CBINSIGHTS

The Big Tech in Healthcare Report

How Amazon, Google, Microsoft, Apple, & Oracle are fighting for the $11T Market

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Big tech | Healthcare

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Judit Tejada
Strategic Insights Consultant, Moffitt Cancer Center

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193 companies helping healthcare payers create balanced value-based contracts

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130 companies accelerating drug discovery for pharma and CRO leaders

Analyzing Microsoft's growth strategy: How the OS titan is building a new foundation for healthcare

The Future of Clinical Trials: How technology is making drug trials more efficient, cost-effective, and inclusive

112 companies helping healthcare providers improve how patients access care

Prioritizing the 8 technologies optimizing the 'digital front door' for healthcare providers

These 259 companies are transforming the clinical encounter for providers and patients

Contents

Summary of findings

Overview of big tech's activities in healthcare

For cloud incumbents, healthcare is an appealing target

- Amazon Web Services is a leader in the cloud healthcare market, refining and deploying a range of AI/machine learning (ML) and life sciences tools.
- Microsoft is developing and promoting Microsoft Cloud for Healthcare, combining new tools and integrations for enterprise healthcare.
- Google is prioritizing life sciences, with a focus on developing search technologies for clinicians like Care Studio. Subsidiary Verily raised $1B in September 2022 to double down on precision medicine.
- Oracle recently acquired EHR vendor Cerner, marking its first major foray into health tech. Integrating Cerner with its other products will help Oracle expand its service lines while gaining valuable data customers.

The home monitoring & wearables market is growing

- Apple is focused on bringing its device ecosystem — including the Apple Watch and iPad — into healthcare settings, including care at home.
- Google is making bets in wearables. It's opting for a diversified approach, having recently dissolved its Google Health division and reallocating personnel to verticals like Fitbit. It released its first Google Pixel Watch in October 2022.

For Amazon, providing direct care is the next frontier

- Amazon is focusing on direct care offerings for employers and consumers, primarily through One Medical and its newest service, Amazon Clinic.

Note: For the purposes of this analysis, we include Amazon, Google, Microsoft, Apple, and Oracle in our definition of "big tech."

What's next?

Big tech players' presence in healthcare will grow. As they become more familiar with the idiosyncrasies of healthcare, big tech players will continue to improve their potentially disruptive technologies. In the near term, they are focusing on growing market share and building tools for a space that's notoriously slow to adapt.

Consolidation will continue, with acquisitions most likely in the remote monitoring and home clinical spaces. Ambient monitoring technologies are growing in sophistication and represent a significant improvement in user experience and long-term adoption potential over wearables. Amazon, Apple, and Google are the most likely to pursue acquisitions in this space.

Access to data is a major driver for every player. Algorithms and products increasingly depend on access to patient and user data. Gathering, leveraging, and monetizing data is a guiding force in big tech activity.

Home health for seniors is the next industry boom. As global populations age and seniors increasingly accept and use technology, look for big tech to begin acquiring, designing, and marketing with the senior health and Medicare Advantage markets in mind.

Black box algorithms won't go away, but transparency will become a selling point. With AI and ML becoming more involved in care distribution and delivery, concerns about how algorithms make decisions will drive more demand for transparency and explainability. Google and Microsoft are far ahead of the pack in responding to this demand.

Where big tech is making moves

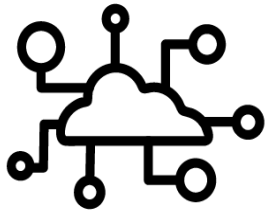
How big tech is transforming healthcare

amazon	The retail giant is moving into healthcare through direct contracting services with employers. Amazon is building a robust platform for virtual, asynchronous, integrated care by adding One Medical and Amazon Clinic to an already substantial pharma supply chain, its cloud computing services, and a growing selection of monitoring devices.
	The iPhone, Apple Watch, and iPad are the key elements of Apple's healthcare strategy. Supported by the Health app and the HealthKit, ResearchKit, and CareKit developer frameworks, Apple aims to be a central provider of healthcare wearables, mobile apps, and portable devices.
Microsoft	The OS leader is building a feature-rich healthcare development platform. Microsoft Cloud for Healthcare covers a broad set of tools, including Azure, AI/ML, and clinical tools. Microsoft's partnerships with CVS Health and Teladoc have bolstered Teams and Azure computing functions for clinical care, while its acquisition of Nuance has given it a suite of voice tools.
Google	Concentrating on life sciences and pharma, Google has moved forward with provider healthcare initiatives, such as its Care Studio for clinicians, since closing Google Health in 2021. It's using Fitbit to carve out space in the consumer healthcare wearables market, and Verily is tackling precision health, real-world evidence generation, and healthcare data solutions.
ORACLE	The newest member of the field made a big entry with its $28.3B acquisition of EHR giant Cerner, which closed in June 2022. For now, Oracle is focusing on integrating its own relationship management, resource-planning, and cloud data products into Cerner, but Cerner's new datasets and products for research will fit nicely alongside Oracle's existing life sciences plays.

What's driving big tech activity in healthcare?

Consumer demand

The pandemic has driven patients to demand more unified, easy-to-access services and technologies. With extensive experience in building consumer-driven user interfaces and experiences, tech companies can quickly set themselves apart.

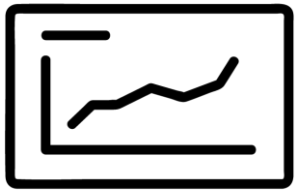


Fragmented systems

The explosion of virtual care, analytics, and monitoring solutions has emphasized the importance of data interoperability and transparency. Big tech is well-positioned to offer end-to-end platforms that simplify data management.

High administrative burden

Providers and payers are inundated with manual, repetitive, and time-consuming admin tasks. Tech companies are solving for this through improved workflows and automation.



Demographic pressure

As populations age, tech companies are investing in home health and other technologies to support seniors in the long term.

Consumers want a range of care options

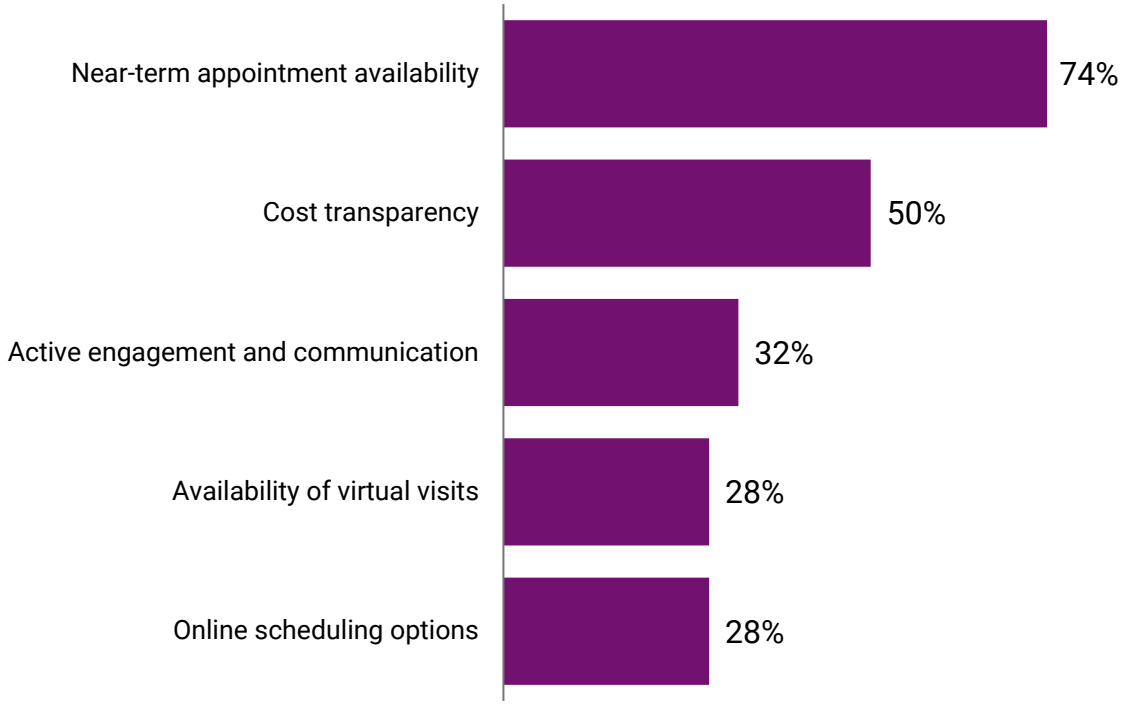
Consumers aren't willing to give up the convenient and accessible care options that arose during Covid-19. In fact, most of them want more.

