Digital healthcare: patient-first?

Proactive, decentralized, personalized, value-based.

April 2021
Healthcare investments

INKEF Capital is a venture capital firm based in Amsterdam, backing promising early stage companies in Europe. INKEF takes pride in being a patient, long-term investor with the ability to support companies through several rounds of funding. From the early stages of being a technology or life science venture, INKEF Capital supports entrepreneurs building their ideas into successful international businesses.

The combination of tech and healthcare, makes Healthtech at the intersection of INKEF’s investment thesis – we have the ambition to bring our experience in developing new drugs & devices and our experience in building software companies to transform healthcare.

MTIP is a Swiss-based growth investor that specializes in scaling up healthtech companies in rapidly expanding global markets. MTIP invests in digitally-connected, decentralized and patient-centric medical technology leaders, based primarily in Europe, with offerings that provide clear health-related economic benefits. MTIP’s entrepreneurial investment team, which has complementary private equity skills and exceptional deal-making capabilities, actively works with their portfolio companies to boost growth. MTIP efficiently deploys capital to unlock value and generate attractive returns for their investors.

Although MTIP is generally “stage agnostic”, MTIP prefers to invest in firms that are in a growth (later-stage, expansionary) phase, with a proven technology that can be effectively scaled to successful and sustainable global enterprises.

Other notable investments

Dealroom.co is the foremost data provider on startup, early-stage and growth company ecosystems in Europe and around the globe.

Founded in Amsterdam in 2013, we now work with many of the world’s most prominent investors, entrepreneurs and government organizations to provide transparency, analysis and insights on venture capital activity.

Visit health.dealroom.co for more info
This report covers tech for patients, professionals, hospitals and biopharma.

Tech for professionals
- Medical practice management
  - doctorly
  - medloop
  - lifen
  - Doctrin
- Telemedicine, AI doctors, & appointment booking
  - babylon
  - Doctorh
  - accuRx.
  - Men Doktor
  - kry
  - Docplanner
  - PUSH DOCTOR
- Collaboration tools
  - Medic Bleep
  - Siilo.
  - Visionable
  - Hospify
  - pando
  - iomedhealth
- Home tests
  - thrive
  - melio
  - restcard
- Continuous monitoring
  - SOPHIA
  - aidence
  - KHEIRON
  - ecomeetrix
  - HUMA
  - WITHINGS
  - CeQu
  - careology
  - DENTAL MONITORING
  - VMCentra

Tech for hospitals & clinics
- Hospital Operations
  - HOPPEN
  - MEDWING
  - borda
  - lumeon
  - mac eye
  - biolog id
- Surgical robotics & AR/VR for surgical training
  - Digital Surgery
  - CMR
  - SV Surgery
  - myTomorrows
  - trialbee
  - inato
  - teckra
  - castor

Tech for pharma & biotech
- Drug discovery & development with AI
  - Exscientia
  - benevolentAl
  - healx
- Patient recruitment & clinical trials
  - inef capital
  - dealroom.co
  - MTP

Platforms for digital products
- wellmo
- INSTANDA

Tech for payers and employers
- Digital health insurance
  - ottonova
  - getsafe
  - alan
  - Collective
  - elma

Digital therapeutics
- Bold Health
- HelloBetter
- VIVRA
- karify
Healthcare is a global $8 trillion ecosystem changing course; an opportunity for tech companies.

The cost of healthcare keeps rising. Yet, that does not always mean better access.

Ageing populations, served by a complex, slow-adapting market mean huge savings to be made in the largest consumer category - the next big digital frontier.

Covid-19 accelerated innovation at patient interface level, but transformation just started.

Digital Health is a $350B market (McKinsey), set to nearly double in the next five years.

Political and regulatory innovation, combined with technological advances can enable improved outcomes and cost-efficiency in healthcare, well beyond the pandemic.

Healthtech is a likely candidate for the next $50B+ tech company in Europe.

Europe is starting to see big Healthtech companies emerge in telehealth (Babylon, Kry), operations software (Doctolib, Docplanner) and insurance (wefox).

The scale of the market means Healthcare could support Europe’s next multi-decacorn(s).
Why this Healthtech report.

It’s been often repeated that the Covid-19 crisis response has brought “10 years of market evolution in 10 weeks”. So far, this has been mostly about the engagement layer (e.g. telehealth). Is a more profound industry-wide shift happening underneath? And if so, what will that change look like and what role will tech companies play?

One thing is sure: the growth of healthcare expenditure is unsustainable. Structural trends continue to drive healthcare costs upwards: ageing population, chronic diseases (incl obesity), and the rising costs of drug development. Digitalization has helped many other industries improve customer experience while reducing costs. Why is healthcare slow to catch on?

Payers (governments and insurers) and consumers have been tolerating slow change until now, but not anymore. Healthcare will see big macro-changes in the coming two years. This report explores the next big things in health innovation and what the future of healthcare might look like.
Table of contents.

1. Healthcare: an $8 trillion industry changing course
2. The future: decentralized, personalized, proactive, value-based
3. The next big thing: tech for patients, professionals, hospitals and biopharma
An $8 trillion industry changing course
Global healthcare expenditure is now around $8 trillion ($2 tn in Europe and $3.5 tn in the US). It is projected to grow by 5%+ per year (faster than the overall economy) to $10 trillion in 2022.

