster customer adoption of digital health care solutions stemming not only from increased awareness of what is available but also from accelerated improvement in regulations for digital therapy approval, prescriptions, and reimbursement (e.g, the DiGA directory for digital health applications in Germany and new FDA guidance in the US), and growth of targeted subsidies (e.g., as provided for in the KHZG/Hospital Future Act for the digitization of hospitals in Germany). These reforms will allow digital health care solutions in many medical areas to move beyond niche status to larger market adoption, and enable their developers to properly monetize their services—via health insurance, for example.

> We will see a surge in the use of at-home tests across a wide range of applications—be it for influenza, RSV, fertility, pregnancy, blood levels, allergies, DNA, or other uses.

Use of at-home tests will surge.

Following the rush for COVID self-tests and corresponding reduced consumer/patient regulatory barriers, we will see a surge in the use of at-home tests across a wide range of applications—be it for influenza, RSV, fertility, pregnancy, blood levels, allergies, DNA, or other uses. The recent IPOs of 23andMe and Cue also point strongly in this direction. Given the overarching trend towards the "quantified self," it will be interesting to see when the first integrations of self-tests with smart devices like the Apple Watch will be developed to enrich the devices' data records and provide even more meaningful recommendations.

The rise of RNA/AI-based therapies will gather strength.

COVID has brought mRNA-based vaccines into public awareness and consequently accelerated their acceptance by patients and regulators. But this development marks only the beginning of a wide range of RNA-based therapy opportunities. Pairing large amounts of clinical and molecular data with AI, the likes of Biontech, Tempus, and Deep Genomics have moved to the forefront of the shift from "one drug fits all" to personalized pharmaceuticals—developing programmable therapies in, for example, oncology and neurology. All pharma companies will accordingly be strengthening their data science capabilities and activities.

Grace Davey

DIRECTOR OF STRATEGIC DESIGN

Grace Davey is one of the founding members of BCG Digital Ventures, where she currently serves as Director of Strategic Design defining innovative new products and businesses with breakout potential. Her understanding of human behaviour and expertise in strategic design have helped shape a number of award-winning physical and digital products in health care. Throughout her career, Grace has strived to put people and their stories at the core of the design process—an approach that has taken her across the globe on research with almost 1000 users, from robotic-assisted surgeons in London to aboriginal elders in Queensland, Australia.

Health care globally has never experienced a year like 2020, with each country dealing with the pandemic in its own way with its own unique and complex health care system. The UK (and what I really mean is its National Health Service, or NHS, with its unique proposition of free health care for all) has come under scrutiny for some of the highest COVID mortality rates in the Western world. I would therefore like to focus my health care predictions this year closer to home, looking specifically at the UK as well as calling on some of my own health care venture and business building experience over the last year.

COVID will continue to accelerate a "digital-first" agenda.

Use of NHS apps and tools in the UK has grown rapidly, especially around mental health, COVID tracking and tracing, and digital therapeutics. This has been true not just in patient care delivery but for decision makers and administrators as well, with many organizations adopting new approaches using predictive analytics and AI to help in their decision making.

> We will continue to see providers and patients embracing low-contact care at a rapid rate.

We will see a pivot in the way we deliver social care.

The UK government has acknowledged that one of its biggest failures in managing COVID occurred in the social care setting, to which it did not afford the same attention as it did to the NHS. Over the next 10 years, starting now, social care will be turned on its head through technology, as people will finally be able to be cared for in their own homes, with all the tech giants looking to play in this space.

We will continue to debate the use of AI in medicine.

While adoption of AI in 'if this, then that' decision support is expected, its use in true clinical settings is more contentious. Although there is increasing evidence of its effectiveness there, much more discussion around ethics will be required before it becomes adopted. With the likes of Babylon Health (an AI-powered health care platform) having begun to trade on the NY Stock Exchange in 2021, the debate is sure to intensify in 2022!

There will be a shift to people paying for care.

Waiting lists for emergency and elective care are growing, which will lead to more people taking health matters into their own hands. I predict we will begin to see an increase in people paying out of pocket and the emergence of interesting new PMI, cash plan, and financing options to service the need.

Reliance on low-contact care will accelerate.

