

Trend 2: Al and behavioral science transform digital therapeutics

- The Covid-19 pandemic turbo-charged the emerging trend of digital therapeutics, with practitioners and life sciences leaders increasingly aware of their potential to improve access to better, more personalized treatment for a wide range of conditions.
- Digital therapeutics will surge in effectiveness and in market growth by combining AI and insights from behavioral science.
- We expect that pharma and medical device companies will continue to evaluate, incubate, promote, and include digital therapeutics to improve efficacy of existing medicines and devices, increase access to patient data across the patient journey, and strengthen brand positioning.

Advances in digital therapeutics are changing how and where healthcare is delivered, moving care from the hospital to the home. These advances augment existing therapies by tracking and promoting wellness, detecting preconditions, and monitoring and managing health conditions digitally. This shift has vast potential to help prevent, manage, and treat diseases and conditions, potentially reducing the burden of disease and health administration costs. It also improves health equity by providing in-home treatment for hard-to-reach communities, which often have the most unmet needs, and for groups previously considered niche — like women. Further, it has the potential to change the trajectory of healthcare for developing countries in ways uniquely suited to the geographic needs and befitting economic constraints.

Digital therapeutics help healthcare providers tailor interventions prescribed to patients and ensure compliance. For maximal effectiveness, digital therapeutics require providers to leverage insights into people's behaviors and what influences these behaviors. These insights are uncovered through a combination of behavioral science, AI, and datasets from people's social lives.

However, technology also introduces risks from device and application obsolescence and ecosystem incompatibility. These risks create additional compliance barriers when vulnerable people use unsupported devices and apps. In addition, risks of data leakage or theft increase when health technology is used outside of a clinical setting.

Rapid growth, vast potential

The rapid growth of medical technology in the past few decades has given rise to this new, digital category of therapeutic interventions. These include companion software to help treat, manage, or prevent conditions and diseases, and span technologies that include web and mobile apps, wearable and ambient sensors, virtual reality and video games. Many of these technologies are enabled by AI and data analytics delivered at the edge. Digital therapeutics now include pills with sensors that transmit information directly to a mobile device to ensure compliance with treatment regimens. For patients with diabetes, these applications sync pharmaceutical therapies, fitness brands, and health trackers with glucose meters. Another novel product is smart contact lenses that detect glucose levels in tears.

Digital therapeutics function most effectively in combination with conventional therapies, often with the intention to improve patient adherence to treatment regimens. Digital therapeutics is a significant growth area in life sciences, with the market expected to jump from \$4.8 billion in 2023 to \$25.3 billion in 2032. With Al's rapidly increasing capabilities, market growth and efficacy stand to exponentially increase. Indeed, 94% of companies in our survey of executives from

Figure 1. Almost all companies plan to increase their spending on digital therapeutics in the next two years



19

Source: Infosys Knowledge Institute

top life sciences companies say they plan to increase spending on digital therapeutics in the next two years (Figure 1).

With the growing recognition that these technologies improve patient quality of life, a rich partnership ecosystem is developing among the healthcare and pharmaceutical industries, commercial companies, research entities, and technology and service providers.

Our survey asked executives to allocate 100 points to indicate investment areas among subtrends enabling the increased impact of digital therapeutics. Priorities were split quite evenly (from 21% to 27%) among integration with traditional therapies, remote patient monitoring, virtual care platforms, and patient engagement and adherence (Figure 2).

These enabling subtrends are also part of a broader move towards decentralized, hybridized healthcare. Virtual care platforms, for instance, provide a range of services to patients to meet them outside of the physical office and make it easier to get the care they

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Figure 2. Life sciences companies plan to spend in four critical areas

Source: Infosys Knowledge Institute

need. In Trend 4 in this journal, we discuss the benefits of combining virtual clinical trials with in-person clinical trials: improved patient engagement, experience, and adherence. For both virtual trials and digital therapeutics, remote monitoring is a less invasive way for researchers and HCPs to gather patient data.

From startup to scale

As an emerging category within healthcare, digital therapeutics is mostly the domain of small innovative firms and startup ventures.