Structural trends continue to drive healthcare costs upwards: ageing population, chronic diseases (incl obesity), and the rising costs of drug development. As standards of living rise, healthcare expenditures also rise. Yet, that does not mean better access. In the US, some households are driven into poverty by healthcare costs.

Per capita healthcare spending by age across 8 developed countries *

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<thead>
<tr>
<th>Age</th>
<th>Pakistan</th>
<th>EU</th>
<th>USA</th>
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<tbody>
<tr>
<td>0-19</td>
<td>$2.2K</td>
<td>$3.6K</td>
<td>$12K+</td>
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<tr>
<td>20-64</td>
<td>$54</td>
<td>$11K</td>
<td>~$4-6K</td>
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<tr>
<td>65+</td>
<td>$11K</td>
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* Data by American Century Investments, based on study on US, Australia, Canada, Germany, Netherlands, Japan, Switzerland, UK.
** Pakistan included for illustrative purposes.
Spending goes to pharma, hospitals, physicians, and other providers. These are beholden to legacy reimbursement systems and complex regulations, which can make them slow to adopt change.

Global healthcare expenditure by type (2019)

- **Hospitals**
  - ~$3.6T
  - 35%

- **Other providers**
  - ~$2.8T
  - 30% = $2.4T

- **Prescription drugs**
  - Physicians *
    - 15% = $1.2T
  - Other providers
    - 30% = $2.4T

- **Admin & net insurance costs**
  - ~$0.8T
  - 10% **

- **Global healthcare expenditure**
  - ~$0.8T
  - 5-10% ***

- **$8T**

* In the US, 15% of spend goes to physicians. In some European countries, physicians work mostly from hospitals/clinics

** Combined biopharma revenue is over $1.4T, whereas $0.8T is value added within the healthcare value chain.

*** Admin in EU ≅ 5% / Admin in US ≅ 10%

Source: Dealroom analysis of data from OECD, Eurostat, CMS for U.S. data, WHO.
“Healthcare is broken - despite spending trillions of dollars each year, half the world’s population has no access to healthcare, whilst 100 million people are driven into poverty from the fees.

“Almost 70% of healthcare money goes into predictable preventable diseases. Seeing a problem early on could mean a $10 solution rather than $4,000 by seeing it too late.”

Ali Parsa
Founder & CEO
Babylon
Healthcare is one of the largest spending categories for households. But almost all spending is indirect (insurance & tax). Therefore, consumers have limited influence.

Out-of-pocket payments and voluntary insurance account for less than 20% of healthcare expenditure in most large developed countries – 10% in the US, 15-20% in most of Europe (but growing).

The remainder is paid via government schemes and compulsory health insurance. As a result, consumers have limited incentives and influence.

However, consumers have already gone digital in many aspects of managing their lives. Expectations have been lifted. Consumers expect technology to follow the same path in healthcare to improve access and outcomes.
However, “payers” (mostly insurers and governments) do have major influence, want to control costs, improve outcomes and get value for money.

**Biopharma wants** to find treatments for big markets and bring down cost of discovering new drugs.

**Providers want** to align themselves more closely with payers.

**Professionals want** to increase their productivity and reduce burnout due to admin.¹

¹ According to Medscape, administration is the main cause of physician burnout.

**Payers want** to control costs and improve outcomes. In order to achieve this they need data transparency to follow the patient journey, have predictability and be able to measure the ROI of interventions.

**Consumers want** better healthcare and expect it to be more like other consumer products.
Huge opportunity for tech to eliminate inefficiencies and wasteful spending while improving outcomes.

In the US alone, wasteful spending has been estimated to be around 25-30%* with the biggest waste category being unnecessary care and excessive admin. McKinsey reckons that healthcare digitization lags most other sectors. According to The Economist 70% of American hospitals still fax and post patient records.

Healthcare industry is spending $200-300 billion per year on IT.

IT spending is roughly $200-300 billion globally if we take Gartner’s estimate 3.9% of sales in healthcare and 3.3% of sales in pharma & medical. Another report estimates $208 billion in 2019, growing to $280 billion by 2021*. This includes spending on legacy IT systems (and some fax machines).

<table>
<thead>
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<th>IT spending as % of turnover, by sector **</th>
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<td>Software Publishing &amp; Internet Services</td>
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<td>Banking &amp; Financial Services</td>
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<td>Media &amp; Entertainment</td>
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<td>Professional Services</td>
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<td>Pharma, Life Sciences, Medical</td>
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<td>Transportation</td>
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<td>Utilities</td>
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<td>Median</td>
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<td>Industrial Electronics &amp; Equipment</td>
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<td>Consumer Products</td>
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<td>Industrial Manufacturing</td>
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<td>Retail and Wholesale</td>
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<td>Food &amp; Beverage Processing</td>
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<tr>
<td>Chemicals</td>
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<tr>
<td>Construction, Materials &amp; Natural Resources</td>
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<tr>
<td>Energy</td>
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</table>

*Report by Markets And Markets, also used by Deloitte.
** Sources: Morgan Stanley, Bain, LocalGlobe analysis of Gartner and Fortune data.
In Europe, government and private providers of compulsory insurance, have the power. In the USA, employers play an important role and they can adopt innovation earlier before clinical evidence is demonstrated.

In the US, employers play a big role in private insurance. Those employers want to control their healthcare premiums. This means startups can go to market by striking deals with corporates; even with a product that does not yet have clinical evidence to qualify for reimbursement. An example is Livongo.