Similar to the way in which hybrid working has become the norm in office work, in health care we will continue to see providers and patients embracing low-contact care at a rapid rate—not just, for example, in video calls for GP appointments but also in the use of robots in the operating room. Robot-assisted surgery will become commonplace as the market value of companies in the field reaches an estimated $275 billion (£208b) by 2025.

Gunnar Trommer

MANAGING DIRECTOR AND PARTNER

Gunnar Trommer is a Managing Director and Partner at BCG Digital Ventures, where he leads BCGDV's Manhattan Beach, California Center. He built the health care vertical for BCGDV and is responsible for developing, incubating, and commercializing innovative digital solutions for pharmaceutical, medtech, payer, and provider organizations. Gunnar's experience spans the conception, design, and development of digital health solutions, including: an enterprise-wide digital strategy and next gen commercial platforms for global biopharma and medtech companies; an app to support remote injection and dose delivery for cancer patients; and digital therapy solutions to assist patients in managing chronic disease.

Medtech and pharma companies will finally be able to engage with patients directly.

As access for medtech and pharma companies to physicians/providers has become more limited, and as more older people (especially retiring baby boomers) are becoming digitally savvy, medtech/pharma will be able to deploy marketing approaches previously found only in consumer industries. There will be a big business opportunity to engage directly with patients.

The relationship between pharma reps and physicians will be redefined.

Prices of pharmaceutical products will eventually come down in the US, and in any case the cost of pharma's current commercial model, with its large in-person sales forces, is no longer sustainable. Given these factors, and the reality that providers are already limiting sales reps' access, pharma will need to find innovative (and most likely virtual) ways of engaging with customers in the medical profession.

Consumer companies in health-related areas will enter the health/health care scene at scale.

As consumer business models become more accepted in health care (think self-paid prescription models), we will see increasing numbers of successful consumer companies in health-related spheres such as nutrition and hygiene both expand their footprints in health/wellness (in many cases through acquisitions) and enter the regulated (digital) health care space.

Telehealth is here to stay.

The increasing use of telehealth will not slow any time soon, given a number of COVID-related factors: the necessity for providers to see patients remotely; at-par reimbursement for in-person and remote consultations; and a broad acceptance by both patients and physicians that these remote conditions will continue for an extended period of time.

> We will see increasing numbers of successful consumer companies in health-related spheres.

Hanno Stegmann

MANAGING DIRECTOR AND PARTNER

Hanno is Managing Director and Partner at BCG Digital Ventures and part of the leadership team of BCGDV's new South East Asia Incubation Center. Previously, Hanno was CEO of Rocket Internet in Asia. In this role, he managed a portfolio of >20 startups in 15 different markets across South East Asia, with many successful incubations and exits. He currently serves as Entrepreneur-in-Residence at the INSEAD Centre for Entrepreneurship as well as a startup coach and mentor. Hanno is a frequent speaker at some of the most important tech conferences in the South East Asia region; his latest speaking engagements have been at Tech in Asia, Rise, Wild Digital, IGNITE, and Innovfest.

Massive health care opportunities will expand beyond developed markets.

Digital health care is no longer limited to the world's more developed markets—adoption is accelerating around the world. In China, for example, millions of users now visit platforms such as those offered by Ping An Good Doctor and Alibaba Health Information Technology for COVID-19 related consultations. This is creating huge opportunities in emerging markets, and large multinational health care companies are now investing heavily in Southeast Asia in particular (e.g., in the telemedicine companies Halodoc, Alodokter, and GrabHealth in Indonesia), where COVID has driven explosive growth. In the region's largest six nations alone, moreover, public health care expenditure will double to $740 billion between 2017 and 2025, driven by demographics and risk behaviours such as obesity and smoking.

> Large multinational health care companies are now investing heavily in Southeast Asia.

New centers of health care innovation will emerge in Asia, with new players driving change.