Bringing in new patients and retaining existing ones requires not just offering basic telehealth services, but also continuing to expand the options available to patients over time.

Hybrid care, for instance, integrates remote encounters, in-person care, and virtual care so providers can be continuously informed and involved in decision-making. Big tech vendors looking to get involved in healthcare are targeting these sophisticated opportunities.

Factors impacting where consumers will seek healthcare

% of respondents (as of 10/13/2021)



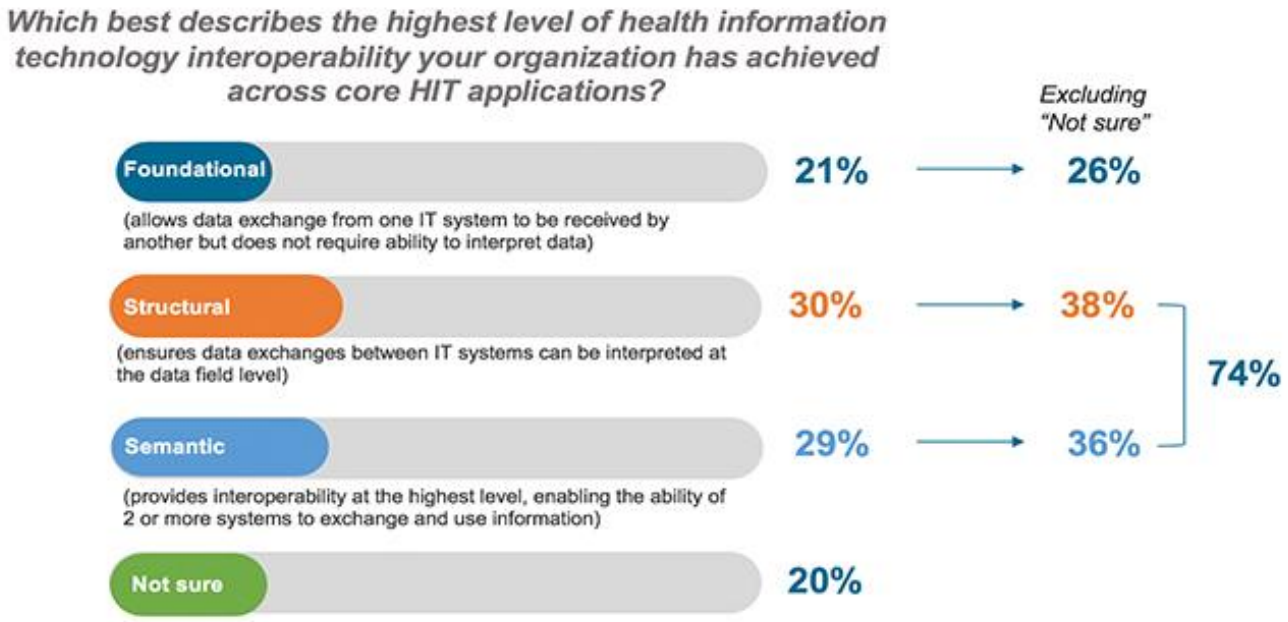
Source: Kyruus

Interoperable data could connect fragmented systems

It's becoming easier to use, transform, and monetize healthcare data as stakeholders adopt healthcare APIs and data interoperability standards, such as Fast Healthcare Interoperability Resources (FHIR).

Cloud services like AWS and Microsoft Azure built their revenue models in other industries on the ability to create network effects with the data they house and transact.

As more third-party and independent vendors store and access interoperable healthcare data, big tech could take advantage of these growing network effects.



Source: HIMSS Media

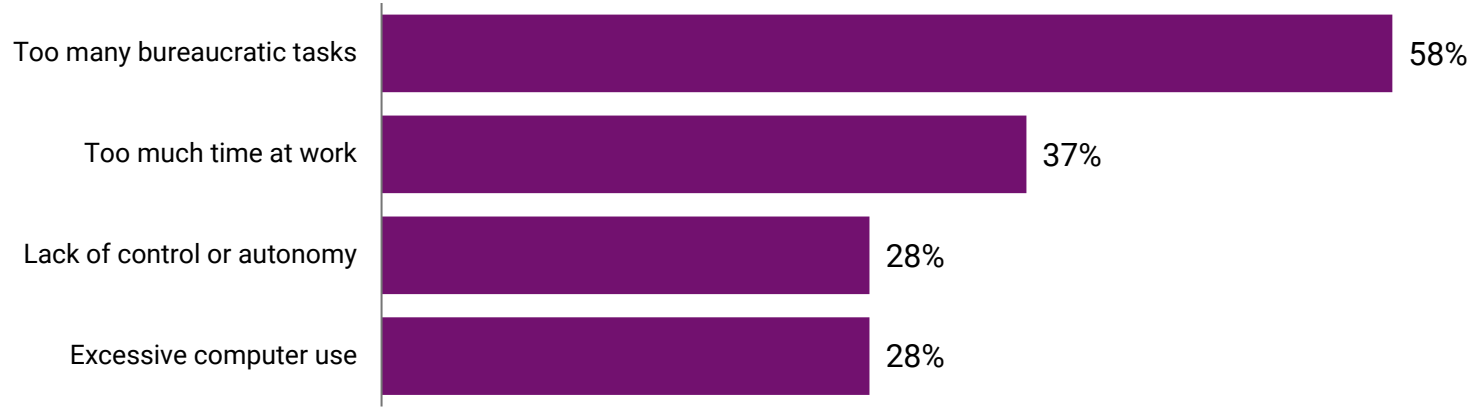
The admin burden needs automation

Healthcare providers are feeling more pressure and burden from repetitive tasks and non-clinical work, while organizations are faced with an over-worked, unhappy workforce.

Big tech has extensive experience in leveraging AI/ML and process automation to build efficiencies in other industries. Healthcare is more than ready for this disruption.

Causes of provider burnout

% of respondents indicating a contributing factor (as of 4/25/2021)