In Europe, governments, private insurers and regulators have the power together. They want to control costs, but coordination is required to get things done. This means significant time between when a technology is accepted by regulators, when it is adapted in the healthcare system and when innovators are able to generate revenue.

Source: Dealroom analysis of data from OECD, Eurostat, CMS, WHO.
“A doctor behind their mobile phone costs the same as a doctor in an office and is just as busy, so this does not help to reduce the strain on our healthcare professionals.

“Being able to see a patient via video doesn’t mean clinicians can see more patients. In 2016, the WHO reported that we were short of 5 million healthcare professionals, and predicted that number would rise to a shortage of 18 million healthcare professionals by 2030. And that was before COVID-19. We need to use technology to care for far, far more people than we do at the moment.

Developing this technology isn’t easy, it requires a combination of medical knowledge, huge amounts of data and relevance to each person in their country and for their demographic. That is why we are leveraging the power of AI to increase access, put more information in the hands of people, ensure earlier opportunities for intervention and as a result improve treatment outcomes and help to reduce costs.”

Ali Parsa
Founder & CEO
Governments and regulators are increasingly putting incentives in place to improve outcomes and reduce costs - a huge opportunity for tech companies.

**Germany**
- Digital Healthcare Act adopted in 2019 to support digital health innovation
- €500 incentive for startup video consultations
- First country to cover prescribed apps: Kalmeda (tinnitus), Velibra (anxiety)

**Sweden**
- Integrated electronic health record solutions (EHRs) and e-prescriptions in Sweden’s 21 regions since 2018
- Teleconsultation reimbursed since 2016, enabling startups (KRY, Min Doktor, Doktor.se)

**UK**
- NHSX Innovation Accelerator and $330M AI in health investment pledged
- Central digital records locator and booking app
- Video consultation available through every doctor’s surgery

**France**
- Online diagnosis & treatment since 2018
- Cross-border treatment: EU doctors teleconsulting patients in France
- KRY (Livi) and Doctolib market leaders in French telemedicine
As a result, bigger Healthtech companies are already emerging. B2C has been scaling faster. B2B takes longer to unlock, but is at least as big an opportunity.

Source: Dealroom.co and Google Finance as of January 15th, 2021.
“The biggest challenge for digital health insurance is from the regulatory side because of the complexity and time it takes to obtain a licence from the regulatory bodies.”

Julian Teicke  
Founder & CEO  
wefox

“The biggest scaling challenge I have seen is selling a completely new type of product in a heavily regulated and conservative market. There are many questions around who benefits from the use of AI, who pays for it and whether it can yet be trusted.”

Mark-Jan Harte  
Co-Founder & CEO  
Aidence
European Healthtech companies are now worth $41 billion.

Combined enterprise value of European healthtech startups

- **22%** Online pharmacies
- **18%** Remote monitoring & Wearables
- **11%** Digital health insurance
- **21%** Digital care (incl. telemedicine)
- **7%** Drug discovery & development with AI
- **7%** Surgical robotics & AR/VR
- **4%** Decision support with AI
- **3%** Digital Therapeutics
- **2%** Patient recruitment & clinical trials
- **1%** Home test
- **1%** Practice management
- **1%** Patient recruitment & clinical trials

Source: Dealroom.co and Google Finance.
1. Healthtech excludes biotechnology and pharmaceutical companies. Using estimated valuations based on most recent VC rounds, public markets and publicly disclosed valuations as of Feb 10, 2021.
And European Healthtech is just getting started.

Source: Dealroom.co and Google Finance. Using estimated valuations based on most recent VC rounds, public markets and publicly disclosed valuations as of 19 Jan 2021.
Covid-19 is often said to have triggered “ten years of market evolution in ten weeks”. But a more meaningful shift will occur in the next two years, and beyond.

There are 3 main catalysts behind the growing adoption of Remote Patient Monitoring Solutions:

1. Increase in number of connected devices and IoHT
2. A shift towards value-based care
3. Improvements in AI and NLP technology

Healthtech impact

Leading up to 2020

- Payers pushing for value-based care
- Growing number of connected devices/IoHT
- Accelerations in AI, NLP, DNA sequencing, editing, digital therapeutics
- Digitally native population

Covid-19 and its second-order effects

- Regulations around virtual care loosened
- Due to increased adoption, trust in virtual care increased
- The US finalized new rules around data interoperability
- Large amounts of late-stage venture capital funding for digital health

Industry-wide shifts

- Some new regulations are made permanent
- Providers need to align with payers more than ever: more focus on value-based care
- Consumers expecting increased virtual care
- VC and big tech continue to invest heavily in healthtech

Late stage venture capital funding for digital health

External factors

Digitally native population with built up demand for digital healthcare

Better appreciation of the benefits of decentralisation following Covid-19 response

In 2020, the US finalized new rules around data interoperability, which marked an industry-wide shift toward patient empowerment and accessibility.
“The pandemic has increased acceptance of digital health solutions. This momentum should be maintained; such solutions are vital in making healthcare more accessible, in rural settings or for the elderly or sick.”

Kurt Höller
Director of Business Creation
EIT Health

"Every sector has its own challenges and health is no different. However, the risks and sensitivities in health are greater than in other sectors. Broadly speaking, the main challenges facing startups are regulation, reimbursement and system inertia.

“High regulatory standards understandably exist in the health sector, companies in this space need to do more to get to market and to remain compliant throughout the life cycle of their product or service. This requires knowledge, experience, expertise, resources, and budget – all of which are sometimes sparse for younger companies.