As technology helps unlock efficiency gains, the importance of digital technologies, including AI, in promoting equitable, affordable, and universal access to health care will mean that emerging markets—in Southeast Asia in particular, again—will be on the radar of HC innovators. Indeed VC investment in health care in Southeast Asia is at an all-time high: According to Tech in Asia research, Healthtech startups in Southeast Asia raised around $180 million in 2020, while in 2021 the industry saw more than $276 million in deal value in only the first half of the year. While investments in telemedicine are currently dominant, new ventures in AI-powered tools (e.g., Bot MD in Singapore) and mental health (e.g., the startup Naluri in Malaysia) are coming from this part of the world. As Southeast Asian markets are all typical "mobile first" markets, a lot of mobile-focused innovation will be coming from this region as well.

Healthtech solutions will continue to become a lifestyle staple.

Customers will not distinguish between lifestyle and health care as they did in the past. Borders will start to blur and customers will expect seamless integration of health care offers in their everyday lives—as we have already seen, for example, in the partnership in Asia between the consumer superapp Grab with Ping An Good Doctor, or the Indonesian telco Telkomsel's recently launched "FITA," an integrated lifestyle app that encourages user adoption of healthier lifestyles. Smart integration of data gathered in social and lifestyle contexts will be translated into smart health care advice, as in the LumiHealth programme designed by a partnership between Singapore's Health Promotion Board and Apple. New ecosystems of health tech startups, HC providers and payers (such as insurance companies), and lifestyle companies will be created to use data and analytics to help HC providers identify the right therapies.

Jens Uehlecke

PARTNER AND DIRECTOR OF STRATEGIC DESIGN

Jens Uehlecke is a Partner and Director of Strategic Design at BCG Digital Ventures and part of the leadership of the Health Care practice area. At BCGDV he has validated, built, and launched several health care ventures in the B2C and B2B spaces, ranging from mental health platforms to AI-powered medtech solutions. Before joining BCGDV, he spent 10+ years helping large corporates transform their organizations by envisioning and creating new products and business lines. Jens has designed and led in-house venture studios, served on the investment committee of a startup fund, and led corporate ventures as their CEO.

Doctors + AI will be the new dream team in medical imaging.

AI will see some breakthrough uses in the medical imaging space, elevating the diagnostic capabilities of the average doctor to a new level. Already, AI outperforms the human eye in many areas when interpreting medical images—for instance, in telling benign lesions from cancer. The emergence of AI-powered imaging tools will require less training and expertise, and thus help democratize procedures that were previously reserved to specialists. At the same time, regulators and society at large will be challenged to develop well-balanced guardrails for a world where AI and doctors are the new dream team.

> “Regulators and society at large will be challenged to develop well-balanced guardrails for a world where AI and doctors are the new dream team.

Retaining medical staff will be a core challenge for health systems.

The COVID pandemic has made a huge discrepancy in Western health care systems even more glaring: While well-trained and empathic medical staff are in high demand, they often work under challenging circumstances. Long shifts, low salaries, and intense psychological pressure make it more and more difficult to retain excellent staff and excite the next generation about pursuing careers in health care. Politicians, providers, and payers will have to tackle this challenge quickly if they want to maintain and improve the level of care. Among many necessary steps, one important one will be the introduction of a new wave of digital workflow tools in medical facilities, to drive efficiency and lower staff workloads.

The empowered patient will be a decision maker and target group for new health offerings.

It has never been easier for consumers to inform and educate themselves about their health and discuss medical topics with their doctors at eye-level. The omnipresence of health information, the availability of wearable sensors and self-tests, the emergence of EHRs, and digital tracking tools all empower patients to make informed decisions. This will trigger a wave of comprehensive health offerings aimed directly at consumers, as well as a further influx of capital and players into the health space—spearheaded by tech companies that can leverage their data, cloud, and AI capabilities.

Mark Zaleski

MANAGING DIRECTOR AND PARTNER

Mark Zaleski is Center Lead for London at BCG Digital Ventures. Mark joined BCGDV in June 2016 after many years as an angel investor, consultant, senior executive, and non-executive company director specializing in multi-country, high-growth e-commerce, digital media, and SaaS businesses. He has led a significant number of funding rounds, investments, business acquisitions, integrations, turnarounds, and exits.

Many changes will need to be made to retain trained medical staff.