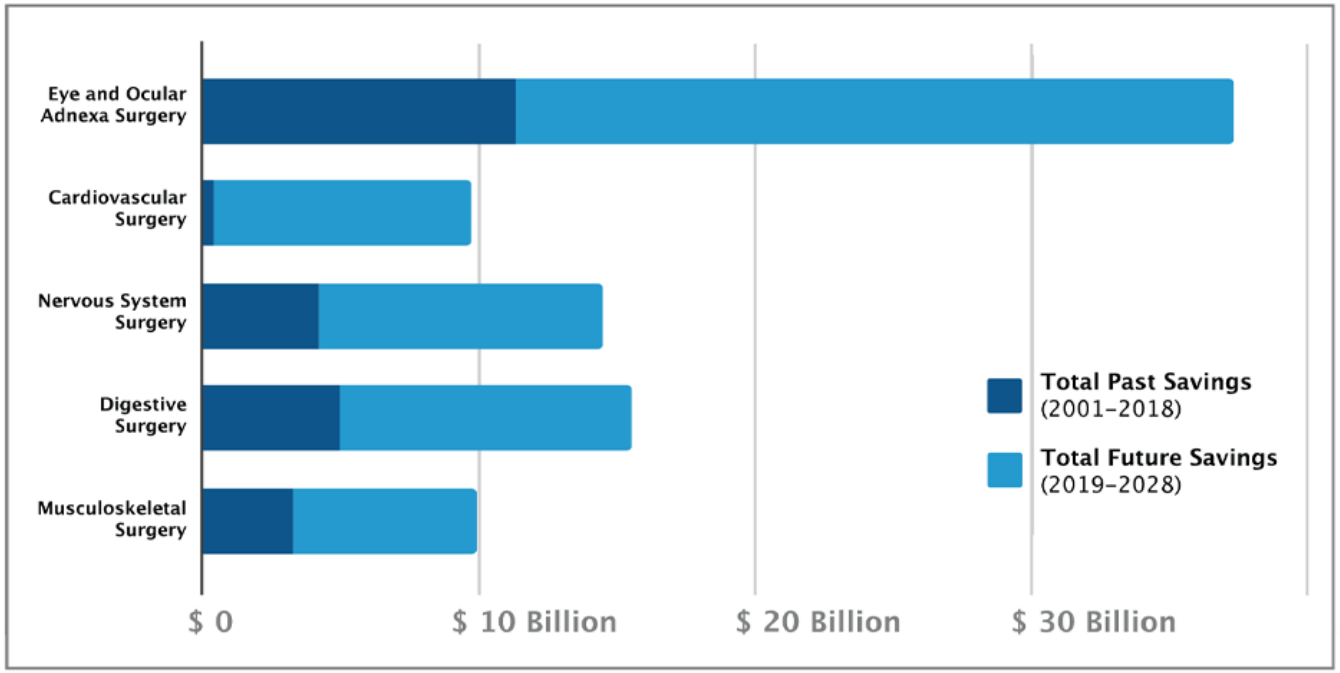
Source: Medscape

Demographic and spending shifts are driving home healthcare investment

Shifting from in-patient (IP) to outpatient care at a home, clinic, or ambulatory surgical center (ASC) can realize significant cost savings for payers, providers, and patients. This is especially important as populations age and as age-specific payer programs like Medicare become more cost-conscious.

With consumers increasingly willing to receive care from a variety of sources, big tech companies are positioning themselves to be integral to digitally enabled home care.

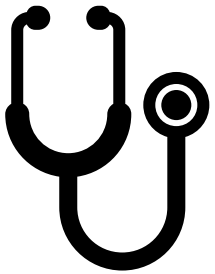
Projected and real Medicare savings when using ASC procedures by surgery type



Source: Advancing Surgical Care

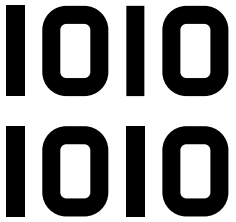
Amazon

Where Amazon is focusing



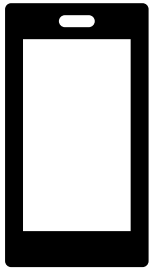
Capturing the provider market

Through acquisitions and new services, Amazon is committing to an employer-focused hybrid primary care model.



Expanding into precision medicine

Combining deep datasets with robust AI/ML, Amazon is partnering with life sciences companies to develop and deploy precision diagnostics and therapies.



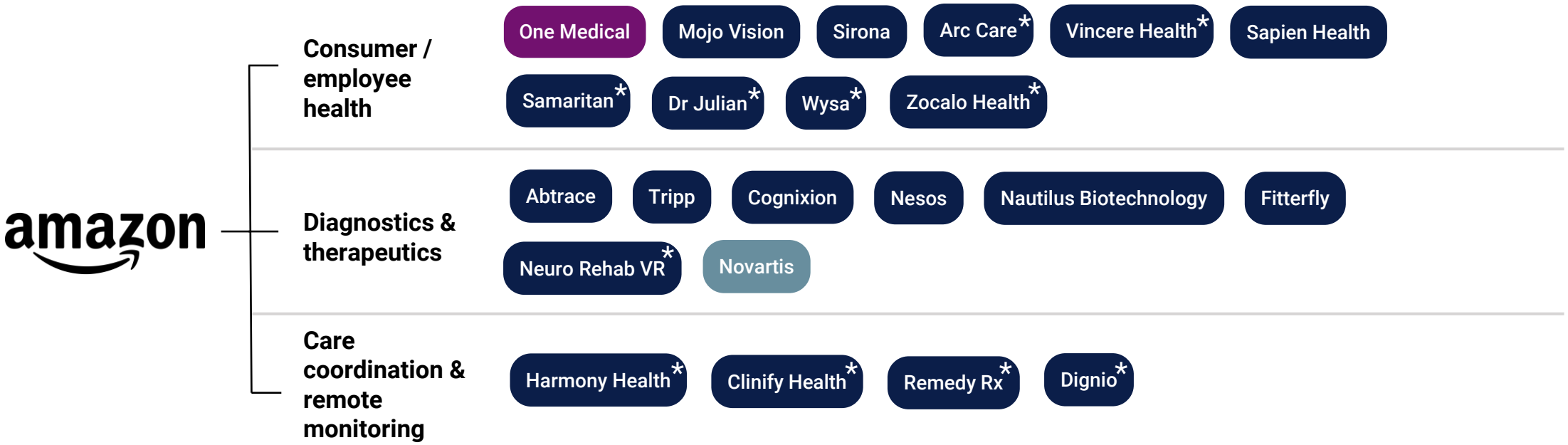
Connecting consumer tech for health

Amazon is making moves into the Apple Watch-dominated consumer health wearables market through product lines like Halo.

Amazon is building for consumer care provision

2021 – 2022 (as of 9/30/2022)

Acquisition Investment Partnership



* AWS Healthcare Accelerator startup participant
These designations are not exhaustive of Amazon's investment and partnership activity in the analyzed period.