Reimbursement requirements for health often vary across countries, which provides further challenges when expanding to new markets, or trading across borders. Such requirements in health can be challenging even for well established companies but are incredibly cumbersome for startups.”
The future: decentralized, proactive, personalized, value-based
So far, we’ve seen a glimpse of what digital healthcare might look like.

- **Proactive**: Most healthcare spending goes to predictable preventable diseases. Connectivity and continuous monitoring are game changers for prevention and proactive care, recovery as well as insurance and financing.

- **Decentralized**: Patient empowerment through self-care, home care, home tests. Data management and analytics are the critical success factor. Getting the right information at the right time to the right professional.

- **Personalised**: At molecular level: gene editing allows for new and personalized treatments. At a system level: treatment selection and treatment optimization through AI software.

- **Value-based**: Payers and regulators are pushing for evidence of better clinical outcomes and/or for lower costs.
Healthcare ≠ better health.

Studies point to healthcare being only a 10-20% contributing factor to health outcomes (quality and length of life). Social determinants (employment, social care, education, neighborhood) are known to have a greater impact on health outcomes than healthcare itself.

Health determinants
Source: County Health Rankings

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Category</th>
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<tbody>
<tr>
<td>30%</td>
<td>Health behaviors</td>
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<td>20%</td>
<td>Clinical care</td>
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<tr>
<td>40%</td>
<td>Social economic factors</td>
</tr>
<tr>
<td>10%</td>
<td>Physical environment</td>
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</tbody>
</table>

- Smoking
- Diet & exercise
- Alcohol & drugs
- Sexual activity
- Access to care
- Quality of care
- Education
- Employment
- Income
- Family & social support
- Community safety
- Air & water quality
- Housing & transit

Spending: shifting focus to prevention (via Deloitte)

Prevention is key to lower healthcare spending. A Deloitte report projects a vision for healthcare shifting from care and treatments dominated (83%) to health and well-being dominated (63%). On top of prevention, another part is faster diagnosis and treatment with the help of AI (e.g., Babylon). New forms of enablement, data, platforms, and delivery will drive 85% of revenue, Deloitte says.
“The illusion in healthcare is that the consumer has a choice, but actually that choice is a decision which involves the entire value chain.

Consumers have long wanted to be able to interact with healthcare like any other consumer product. As healthcare providers were forced to shut their doors due to Covid-19, care shifted online overnight, with talk of 10 years of market evolution happening in the course of 10 weeks.

The crushing reimbursement problem (especially a factor in the US), has also reached a critical moment in 2020/21. The cost of care has been going up for a long time, and it’s more or less been tolerated. But the pandemic largely forced the closure of the two biggest margin generators in health systems - elective surgery and the emergency room. This means a profit centre of the health sector ceasing to exist.

That’s the catalyst for innovation. Payers, who have not been spending, are sitting on lots of capital. I believe they will start investing in things that allow them to control the patient journey and provide predictability in how care is delivered. That is going to drive a big macro change. Meanwhile, providers will more closely align with payers.

Change that would have taken 20 years, is going to take two.”
Digital health is already a $350 billion market, according to McKinsey.

In addition to $200-300B healthcare IT spending mentioned earlier, there is also digital health: providing healthcare digitally. McKinsey estimates this digital healthcare market to be $350 billion in 2019 and growing to $600 billion by 2024 (shown on the right). There is probably some overlap between IT spending and digital health but they are two separate things.

Replacing IT systems and digital health together have a huge opportunity to eliminate wasteful spending and improve outcomes. Another McKinsey report frames this opportunity through three innovation layers:

1. **Engagement layer** (user experiences and payment models)
2. **Infrastructure layer** (health records, data sharing & interoperability)
3. **Intelligence layer** (AI and analytics)

We use this framing in the following slides, adding the R&D layer as a fourth.
So far, most VC investment activity and value creation has been in the engagement layer: building new user experiences.

Combined enterprise value of companies founded since 2000 by segment and innovation layer

Professionals

Providers

Biopharma

Payers

Source for valuations: Dealroom.co analysis of private and public valuations.
Tech giants are building full-stack capabilities. For them, healthcare’s huge market is an opportunity to sustain growth.

Notable investments, acquisitions and home-grown products

<table>
<thead>
<tr>
<th>R&amp;D layer</th>
<th>Intelligence layer</th>
<th>Infrastructure layer</th>
<th>Engagement layer</th>
</tr>
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<tbody>
<tr>
<td>Google</td>
<td>verily Life sciences</td>
<td>Google Cloud for healthcare and life sciences</td>
<td>amwell Digital care</td>
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<tr>
<td>Amazon</td>
<td>Project Baseline Data clinical research</td>
<td>AWS, Amazon Comprehend Medical, Amazon HealthLake</td>
<td>Google Fit Fitness tracking</td>
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<td>Apple</td>
<td>DeepMind Neural research</td>
<td>Halo Digital care</td>
<td>PillPack Pharmacy</td>
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<td>Facebook</td>
<td>NeuralIT Speech recognition</td>
<td>Amazon Alexa Digital care</td>
<td>Devoted Health plans Digital care</td>
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<td>Microsoft</td>
<td>Innovaccer Health data</td>
<td>Azure for the healthcare industry</td>
<td>Open source software</td>
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<td>Tencent</td>
<td>Microsoft Research</td>
<td>Nice for the healthcare industry</td>
<td>Sleep sensors Digital care</td>
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<td>Roche</td>
<td>voiceit</td>
<td>Azure</td>
<td>Preventive Health Digital care</td>
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<tr>
<td>Bristol Myers Squibb</td>
<td>DeepMind</td>
<td>Azure Cloud for the healthcare industry</td>
<td>Digital health</td>
</tr>
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</table>

Source: Dealroom.co
Digital healthcare platforms are seeking to integrate and create one-stop-shop solutions. This will drive more M&A activity.