Burnout in the health care profession is high—especially in nursing, but also in physician specialisms like general practice. For the UK and the NHS, the COVID-19 pandemic has exacerbated a skills shortage caused by Brexit. Avoiding further attrition among providers will require a number of measures: making PPE adequate and more readily available; adoption of safer work practices; use of new technologies to make better use of the skilled workforce; and enabling staff to operate at the top of their skill levels (e.g., by enabling pharmacists to provide training and expand primary care offerings). The NHS also has to fill more than 100,000 vacancies in the social care field.

> We will see a significant increase in non- traditional health care players using their brands, reach, and customer knowledge to disrupt the health care landscape.

Trust in health care advice will need to be restored.

Politicians say they are "following the science" while still acting like politicians. Too many people believe misinformation on social media such as Facebook and Twitter rather than qualified scientists. As a result of these and other factors, there has been an overall decline in trust in the health care information people receive—the industry as a whole will need to focus on restoring trust in the health care systems and practices.

Virtual education for health care professionals will increase.

As in other walks of life, online education, refresher courses and (re)certification in health care can be offered more safely and efficiently online. Solutions will improve to support the end-to-end HCP professional training and development journey—from creating personal development plans, to finding and completing courses, to completing education and certification programs, and to recertification.

New Entrants in HC.

We will see a significant increase in non-traditional health care players using their brands, reach, and customer knowledge to disrupt the health care landscape—the way telecommunications company BT did, for example, when it released a Connected Care platform, Encircle, that helps people look after the wellbeing of their loved ones using discreet smart sensors. These new entrants will partner with traditional providers to deliver more customer-focused health care.

Nate Beyor

MANAGING DIRECTOR AND PARTNER

Nate Beyor is a Managing Director and Partner at BCG Digital Ventures. He is passionate about the interface between technology and biology, and has devoted his career to innovation at this intersection, including microfluidics, biologistics manufacturing, and stem cell therapy development. Nate is an expert in digital health, including: DTC patient engagement for accelerating the adoption of medical devices and drugs; clintech; remote monitoring solutions; and software solutions such as digital therapeutics. Before coming to BCGDV, Nate founded Roz Health, Tweed Network, and Polymorfix (now Baronova).

> The dialogue will shift from "Who is your primary user?" to "Who is your natural interface partner?

After a banner year for investment in digital health, the capital influx will level off.

As 2021 closes out with an estimated sector funding almost 2x that in 2020 (which was already 2x that in 2019), with nine-figure deals hitting our feeds every day, all eyes are watching to see if the industry will deliver on its promise. Revenue, growth, outcomes—the KPIs of 2022—will begin to assume the importance they have in more mature industry sectors. Investors will need to see their dollars turn into results in order to keep them in the game. If we are lucky, at least one publicly traded decacorn will emerge to cement the value story for the rest of the industry.

Ecosystem architecture will begin to take root in digital health.

Health IT is notoriously fragmented, and this fragmentation will exist up and down the technology stack of the future. Winners will begin to embrace the notion of an ecosystem architecture. Backend solutions will be increasingly complex and celebrated. APIs as products may soon be enough. The dialogue will shift from "Who is your primary user?" to "Who is your natural interface partner?"

Big tech will take off the training wheels.

Health experiments by the tech giants have, to date, been largely exercises in innovation and expenditure rather than value generation. But many of these experiments are starting to hit the tipping point when it comes to scale. Microsoft now owns both speech-recognition capabilities (Nuance) and a leading cloud platform (Azure); Apple has the largest distributed network of clinical-grade remote monitors (Apple Watch); Amazon has moved into consumer-friendly primary care (Amazon Care) and point-of-care hardware (Alexa Smart Properties); and Google is investing heavily in AI (including in dermatology and mammography). These efforts are already real-world tested and ready to scale, and we can expect the experiments to turn into businesses in the coming months.

Sawan Ruparel

DIRECTOR OF ENGINEERING

Sawan Ruparel is Director of Engineering at BCG Digital Ventures, where he has led multiple digital health ventures from ideation to commercialization, including the development of Class I and Class II software as medical devices (SaMD). At BCGDV, Sawan has worked with over twenty partners to create custom software solutions to maximise impact, and has served as CTO for four digital health ventures. He has expertise in digital therapeutics, creating analytical and workflow solutions, and ensuring digital health compliance with ethics regulations such as HIPAA, and has significant experience as a hands-on engineering leader and security architect.