Theme 1: Capturing the provider market

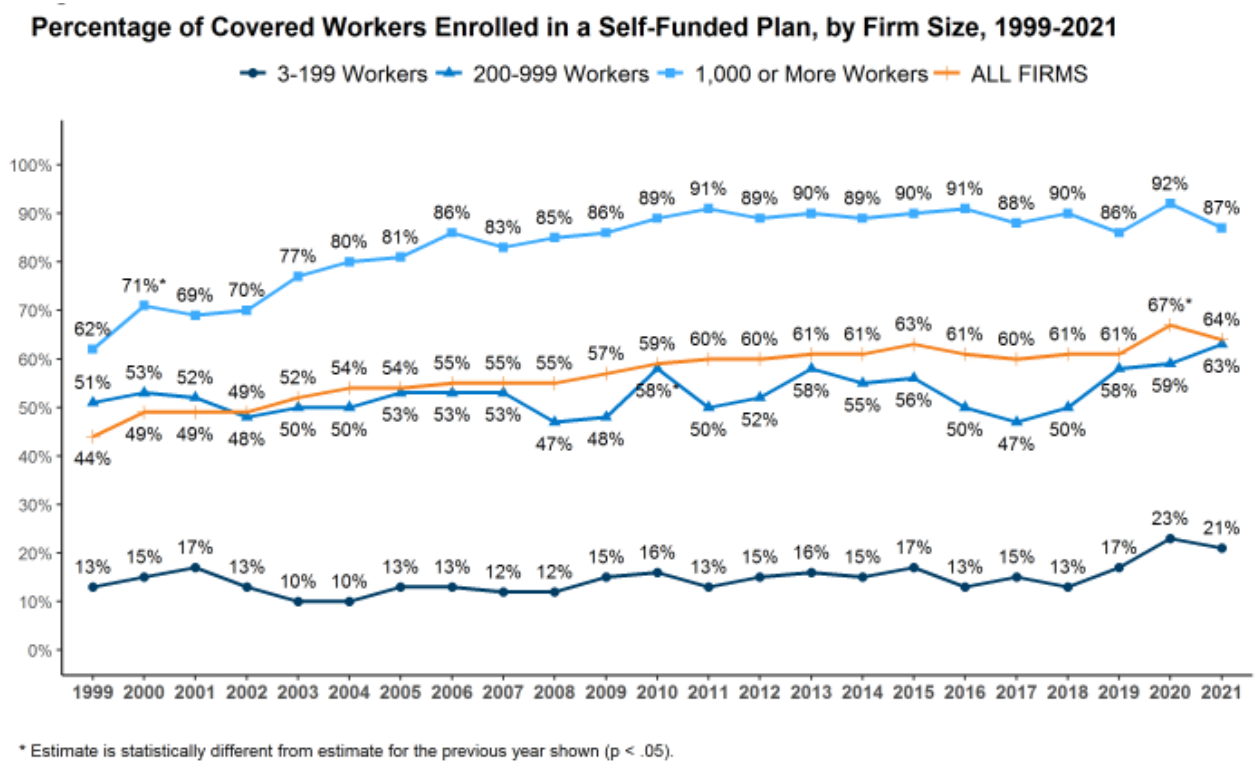
Disrupting primary care

Employer health is Amazon's target of choice

Self-insured employers have been growing as a market for more than 20 years, while healthcare costs have grown alongside them.

Since 2018, Amazon has been looking for ways to both control its own employee healthcare costs and turn that into a saleable product. Amazon Care, a combination of partner clinics and virtual care tools, failed to gain traction and was closed in August 2022.

However, Amazon may have found its answer with the $3.9B acquisition of established primary care provider One Medical in July 2022.



* Estimate is statistically different from estimate for the previous year shown ($p < .05$).

Source: KFF Employer Health Benefits Survey, 2021

Hybrid care is a winning model

With an employer-focused, hybrid care model, One Medical has seen impressive growth, with a 27% year-over-year (YoY) growth in membership and more than doubling net revenue YoY in Q2'22.

One Medical has built a more comprehensive primary care offering than Amazon could. It added behavioral health offering Healthy Mind to its product suite in Q1'22.

By partnering with local health systems, One Medical also offers access to specialty consults and admissions.

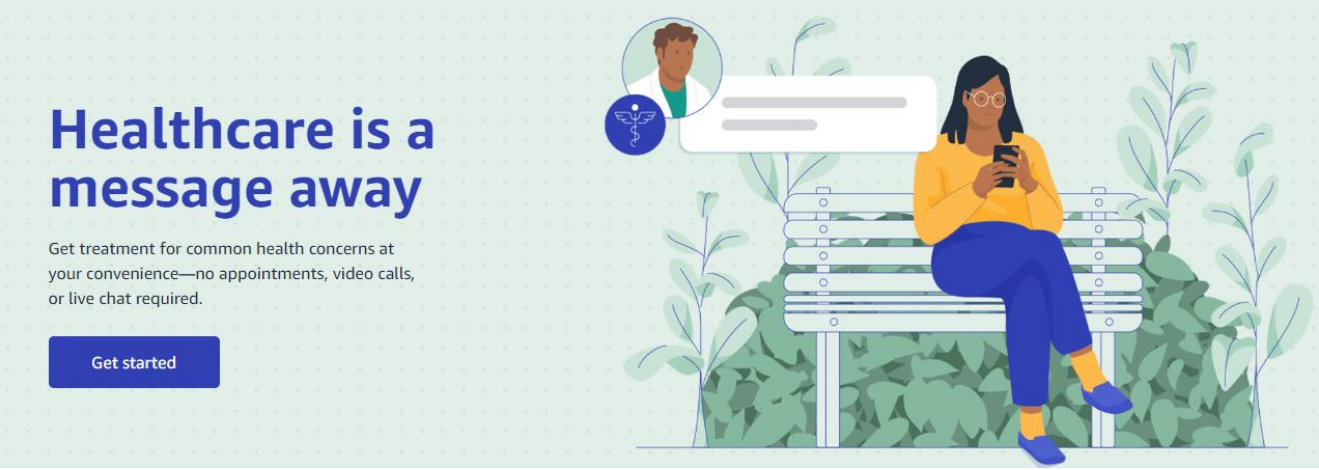
Source: One Medical

Amazon Clinic is its new front door

Amazon debuted its Clinic offering in November 2022. Through an asynchronous questionnaire and messaging process, the company will provide patients with care plans, prescriptions through Amazon Pharmacy, or recommendations for next steps.

Care will cover common non-urgent and chronic needs including high blood pressure, STIs, birth control, asthma, and migraines.

Amazon Clinic is currently using outside provider partners. Services are currently only available in 32 states, but a One Medical integration would quickly expand that area.



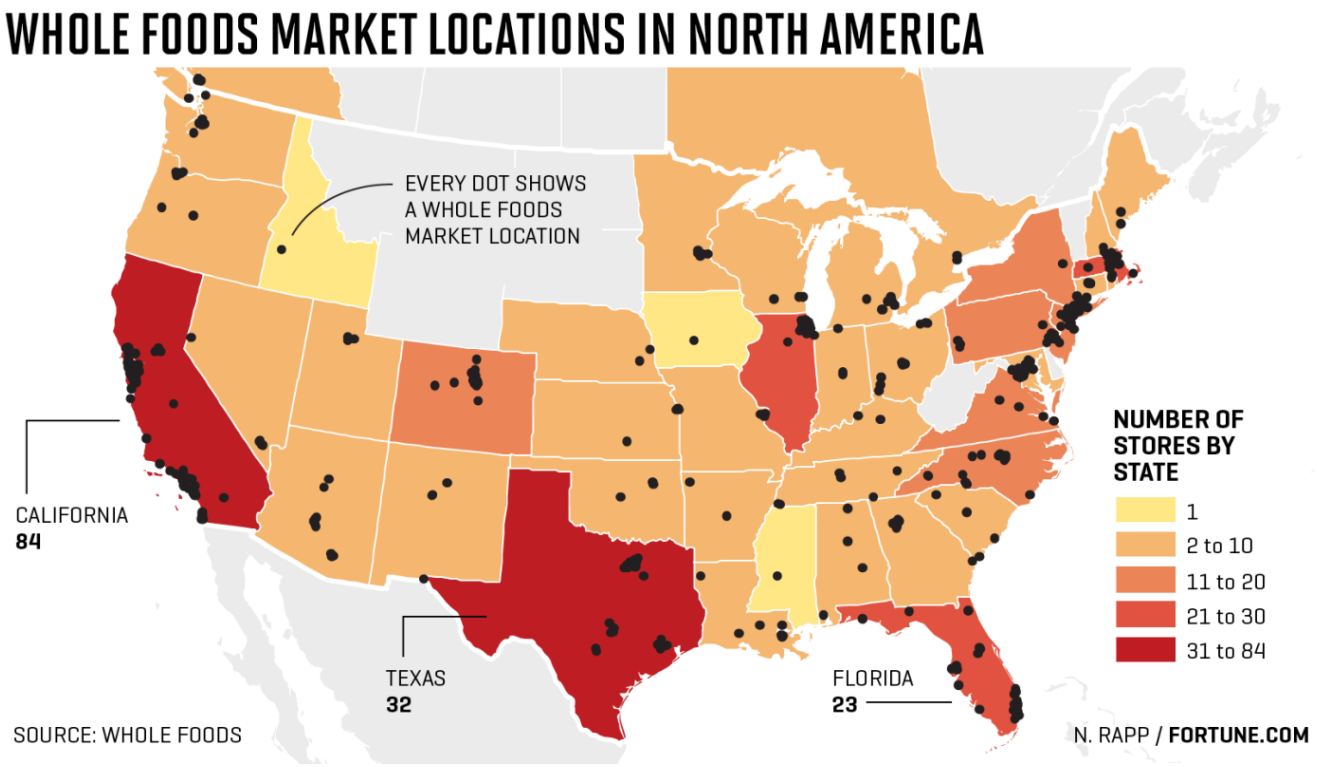
Source: Amazon

The next step is expansion

One Medical has a clinical presence in the largest markets Amazon is targeting, but it will need to expand rapidly to meet its pre-acquisition 2023 targets for revenue and patient growth.