**Personal genomics**

- FuturaGenetics
- 23andMe

**Drug discovery**

- GSK
- Shionogi
- Pfizer
- Biocon

**Pharma integrating digital therapeutics into their pipeline**

**Digital Therapeutics**

- happify
- sidekick
- HelloBetter

**Health insurance**

- Clover Health
- Alan

**Telemedicine**

- Livi
- Amwell
- Teladoc
- TeleClinic

**Online pharmacy**

- Zur Rose
- CVS

**Remote monitoring**

- Follow
- Livongo
- TytoCare

**Remote monitoring**

- Doctolib

**Mental health**

- Headspace
- Calm

**Health sensors**

- Respiration
- Personal
- Digital

**Drug discovery**

- GSK and 23andMe collaborating on R&D of new treatments using human genetics

**Ping An will partner with Shinogi on data-driven drug discovery**

**Teleclinic acquired by ZurRose. Pharmacies object: drugs can’t be sold by the prescriber, by law**

**Hims & Hers (USA) is creating a one-stop shop incl. Telehealth, products, and mental health support**
Investor appetite for Healthtech has been growing significantly.

VC investment in European healthtech startups

<table>
<thead>
<tr>
<th>Year</th>
<th>2016</th>
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Number of VC rounds >$2M

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<td>198</td>
<td>259</td>
<td>266</td>
<td>289</td>
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Source: Dealroom. Note: Healthtech excludes biotechnology and pharmaceutical companies.
Venture capital investment activity has moved beyond telehealth, to remote monitoring, AI-first products, digital therapeutics and more.

VC investment in European healthtech startups

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<td>Digital care (incl. telemedicine)</td>
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<td>Remote monitoring &amp; wearables</td>
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<td>Drug development with AI</td>
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<td>Digital health insurance</td>
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<td>Surgical robotics &amp; AR/VR</td>
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<td>Clinical decision support with AI</td>
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<td>Digital therapeutics</td>
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<td>Hospital operations</td>
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<td>Patient recruitment &amp; clinical trials</td>
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<td>Home test</td>
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<tr>
<td>Practice management software</td>
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<tr>
<td>Medical coordination</td>
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</tr>
</tbody>
</table>

**Examples**

- Surgical robotics: $240M Series C
- Decision support: $110M Series F
- Drug discovery with AI: $90M Late VC
- Psilocybin therapy: $80M Series B
- Diagnosis of epilepsy: $72M Series B
- Health insurance: $66M Series D
- Drug discovery with AI: $60M Series C
- Remote monitoring: $58M Series B
- Drug discovery with AI: $56M Series B

Source: Dealroom.co
Notable investors in European Healthtech.

<table>
<thead>
<tr>
<th>Sector agnostic European funds</th>
<th>European funds with dedicated Healthtech focus</th>
<th>U.S. / Asian investors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eighth Roads</td>
<td>Mtp</td>
<td>NEA</td>
</tr>
<tr>
<td>Kinnevik</td>
<td>Wellington Partners</td>
<td>Draper Esprit</td>
</tr>
<tr>
<td>Vitruvian</td>
<td>LSP HealthCare</td>
<td>Goldman Sachs</td>
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<tr>
<td>Acton</td>
<td>Endeavour Vision</td>
<td>Seroba</td>
</tr>
<tr>
<td>VENTURES</td>
<td>Serena Atlantic</td>
<td>Temasek</td>
</tr>
<tr>
<td>BOM Brabant Ventures</td>
<td>EDC</td>
<td></td>
</tr>
<tr>
<td>INKEF Capital</td>
<td>Aidence</td>
<td></td>
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<tr>
<td>Idinvest Partners</td>
<td>Doctolib, CarioLogs, FeetMe, Sophia Genetics</td>
<td></td>
</tr>
<tr>
<td>INKEF Capital</td>
<td>Calypso Biotech, iOnctura, Castor EDC, Aidence</td>
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</tr>
<tr>
<td>BOM Brabant Ventures</td>
<td>Citryll, Onera, Enpicom, MedEye</td>
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<tr>
<td>Seventure Partners</td>
<td>MedEye, FeetMe, Keen Eye, PushDoctor</td>
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<tr>
<td>btov Partners</td>
<td>Ottonova, Healx, Ava</td>
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<tr>
<td>Target Global</td>
<td>Thriva, BestDoctor, MediQuo</td>
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<tr>
<td>Seedcamp</td>
<td>Doctorly, Elephant Healthcare, Peppy, Veratrack</td>
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<tr>
<td>Entrepreneur First</td>
<td>Vine Health, Kiroku, AccuRx, Maaind</td>
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<tr>
<td>Partech</td>
<td>Doctorly, Elephant Healthcare, PushDoctor, Alan</td>
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<tr>
<td>HV High-Tech Gründerfonds</td>
<td>Qnami, Mercuris, IATROS</td>
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<tr>
<td>Global Founders Capital</td>
<td>Echo, Mybacs, Hometouch</td>
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<tr>
<td>Investiere</td>
<td>Qnami, Comhya, Sympatient, Nagi Bioscience</td>
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</tr>
<tr>
<td>Seedcamp</td>
<td>Doctorly, Elephant Healthcare, PushDoctor</td>
<td></td>
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<tr>
<td>Eight Roads</td>
<td>VarmX, Lumeon, ViCentra, Atlantic Therapeutics</td>
<td></td>
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<tr>
<td>Eight Roads</td>
<td>Oviva, DoctorLink</td>
<td></td>
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<tr>
<td>Balderton</td>
<td>Kaia Health, Healx, Sophia Genetics, myTomorrows</td>
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<td>Creadum</td>
<td>PlusDental, Ottonova, Aurora Health, Heartbeat medical</td>
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<tr>
<td>Northzone</td>
<td>Eight Roads, Eight Roads, EDC</td>
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<tr>
<td>Atomico</td>
<td>Quanta Dialysis Technologies, Lumeon, Oviva, TrialBee</td>
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<tr>
<td>Earlybird</td>
<td>Quanta Dialysis Technologies, Lumeon, Oviva, TrialBee</td>
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<td>Idinvest Partners</td>
<td>Oviva, DoctorLink</td>
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<td>Seedcamp</td>
<td>VarmX, Lumeon, ViCentra, Atlantic Therapeutics</td>
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<tr>
<td>Series B+</td>
<td>VarmX, Lumeon, ViCentra, Atlantic Therapeutics</td>
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<tr>
<td>Series A</td>
<td>VarmX, Lumeon, ViCentra, Atlantic Therapeutics</td>
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<tr>
<td>Seed</td>
<td>VarmX, Lumeon, ViCentra, Atlantic Therapeutics</td>
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</tbody>
</table>