> Employers will look for aggregated offerings through existing players, allowing them to reduce the number of vendors they must manage and focus more on improving their employees' engagement and experience.

We will see increased focus on clinical outcomes for digital health companies.

With the large number of digital health companies entering the market in many therapeutic areas and targeting the same pool of demand and share of wallet from consumers, these firms will need to demonstrate successful clinical outcomes in order for their offerings to be accepted and adopted by providers. Digital health companies will therefore partially adopt a clinical study format to identify and confirm their claims or clinical hypotheses.

Some digital therapeutics (DTx) will become eligible for reimbursement.

We will see adoption of reimbursement for DTx in certain therapeutic areas, such as mental health and specialty care, as companies provide more evidence that these products improve patient outcomes. Reimbursement will be limited to DTx products that not only show evidence of efficacy but are also proven to be on par with, or better than, the alternatives.

Employers will look to aggregate health care offerings for their employees.

Employers face many challenges in addressing the health needs of their employees while also containing costs attached to new healthtech solutions. Employers will look for aggregated offerings through existing players, allowing them to reduce the number of vendors they must manage and focus more on improving their employees' engagement and experience.

Specialty care will become more decentralized.

With increased adoption of telemedicine, we are seeing the possibility of providing specialty care through such alternative formats, allowing more people to access the advice and care they need. This is made possible by help from PCPs, who remain the best advocates for their patients.

Sid Thekkepat

PARTNER AND DIRECTOR OF VENTURE ARCHITECTURE

Sid Thekkepat is a Partner and Director of Venture Architecture at BCG Digital Ventures. He has over fifteen years of experience with fast-growing tech companies. At BCGDV, Sid has worked with clients to launch a variety of solutions (e.g., precision medicine, clinical research, personalized marketing) utilizing health care data. He is also an expert on the digital health ecosystem and helping clients redefine their operating models to launch digital solutions. Before joining BCGDV, Sid founded a deep tech startup focused on speech recognition, and was also an early-stage venture capital investor including leading a pre-seed round of investment in Noom.

The digital health ecosystem will become real and disruptive.

Well-funded, API-first and innovative digital health companies will start working cohesively to rewire traditional (and sometimes archaic) health care flows. As we watch traditional players being disrupted by lower-cost, consumer-friendly options, it will be fascinating to watch how incumbents react. Those that thoughtfully partner and have technical capabilities to integrate are going to win. Some of the questions worth asking will be: Which incumbents will make big bets to retain their control points? How will pharma companies invest to drive their own competitive advantage?

> “Innovative digital health companies will start working cohesively to rewire traditional (and sometimes archaic) health care flows.

Building blocks for health tech will start emerging.

At least one truly open platform will emerge to shape the market. In part because there is a talent squeeze, and in part because it’s high time that developer-friendly building blocks will have their day in the sun. Look for firms such as Zus, Commure, and Capable to get significant market traction and become go-to platforms for all health tech businesses. Also look for this to create value through a variety of levers such as shared component creation cost, standardization, and breaking open data silos.

Health care data privacy and security will take center stage.

As ONC’s Cures Act Final Rule takes effect in the US and every large health care company looks to insert itself at the point of care, these firms are bound to have some hiccups along the way. Health care players will need to be mindful of how they approach data access and usage. This will also lead to an emergence of solutions for security and compliance.

Stuart John

DIRECTOR OF PRODUCT MANAGEMENT

Stuart John is Director of Product Management for Health Care at BCG Digital Ventures. He has over 20 years of experience as an early-stage product strategist, with a strong technology, design, and marketing background. At BCGDV, he is responsible for developing, incubating, and commercializing innovative digital solutions for pharma, medtech, and health care payers and providers. Stuart has led groundbreaking ventures to enable better outcomes and quality of life for patients through digital therapeutics, software as a medical device, AI/ML analytics, personalization, and intuitive integrations with clinical workflows and systems. At BCG he is a topic leader in SaMD regulatory compliance and quality management systems. Prior to joining BCGDV, Stuart led new global product launches for smartphone manufacturers, mobile operators, and tech platforms, including launching the first mobile version of Skype.