With 188 clinics in 13 major markets, One Medical has a clinical presence that could cover 72% of US employees.

With a nationwide brick-and-mortar presence in Whole Foods, Amazon could quickly build and scale a retail clinic-style presence for One Medical in its highest-value target markets: high-income, white-collar urban and suburban neighborhoods.



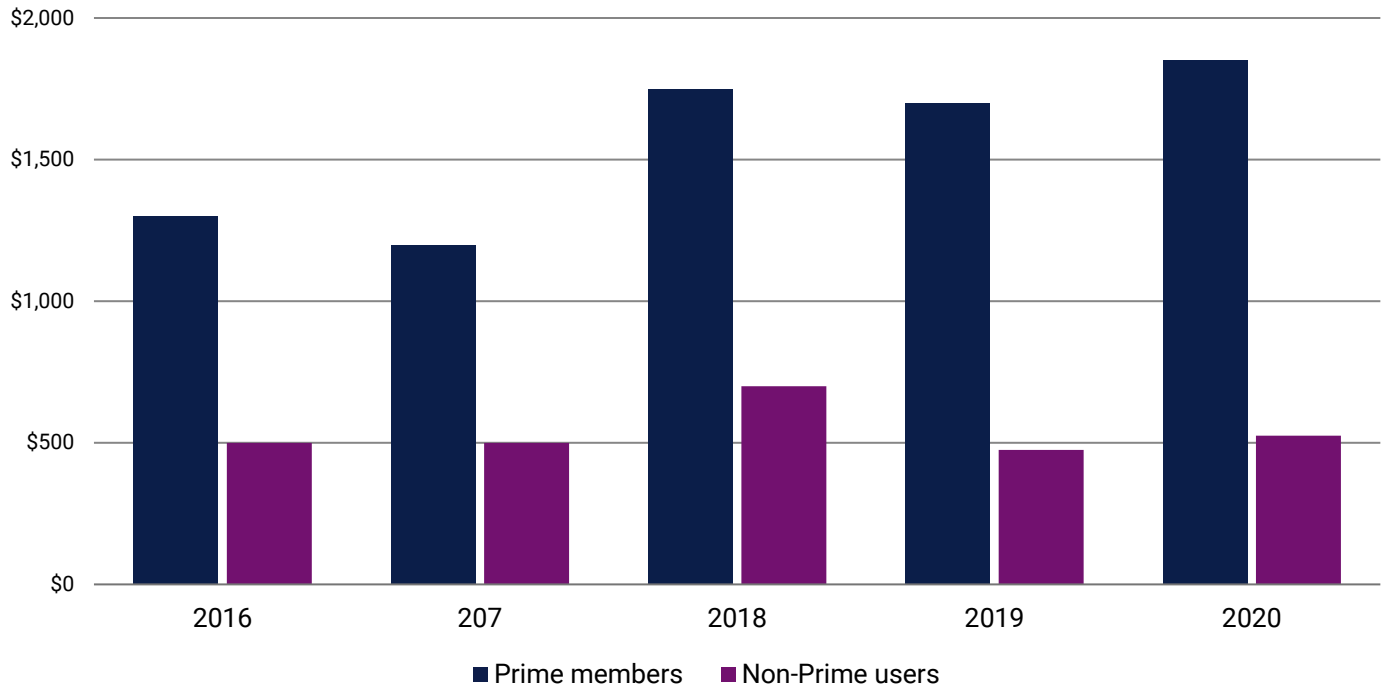
Source: Fortune

One Medical + Amazon Prime?

One Medical already operates a retail subscription model. With more than 200M Prime subscribers worldwide, look for Amazon to leverage One Medical and Amazon Clinic as subscription add-ons.

Prime subscribers are more loyal and spend significantly more with Amazon than non-Prime shoppers.

Average annual spend on Amazon.com



Source: Quartz

Theme 2: Expanding into precision medicine

AI partnerships in pharma & life sciences

Amazon is exploring precision medicine partnerships

Precision medicine takes advantage of developments in genomics, molecule design, and biological therapies to provide more effective treatments that are personalized to individual patients.

These may include turning specific genes on or off in cancer cells, activating suppressed immune functions, or tailoring medications and dosages to specific biology and metabolisms.

Amazon launches cancer vaccine clinical trial in partnership with Fred Hutchinson

July 2022 | BUSINESS INSIDER

In partnership with a leading cancer hospital, Amazon is beginning clinical trials of personalized cancer vaccines that will leverage AWS' machine learning capabilities.

Building the foundation for precision medicine

Data transfer and storage solutions

Reduce storage costs and accelerate genomics innovation with secure data transfer, global collaboration, and access to genomic datasets.

Secondary analysis solutions

Accelerate analysis of genomic data with access to best-in-class workflow automation and analysis with AWS for Genomics.

Data aggregation and governance solutions

Securely aggregate multi-modal data at population scale in a secure and compliant-ready environment.

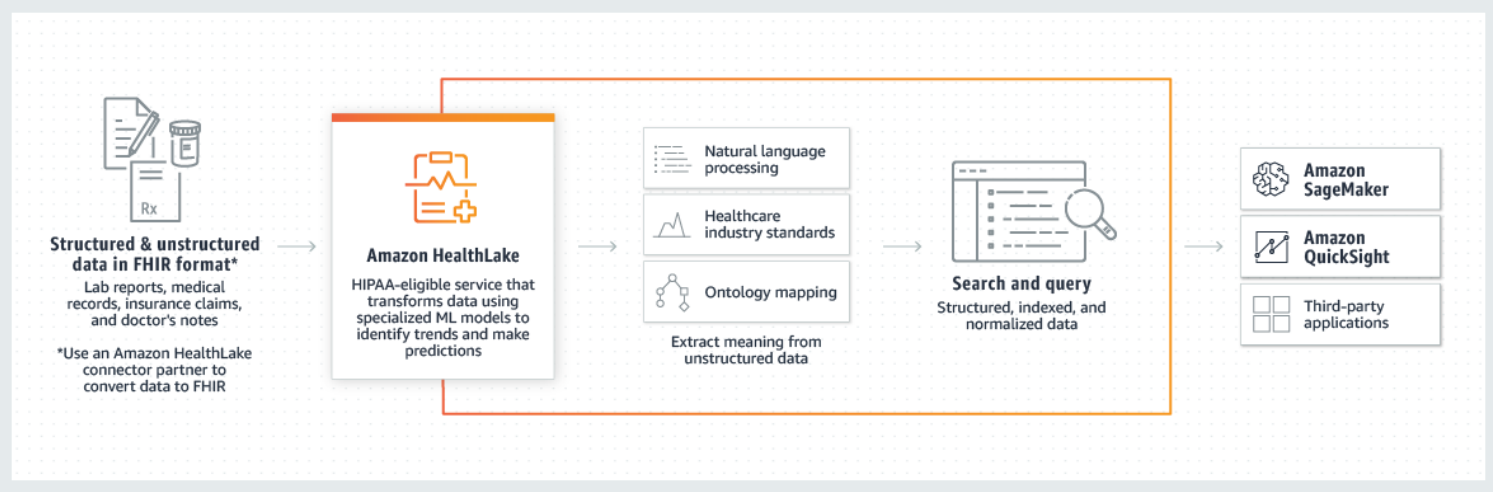
Tertiary analysis and ML solutions

Query and interpret genomic data to unlock new discoveries, fuel drug discovery, and improve patient care.

Clinical genomics solutions

Supporting innovation at the intersection of biology and technology.