Source: Dealroom.co. Not exhaustive. Funds selected based on number of investments in Healthtech and (future) unicorns.

Explore European Health investors

Visit health.dealroom.co
Exciting things are happening at the intersection of Biopharma & Healthtech. Traditionally two different silos, now increasingly overlapping domains.

- **Healthtech**
  - Software
  - Digital therapeutics: software is the treatment, requiring clinical validation in trial and demonstrating cost effectiveness in studies.
  - General AI which solved a major protein folding challenge (AlphaFold) potentially enabling a step change in drug discovery.
  - Acceleration of drug discovery using AI identifying new targets, mutations, etc. (Healx, BenevolentAI)
  - Predicting chemical effects of compounds in cells / humans.
  - Using technology modeling / predicting experiments that would otherwise cost years to execute (animal models, safety testing, etc).
  - Using technology to get earlier read outs in clinical trials telling you if you have efficacy of a treatment earlier (i.e. in phase II with 100-200 patients vs. Phase III with 1,000 patients) (Aidence / NeuroKeys)
  - Improving patient selection, thereby reducing the need for large patient cohorts (FlatIron, Castor, Antidote.me)
  - Better insights in patients beyond the clinical trial phases, improving transparency towards payers

- **Biopharma**
  - Biochemical formulas
  - Accelerating clinical trials. Establishing efficacy earlier (e.g. in phase II with 100-200 patients vs. Phase III with 1,000 patients)
  - Better insights in patients beyond the clinical trial phases, improving transparency towards payers

- ✔ Better alignment between biopharma, providers, payers
- ✔ Faster development of treatments
- ✔ Better data on (cost) effectiveness

---

For Biotech:
1. Acceleration of drug discovery using AI identifying new targets, mutations, etc. (Healx, BenevolentAI)
2. Predicting chemical effects of compounds in cells / humans.
3. Using technology modeling / predicting experiments that would otherwise cost years to execute (animal models, safety testing, etc).
4. Using technology to get earlier read outs in clinical trials telling you if you have efficacy of a treatment earlier (i.e. in phase II with 100-200 patients vs. Phase III with 1,000 patients) (Aidence / NeuroKeys)
5. Improving patient selection, thereby reducing the need for large patient cohorts (FlatIron, Castor, Antidote.me)
Convergence of Biopharma & Healthtech bodes well for tech hubs that are strong in both.

<table>
<thead>
<tr>
<th>Biotech clusters (startups, investors, academia)</th>
<th>Healthtech Clusters (startups, investors, academia)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paris, Stockholm, Berlin, Barcelona, Zurich</td>
<td></td>
</tr>
</tbody>
</table>

What makes biotech and healthtech so different

Healthtech sells software at zero marginal costs. Biotech sells a physical biochemical formulation. They also have different buyers, regulatory paths, and therefore two very different investor groups - traditionally at least.

Why they are converging

Increasingly, many Healthtech companies have shared characteristics with Biotech. For instance, Digital Therapeutics is getting clinical validation in a randomized controlled trial demonstrating efficacy in a rigorous way that is accepted by the ecosystem.

Why it matters

Convergence will play a major role in the shift to value-based care and reducing costs. Predicting, say, the chemical effects of compounds in cells / humans can accelerate experiments that would otherwise cost years to execute (animal models, safety testing, etc).
The next big things: tech for patients, professionals, hospitals and biopharma
Startups are developing digital tools to improve and change the pain points in the patient's journey, providing personalised and engageable self-care solutions.