Digital therapeutics increases patient adherence to protocols and improves health outcomes. It complements contemporary treatments with digital options, addressing gaps in an already constrained healthcare ecosystem.

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But it is already very relevant to larger life sciences organizations, pharmaceutical and medical technology alike.

Here are two compelling reasons. First, startups will only achieve reach to a large number of patients with the sponsorship of large life sciences organizations. For the big incumbents, early-stage partnerships or incubator relationships smooth the integration of innovative new digital tools with established processes and systems. Second, as digital therapeutics reach scale, they will spawn more and richer data about patients and patient journeys. The large and established life sciences companies that engage with digital therapeutics at the present stage will have access to that data. Rich data then has the potential to influence patient adherence, enhance efficacy and improve patient outcomes.

Al and behavioral science

An especially promising area is the combination of AI with insights from behavioral science. For instance, an app can analyze a user's behavior and predict when to nudge them to take medication, exercise, or follow their prevention or treatment plan.

As described in Trend 4 in this journal, noninvasive monitors collect patient health data, such as facial emotions, gait patterns, and sedentary time. Similarly, data from monitors, fed back into apps, can provide highly personalized prompts and feedback to patients as well as modifications to the engagement interfaces and the health and care plans. With rapid innovations in both AI and digital therapeutics, it is not difficult to imagine that a company will create a Spotify-like playlist for health.

Specifically, this would be an interactive, smart system that suggests a personalized series of treatments based on patient (aka user) data, in the same way that streaming services suggest playlists based on a user's preferences. This health playlist would evolve over time and according to preferences, and how a condition evolves — and also based on changes in patient behavior, mood, and environment.

A recent study explores how AI and machine learning (ML) can analyze patient engagement — the primary indicator of success of digital therapeutics interventions. Researchers showed that AI and ML can indicate not only the level of engagement but also the quality of engagement. This



Figure 3. Most life sciences firms expect generative AI to provide ROI in digital therapeutics

Note. Percentages do not total to 100 due to rounding.

21

Source: Infosys Knowledge Institute

and other AI applications that measure engagement and experience detect where engagement plateaus – and then automatically recommend a different approach.

The role of generative AI

It is early days for generative AI in this field, but 99% of our survey respondents expect generative AI to achieve return on investment in the next three years. In fact, 7% say they have already achieved returns for generative AI in this rapidly progressing field, despite the up-front tech costs and behavior changes required for patients and providers. Generative AI is expected to improve the patient experience – perhaps ironically, as AI has the potential to make patients feel more cared for, thanks to personalization via richer, data-based feedback.

Practical benefits

Digital therapeutics products offer benefits not only to individuals and their healthcare providers but also to society more broadly.

At the individual level, these products help patients manage chronic conditions such as diabetes, autoimmune diseases, and cancer. For instance, digital therapeutics assist with managing complicated dosing requirements and self-administration of treatments as well as complementary changes in patient's wellbeing behaviors, such as nutrition or physical exercise. They also provide a personalized mix of educational materials, dosing guidelines, and tools for monitoring side effects. Together, these interventions make it easier for patients to maintain medication regimes. Medication non-adherence is a common problem, with approximately 50% of patients not taking their medications as prescribed. Increasing patient compliance was identified as "the most impressive application of digital therapeutics" from a diabetologist's perspective. The Digital Therapeutics Alliance lists the benefits as increasing access to therapies; offering the convenience and privacy of home treatment; providing therapies in a variety of languages; and providing results and supplying insights on personalized goals and patient outcomes.

These benefits extend beyond the individual by improving access to healthcare and addressing disparities in care at the population level.

Digital therapeutics products equalize the rural versus non-rural health divide, providing patients "asynchronous support and therapy when they are actively experiencing symptoms or are unable to immediately access their healthcare providers." Digital therapeutics are available or under development for six of the seven causes of death identified by the US government initiative Healthy People 2020. These products directly address the disease or underlying associated conditions and stand to substantially improve people's health.