HealthLake is a HIPAA-eligible cloud service for storing, transforming, and structuring health data for large-scale queries and machine learning models. Amazon is positioning HealthLake as a first stop for the development of precision medicine treatments.



Source: AWS

Theme 3: Connecting consumer tech for health

Halo, Alexa, and the Amazon ecosystem

Remote monitoring is growing in scale and scope

Kaiku Health partners with Roche to deploy digital cancer management tools

May 10, 2022 | mobihealthnews

Biofourmis nets FDA breakthrough label for digital heart failure treatment assistant

July 29, 2021 | FIERCE Biotech

Best Buy to acquire Current Health to help make home the center of health

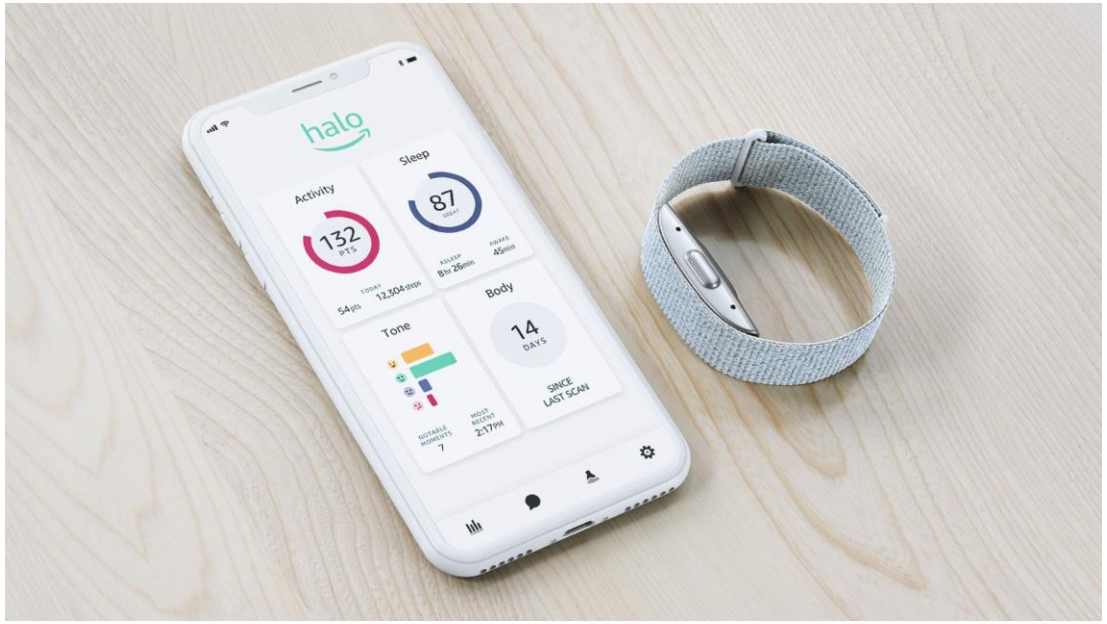
October 12, 2021 | BEST BUY

Building a health ecosystem for Halo

The Amazon Halo fitness tracker is Amazon's first health & wellness wearable.

Amazon has deployed a variety of partnerships and programs to encourage subscription.

Fitness and workout partners that are part of the Halo membership subscription can be integrated into Amazon Alexa skills and Echo devices.



Notable Halo partners:

Aaptiv
exhale
headspace
Lifesum
openfit
orangetheory
p.volve

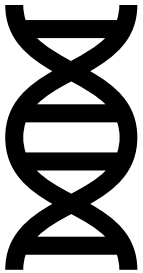
Source: Amazon

Amazon’s plans point to key trends for 2023

	Capturing the provider market	Expanding into precision medicine	Connecting consumer tech for health
Summary	Amazon is building out a hybrid primary care option. Supported by its other healthcare investments, it will offer self-insured employers a subscription-based integrated care network.	Through deployment of supporting tech stacks and targeted partnerships, Amazon is taking an active role in creating and applying precision medical tech.	With remote monitoring gaining steam among both consumer and clinical users, Amazon is trying to build out a wearable and home ecosystem for healthcare.
Implications	Amazon may have settled on a long-term healthcare strategy: subscription-based hybrid healthcare both for employers and as a Prime-style subscription.	Amazon wants to do more than run passive cloud infrastructure. Look for more partnerships and possibly acquisitions as it explores the space.	Expect new versions of Halo wearables with improved internals and software to arrive, along with integrations into the Echo/Alexa smart home ecosystem.

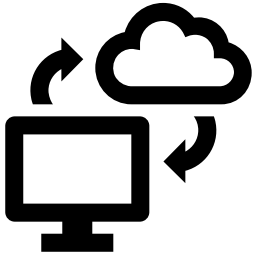
Google

Where Google is focusing



Building a life sciences brand

Through Google cloud infrastructure and Verily, Google wants its brands to be synonymous with advanced life sciences, pharma discovery, and precision medicine.



Creating a search engine for healthcare

Google is using its strengths in unstructured data analysis and as a search engine leader to build new search tools for providers, while embedding patient solutions like scheduling and cost estimates directly into search results.

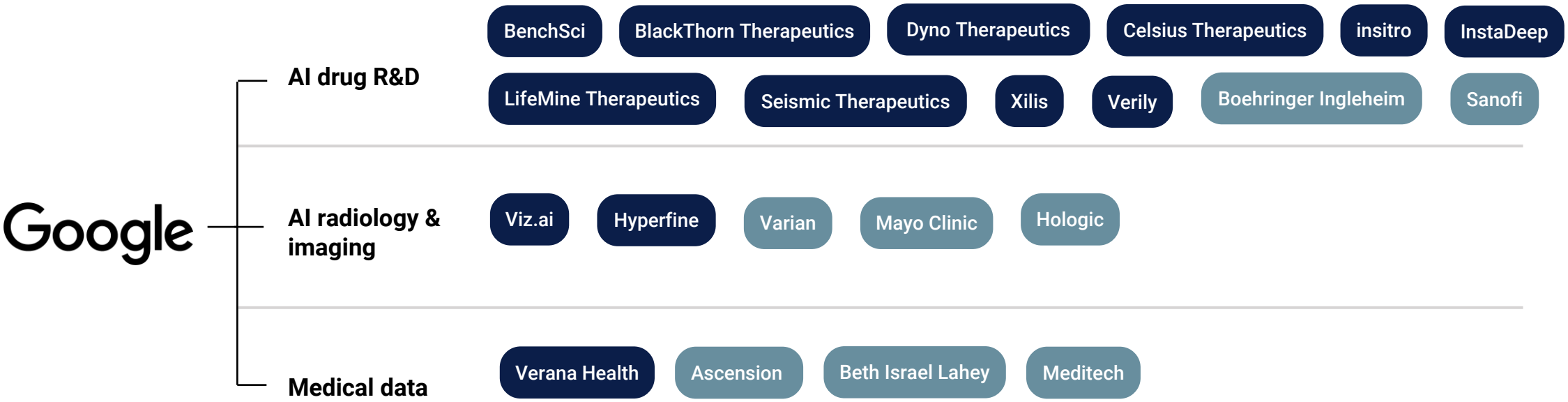
Finding a place in consumer wearables

With the Pixel Watch and a relaunch of Fitbit and Device Connect, Google hopes to capture a slice of the growing healthcare wearables and data market.

Google is targeting life sciences and data

2021 – 2022 (as of 9/30/2022)

● Investment ● Partnership



These designations are not exhaustive of Google's investment and partnership activity in the analyzed period.