The safety and efficacy of critical applications of AI will come under renewed scrutiny—increasing transparency and trust.

The FDA has now cleared over a hundred devices with some form of AI/ML-based algorithm embedded—many through the 510(k) pathway. So we will see a renewed focus on the safety and efficacy of adaptive/learning systems as the technology is applied beyond detection/analysis in radiology and oncology to diagnosis and treatment in daily clinical practice. Key developments will start to overcome the lack of transparency and increase trust in the operation of these systems: scrutiny of the datasets for AI/ML training; examining inherent biases within the models; improved simulation and training for correct operation by HCPs; stricter lifecycle-based change control; and having a human mediate the personalized results for patients.

Digital therapeutics, including AI/ML-assisted treatments, aimed at mental health and wellness will disrupt psychiatry by providing innovative forms of treatment and care.

As fallout from the pandemic continues to take a mental and emotional toll in many areas of daily living, the field of psychiatry will be disrupted by digital therapeutics that combine cognitive behavioral therapy, sleep analysis, and coaching support. Employers/PBMs and patients, meanwhile, will be willing to bear the cost of mobile medical app subscriptions until a reimbursement pathway is more widely established. AI/ML-assisted treatments will improve outcomes in cases of depression and addiction, and provide patients with increasingly integrated, sensor-based tools to work on reducing cardiometabolic risk factors tied to diabetes and comorbid chronic lifestyle factors.

> There will be an unprecedented and growing real-time awareness of individuals' physiological and mental status.

Consumerized on-demand health care will continue to disrupt the sector.

Telemedicine is just the first wave of disruption in how people relate to the health care system. Rapid COVID testing, ubiquitous temperature checks, a growing set of at-home diagnostics, and digital proof of vaccination records are all becoming regular features of social and professional settings. With increasingly accurate medical sensors in smart watches and wearables tied to personal health records and personalized insights, there will be an unprecedented and growing real-time awareness of individuals' physiological and mental status, with the ability to rapidly self-test, diagnose, and seek virtual treatment or prescriptions without engaging with the family doctor or local health services.

Conclusion

At the dawn of a new year, the field of digital health care continues to evolve at remarkable speed, creating a future we cannot entirely foresee. Some trends are clear, however, and we hope that this report has provided you with insights into some of the most significant developments we are now seeing and ways of charting the path forward for your own organization, discipline, or industry.

Amid the many trends we have discussed—covering technology, product and service offerings and solutions, knowledge bases, and business models, among other areas—we see three overarching principles we believe should be guiding innovators in digital health in 2022 and beyond:

1. Ecosystem at scale: As organizations strive to be leaders in their own particular areas of specialization (e.g., diagnosis and detection, medication delivery, ancillary products and solutions) the creation of ecosystems of digital health players forming an end-to-end continuum will be necessary for providing customers with the service they expect.

2. Transformational business models: In addition to creating novel digital health offerings, it will be essential that companies ensure that these offerings make sense financially and have business models (including a billing system) behind them that will work. Otherwise, given costs, the scalability of such solutions will be impaired or, at the least, very challenging.

3. Hyper-personalization: It will be imperative for companies to utilize technology and draw upon the insights of behavioral science to create value for providers and customers through highly personalized insights and care. To get to this hyper-personalization, companies will need to obtain the appropriate data to better serve customers through different novel AI/ML methods that will generate context-rich and actionable insights.

At BCG Digital Ventures, we are committed to "unlocking the potential of those who advance the world." We are motivated by opportunities to reshape the health care ecosystem with digital tools, technologies, and solutions to empower patients, physicians, care teams, and others who work in the field of health.

As we offer our predictions for 2022, we look forward to collaborating with you to actually create the next generation of digital health solutions.

About BCG Digital Ventures

BCG Digital Ventures (BCGDV) is the corporate innovation and digital business building arm of Boston Consulting Group. The organization invents, launches, scales, and invests in industry-changing new businesses with the world's most influential companies. BCGDV's diverse, multidisciplinary team of entrepreneurs, operators, and investors work cross-functionally, rapidly moving from idea to market in less than 12 months. Founded in 2014, the organization has 12 Innovation Centers and satellite locations around the world.

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