### Prevention
- **Lifestyle**
  - Medical/ family history
  - Home testing
    - At-home tests determining lab results

### Symptoms
- **Experience & report symptoms**
- **Health tracking**
  - Integration with wearable devices that track vital signs for an earlier intervention
  - WITHINGS
  - HUMA
  - OURA
  - dreem

### Care plan
- **Consultation**
  - General Practitioner
  - kry
  - babylon
  - HelloBetter
- **Specialist**
  - ONKO HEALTH
  - biloba
  - Minder

### Test & Diagnosis
- **Physical examination**
  - Lab exams
  - Pathology
  - Diagnostic Imaging
  - SkinVision
  - melic

### Treatment
- **Treatment options**
  - Patient-doctor to come with a share-decision making of the treatment option
  - Digital therapeutics
    - Personalised treatment via software or complementary medical devices
  - Remote treatment
    - Medical devices for therapies
    - Rehabilitation

### Post-treatment
- **Continuous monitoring**
- **Patient engagement**
  - Monitor patients in real time, medication adherence, emotional support
  - Careology
  - CUREETY
  - current health
  - uwen
Digital health platforms have started with three different approaches, but are adopting many strategies from other business models as they mature.

**Direct-to-consumer**
AI-based and/or own doctors

**Two-sided marketplace**
Without own doctors

**SaaS-first**
Providing tools for doctors first, telemedicine marketplace as add-on
Tech for patients: what’s next after telemedicine.

Connectivity and continuous monitoring are game changers for prevention and proactive care, recovery as well as insurance and financing

Combining diagnostics with treatment

In Femtech there are many more opportunities for innovative players to tackle stigmatized conditions, for example around fertility and pregnancy

Make the patient the point of care, shifting it from hospitals to where the patient is

Accessible wide range of at-home tests determining lab results with efficiency and ease

Discover the companies

Femtech | Home test | Muscle activity monitoring | telemedicine & AI | Digital therapeutics | Continuous vital signs | Heart rate monitoring | Cancer patient care | Neurological and mental health | Personalised programmes

165+ Digital health solutions for patients»

Source: Dealroom.co
“As healthcare costs increase to less sustainable levels, digital can 'bend the cost curve', making healthcare affordable to more.

“The pandemic has moved adoption of digital and remote care forward by many years. Healthcare systems are right to demand significant evidence that new approaches are beneficial for patients and cost-effective. Covid-19 shifted our services fully remote. Initially, fewer patients were referred, as primary care doctors saw fewer patients, but volumes quickly recovered, and we could capture a higher share.

Oviva’s remote service in Switzerland, Germany, UK and France became a safe and broadly accepted treatment, while face-to-face care, especially with groups of patients, is currently less safe. In addition, we developed a new, reimbursed D2C channel. We expect this channel to be a major driver of growth, more scalable and higher gross margin compared to our B2B2C channel.”

Klaus Mitterer
CFO
Software-enabled solutions transforming and streamlining healthcare providers’ tech stack.

Patient access
- Electronic health record (EHR)
- Patient information shared across health systems

Care coordination
- Diagnostic Decision support
  - Screening
    - AI-based image analysis
    - Oncology
    - Neurology
    - Cardiology
    - Pulmonary
  - Surgical preparation
    - Cognitive simulators for complex surgical planning
    - Simulate impact of procedures before or during surgery

Intervention
- Robotics
  - Assist surgeons to access and visualise anatomical locations that are hard to reach

Patient engagement
- Recovering and Monitoring
  - Track risk symptoms
    - Monitor patients in real time
    - Professionals can intervene early

Software-enabled solutions transforming and streamlining healthcare providers’ tech stack.

Clinical decision engine & enablement
- Fully integration of hospital workflow: patient safety, staff and asset management

Pharma supply chain
- Medication management, trace and verification

Workforce coordination & communication
- Secure messaging for medical professionals and teams
- Healthcare Staffing
B2B tech for hospitals and medical professionals: from replacing the fax machines to surgical robots, what’s happening.

Streamlining the hospital tech stack with different medical software for secure documentation, record of patient history, e-prescription and billing

Improve care team capacity and efficiency through better care team coordination

Improving outcomes: reduce wait times. Enhance patients’ service, comfort and safety

Surgical & medical intervention robotics for better precision and cognitive simulators for surgical training (AI, 3D, AR/VR) for planning and education

Clinical decision support with AI: pathology and radiology with AI-based analysis

Discover the companies
Voice to text assistants | decision support: neurology | surgical training | document management | decision support: pulmonary | hospital BI | staff communication | decision support: oncology | decision support: cardiology | surgical robotics

100+ B2B solutions for hospitals and medical professionals »

Streamlining the hospital tech stack with different medical software for secure documentation, record of patient history, e-prescription and billing

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100+ B2B solutions for hospitals and medical professionals »
“We decided to focus on the early detection and measurement of lung cancer, as this is a time-consuming and error-prone task for radiologists and it has great benefit for patients as their survival chances are much higher when an abnormality is found earlier.

“Imaging diagnostics is a data-driven business, and AI is very well suited to contribute to improving the quality and efficiency. The human experts are in short supply, and their workload is ever-increasing in volume and complexity. AI will become an indispensable tool for detecting, diagnosing disease and tracking treatments.”

Aidence has founded a consortium (ICOVAI) to create an AI model for the automated detection of Covid-19 on chest CT. This will be offered to any interested hospital on a non-profit basis, courtesy of a Horizon2020 grant from the EU. We hope to release this new product before the end of 2020 after proper clinical validation in cooperation with one of the participating academic sites.”