Theme 1: Building a life sciences brand

Google, Verily, and the data economy

Building pharma, life science, and data ecosystems

AI drug discovery

insitro

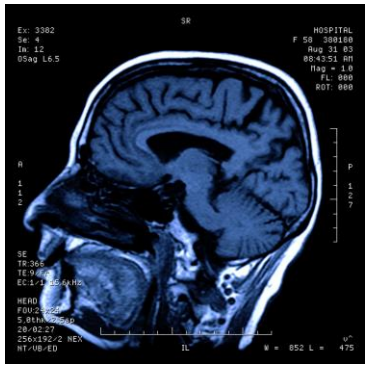
Relationship: Investment

Round backed: $400M Series C (3/15/2021)

About: insitro is an ML-powered drug discovery startup led by Calico's ex-chief computing officer Daphne Koller.

Radiology

varian



Relationship: Partnership (4//8/2021)

About: Google and Varian are co-developing computer vision solutions for radiology support, such as training algorithms on diagnostic images to automate radiotherapy planning.

Real-world data and evidence

Verana Health

Relationship: Investment

Round backed: $150M Series E (1/14/2022)

About: Verana Health aggregates and sells real-world data from anonymized patient health records, claims, and imaging.

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Source: insitro, Varian, FDA

Verily is flush with capital and looking to buy

After raising $700M in 2020 to expand its commercial reach and build out research programs, Alphabet subsidiary Verily raised another $1B in September 2022.

Verily plans to target precision health and medicine.

It also plans to spend money on partnerships and acquisitions. In 2021, it bought SignalPath to expand its Baseline clinical trial product.

Funding 6 Fundings / $3,500M

Date	Round	Amount	Investors	Valuation	Sources
9/29/2022	Corporate Minority - II		Swiss Re		1
9/9/2022	Unattributed	$1,000M	Alphabet, and Undisclosed Investors		9
12/17/2020	Private Equity - II	$700M	Alphabet, Silver Lake, and 2 more		7
1/3/2019	Private Equity	$1,000M	Ontario Teachers', and Silver Lake	▲$3,384.89M VentureSource Estimate	6
1/26/2017	Corporate Minority	$800M	Temasek	$1,637.19M VentureSource Estimate	6
1/1/2015	Spinoff / Spinout		X - The Moonshot Factory		3

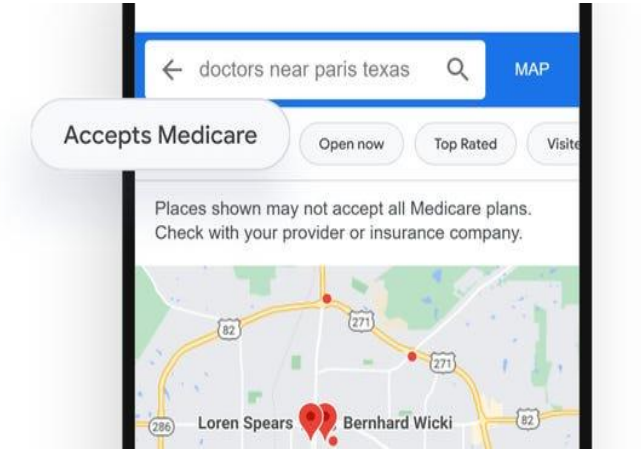
Verily has raised $3.5B in disclosed funding since 2017.

Theme 2: Creating a search engine for healthcare

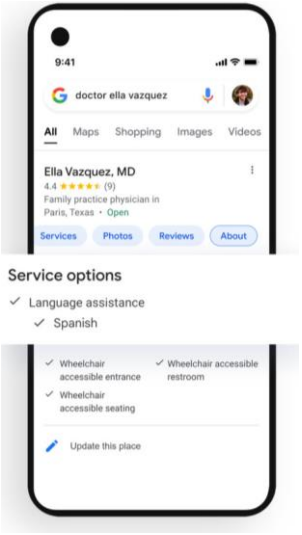
Search tools, language processing, and scheduling

Google is helping patients access providers

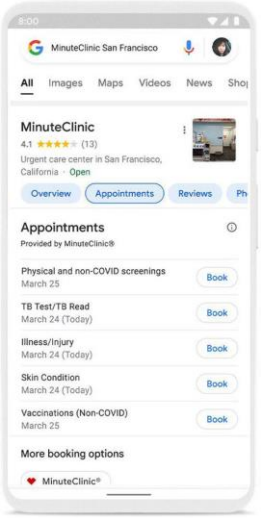
Google is already the most popular source for searching for a provider or hospital. It isn't stopping there.



Google searches show which insurance a provider accepts.



Providers can include languages they practice in.



Through Reserve with Google, searches show available appointment dates and times and allow patients to schedule.

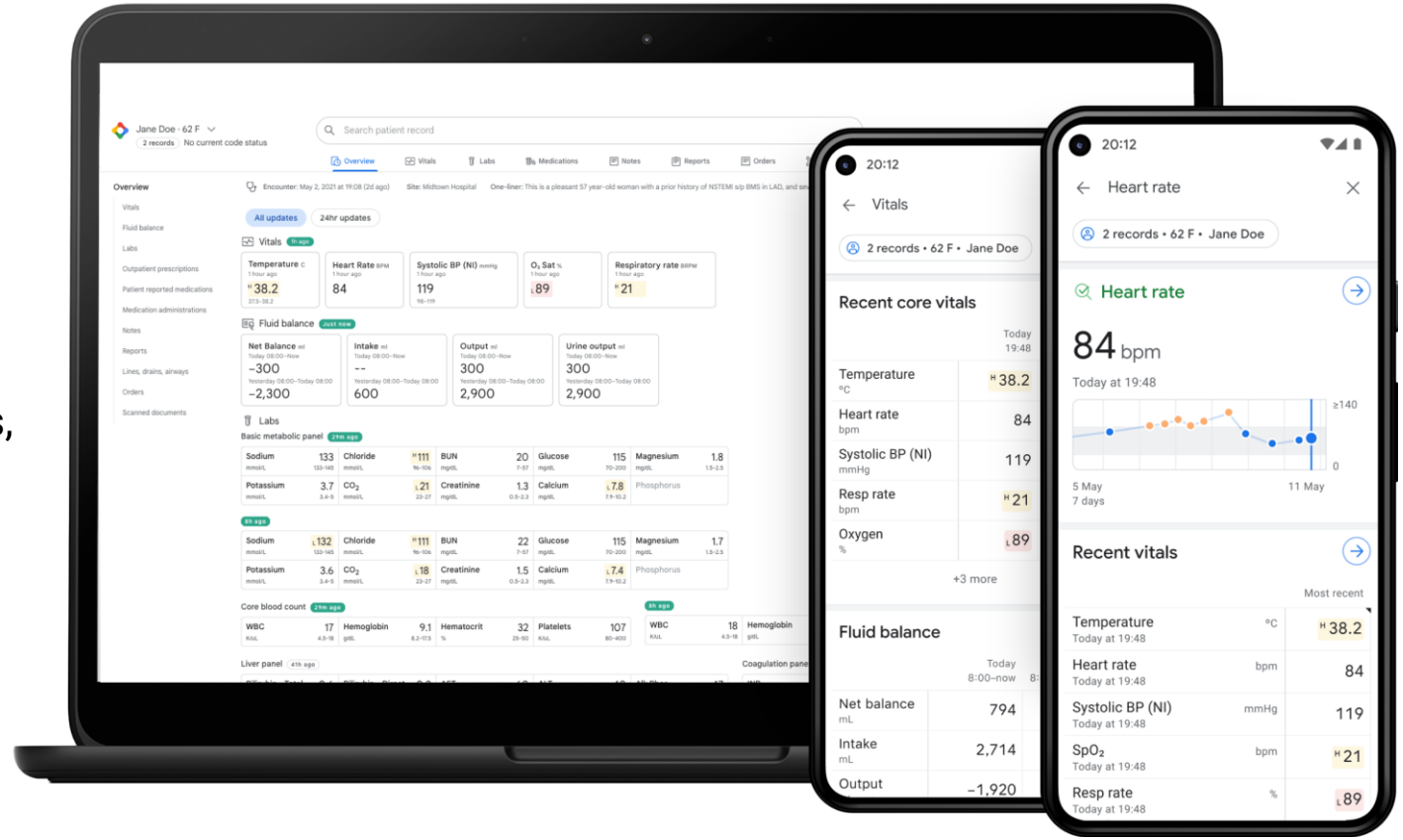
Source: Google

Care Studio is slowly coming together

Care Studio allows providers to search for and display health record data. By leveraging strengths in data analysis and presentation, Google is hoping to transform how providers access and manage patient data.