Digital therapeutics in action

Digital products are already in use or are under investigation in several areas of the life

sciences industry. For example, the complex women's health space has traditionally been left behind, limited by data and research built on male medical profiles. As the femtech market plays catch up, it is expected to grow from \$36.5 billion in 2023 to almost \$42 billion in 2028. This growth is fueled by an increasing radical global awareness of women's health disparities, and the market will utilize multiple levers, including AI, data, crowdsourcing, and innovation to address the gender healthcare gap.

One healthcare technology company focused on improving women's cardiovascular health recently received funding to support a clinical trial for textile-based sensor technology to gather medical-grade data from women's physiology (a smart bra). The trial will address women's low participation rates in cardiac rehabilitation programs and will use a personalized, data-driven approach to improve patient experience in cardiac rehabilitation.

Despite only modest growth in 2024, global wearable technology is forecast to grow in the product areas of smartwatches and smart rings. Some analyses suggest a resurgence of interest in smartwatches, especially in emerging markets like India. These portable, wearable medical devices consolidate health data and provide physicians with immediate medical readings from patients.

An upcoming special issue in the peerreviewed journal Sensors explores wearables for neurological conditions. These socalled neurological wearables offer remote assessment, testing, and treatment of neurological injuries and diseases. Wearables capability in neurology and other clinical areas is expected to drive the market segment further, particularly in the ability to assess cognitive capabilities during everyday activities. Beyond wearables, a wave of innovation also extends to ambient sensors embedded in people's homes, enabling more continuous monitoring and avoiding the user-dependent challenges of wearables (dead battery, forgetting or simply deciding not to wear them, etc.)

Shifting from device types, companies are applying digital therapeutics to a widening range of conditions. This includes topics ranging from pain management, anxiety and depression, digestive health and sleep management to cancer treatments, respiratory therapies and treatments for neurodegenerative conditions.

Fuller implementation

Like other life sciences disciplines, digital therapeutics was catapulted into prominence by the Covid-19 pandemic. Their momentum is extending as they prove their value in multiple areas – community health, women's health, neurological conditions, more and better data, and patient experience. However, success also relies on the understanding of and compliance with an increasingly challenging regulatory landscape, and a growing imperative for trust and transparency.

Our research shows that regulatory barriers are a priority for life sciences leaders, with 49% indicating that regulations are significant

23

obstacles to implementing new technologies. A further 34% say this is a moderately significant barrier. For digital therapeutics, the picture is fragmented— the EU has no specific legislation on digital therapeutics. However, Germany has established its own Digital Healthcare Act, which addresses digital therapeutics.

There is a pressing need for new regulatory frameworks and to improve regulator ability to evaluate increasingly complex products, which support rapid updates to their software and use adaptive algorithms that change over time as they encounter new data.

Other challenges include the difficulties of reimbursement through insurance, lack of development skills for those creating digital products, patient acceptance, devices that become obsolete, and technology ecosystem incompatibility, such as competing operating systems).

Despite their promise, digital therapeutics solutions have not yet fully entered mainstream healthcare. This is partly because it is difficult for patients and health practitioners to separate unproven, lowvalue applications from genuinely valuable, evidence-based products. Finally, as with any device that stores and transmits patient data, privacy and security are particularly important for digital therapeutics.

Another challenge for Al-based digital therapeutics will be evaluating their safety

and efficacy in diverse populations. This is crucial to ensure equitable healthcare delivery. Device labeling should clarify how AI models were trained and how they derived their outputs.

On the cusp of growth

Advances in Al continue to stir up excitement about digital therapeutics. Its acceleration depends on both expertise about software and patient behavior, and companies navigating an uncertain regulatory landscape. It also depends on trust. Like all interventions, the physician-patient relationship has long been understood as a cornerstone of good outcomes and functional health. This relationship is essential in digital therapeutics too – as is trust in technology to provide the expected medical outcomes.

Especially as digital therapeutics expands into new clinical fields, real-world data and evidence is necessary for this area to reach its full potential. Digital therapeutics thus stands to benefit from the kind of collaborative ecosystem described in Trend 7 of this journal, and in research published in Nature.

Clinicians, academics, commercial companies, manufacturers, regulatory bodies, and organizations like the Digital Therapeutics Alliance can together overcome implementation and engagement barriers. These collaborations can also lower costs, as well as historical healthcare bottlenecks and complexities.