Mark-Jan Harte
Co-Founder & CEO
AI is making drug discovery faster and more effective by increasing the likelihood of success and shortening the time-to-market of new drugs.

Tech enabling and accelerating the drug discovery & development process

**Research & discovery**
- Target discovery
- Drug discovery

**Preclinical & clinical research**
- Decentralised clinical trial

**Approval**
- Market

**Research analysis**
- Aggregate and synthesise information from biomedical publications

**Datasets/molecular modelling**
- Build predictive models of genomic data and chemical structures

**Repurpose existing drugs**
- Repurpose existing drugs to accelerate treatment of diseases with AI

**Identify drug candidates**
- Clinical-stage pharmatech companies with own AI driven systems

**Validate drug candidates**
- In silico experiments
- Exclude toxic or reactive molecules

**Patient recruitment**
- Recruit patients for human clinical trials
- Patient Enrollment

**Clinical trials software**
- Real-time monitoring and management of patients to measure study effectiveness (Phase I,II,III)
- Real World Evidence

**Regulatory submission**
- FDA/EMA review

**Post-approval**
- Postmarketing surveillance, safety monitoring (Phase IV)
Many startups are helping biotech and pharma companies to reduce research costs with AI-based solutions.

Drug discovery and development with AI to reduce time-to-market

Digital therapeutics enables a direct and personalised delivery of medical intervention

Clinical trials are the most expensive part of developing drugs (1), patient recruitment & clinical trial software simplify and accelerate the process.

Innovation happening on biological level with increased use of technology

1. Tufts Center for the Study of Drug Development

Discover the companies

Research analysis | datasets analysis | imaging and diagnostics | design novel drugs | optimise clinical trials

100+ AI-based solutions making drug discovery faster and more effective »

Discover the companies - Healthtech Ecosystem

Design novel drugs and repurpose existing drugs

- Exscientia
- BenevolentAI
- Koa Health

Datasets/Research analysis and molecular modeling

- Neurala
- FlatIron Health
- Castor

Imaging and diagnostics

- Aidence
- NeuroKeys

Cancer and immunology

- FlatIron Health
- Desargues

Neurological diseases

- Aidence
- NeuroKeys

Optimise clinical trials

- Castor
- Antidote.me

Source: Dealroom.co
“AI is a safe and useful tool, but in my opinion, the scariest part of AI is data protection. We shouldn't be exposing individual patient-level data, we should be generating a digital copy that has all the same properties but doesn't contain actual patients, ensuring that individual identities cannot be revealed.

“The vast majority of research, including for Covid-19, is not decentralized. Everything is hospital based because people were used to doing it that way, and this is not an industry that likes innovating. Almost all trials require patients to go to the hospital for enrolment, for consenting, for any measurements, etc.

Now, of course, with Covid-19 happening, none of that was possible, everyone started looking for solutions to continue finding and enrolling patients, and conducting research measurements while they were at home. Most of the decentralized trials (or remote trials) that have happened, don't happen at the hospital. This has really become super popular, at least for exploration.”
“Ideally technology should always aim to extend and improve on available capabilities. Replacing human interaction (or any manual process) with an automated option often results in lesser quality customer satisfaction. Therefore, a thoughtful balance between applied technology and service appear to be the best solution in healthcare.

“Covid-19 has disrupted the clinical trial operations with studies initially being cancelled, put on hold or at least significantly delayed. We have since seen a return of activities as the market is catching back up concurrent with the increased demand for support on Covid-19 related research on vaccines and therapeutics. From an operational standpoint, protocols are now increasingly calling for the use of remote consent (eConsent), telehealth and decentralized (virtual) monitoring and data collection. Many protocols are being amended to meet the new standards. We expect this trend to prevail with demand increasing for decentralized and virtual trials.”

Lars-Olof Eriksson  
CSO
European healthtech companies that are supported by the continent’s leading Universities and Research Institutions.

<table>
<thead>
<tr>
<th>Company</th>
<th>Category</th>
<th>University Research Inst.</th>
<th>VC funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nanopore DNA sequencer</td>
<td>Oxford</td>
<td>$796M</td>
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<tr>
<td>Exscientia AI-based drug discovery</td>
<td>Dundee</td>
<td>$106M</td>
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<tr>
<td>Biogenica Genomic interpretation</td>
<td>Sanger Inst.</td>
<td>$82M</td>
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<td>healx AI-based drug discovery</td>
<td>Cambridge</td>
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<tr>
<td>GENOMICS Genome analysis</td>
<td>Oxford</td>
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<td>Synthace Laboratory automation</td>
<td>UCL</td>
<td>$42M</td>
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<tr>
<td>bit.bio Cell coding</td>
<td>Cambridge</td>
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<td>Fluidic Analytics Protein analysis</td>
<td>Cambridge</td>
<td>$39M</td>
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<tr>
<td>endomag Breast cancer care</td>
<td>UCL</td>
<td>$38M</td>
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<tr>
<td>Perspectum Medical imaging</td>
<td>Oxford</td>
<td>$36M</td>
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<tr>
<td>ONI Super resolution microscopes</td>
<td>Oxford</td>
<td>$30M</td>
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<tr>
<td>oxfordvr VR therapy for mental health</td>
<td>Oxford</td>
<td>$17M</td>
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