The clinical search tool saw its first EHR integration in March 2022. Recent updates allow for the use of natural language processing to address multiple terminologies, typos, abbreviations, and external unstructured data.

In the near future, Google will likely notch more EHR partnerships and could look to integrate its own deidentified datasets into deployments.



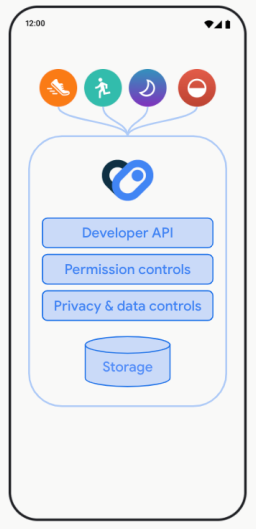
Source: Google

Theme 3: Finding a place in consumer wearables

Building a new market for Fitbit Health

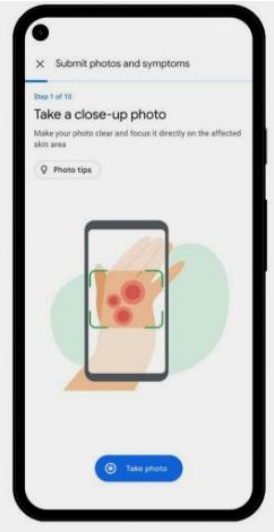
From Android OS…

Apps and APIs for fitness, wellness, and healthcare for more than 2B Android users



Health Connect
Provides a common set of APIs for fitness and health data

Google Health Studies
Allows self-enrollment and participation in medical research



DermAssist
Identifies and answers questions about skin conditions through AI analysis of submitted photos

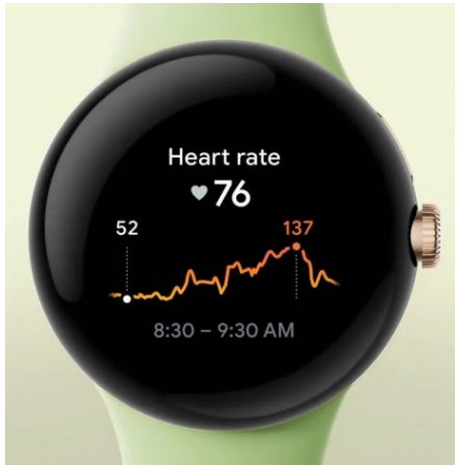
…to Fitbit and Google Pixel Watch…

The Pixel Watch and Device Connect for Fitbit are the first steps to an Apple Watch-style clinical ecosystem

The Pixel Watch uses Fitbit health and tracking software. It lacks a temperature sensor but tracks heart rate, pulse O2, ECG, movement, and sleep. With pre-built enrollment, dashboards, data connection, and modeling tools, Device Connect enables the Fitbit Web API to collect, store, and share user data.

Google foresees uses for the Watch and collected data in the pre- and post-operative spaces, along with chronic disease management, population health, and clinical research.

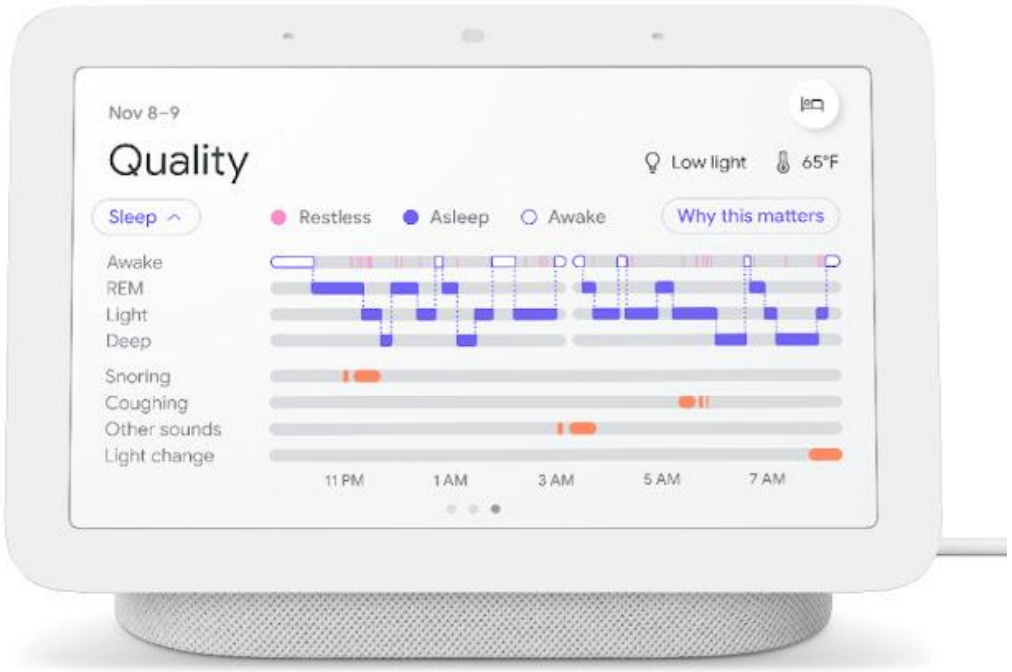
Google is accelerating plans for FDA-approved algorithms. A PPG Afib detection algorithm was approved in April 2022.



Source: Google, The Keyword

...to Nest

New healthcare functions and potential integrations for the smart home



Google launched sleep sensing through the Nest Hub, its smart home controller, in 2021. Low-energy radar detects granular motion, while microphones and other sensors detect snoring, coughing, ambient light, and other factors.

Camera upgrades can enable pulse monitoring and respiratory tracking. Mount Sinai Health System has already piloted the use of Nest devices for patient monitoring.

Ambient monitoring is a growing field in the remote monitoring market, and smart home devices are well-placed to take advantage of it.

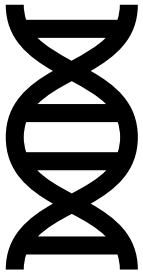
Source: Google

Google’s plans point to key trends for 2023

	Building a life sciences brand	Creating a search engine for healthcare	Finding a place in consumer wearables
Summary	Through partnerships and investments, Google is finding ways to build the datasets and software functions needed to provide a leading cloud platform for life sciences and precision medicine.	Google is using its existing strengths to move into unexpected spaces in provider healthcare, including by integrating patient tools directly into its search engine results.	Google doesn’t lead in wearables or home electronics, but Android is a firm leader in the smartphone OS space. Google is looking to grow its share of the monitoring market by developing new device integrations and Android toolkits.
Implications	With no shortage of funds, Verily will continue to buy, build, and partner. Developing a deep real-world dataset will be key to the rest of its product goals.	Google can maintain a firm hold on provider scheduling by leveraging its existing business relationship tools. Expect it to seek out new partners for Care Studio.	New Android-specific apps and device improvements could grab attention in the clinical monitoring space. Google will also continue building healthcare integrations into its Nest Hub to stand out in the smart home market.

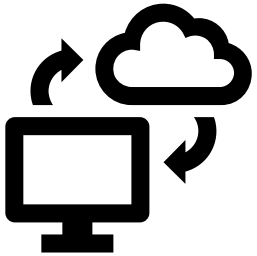
Microsoft

Where Microsoft is focusing



Courting enterprise software developers

Microsoft Cloud for Healthcare could become the leading enterprise IT design environment for provider-focused software.



Developing Azure's data and AI capabilities

Microsoft sees its greatest opportunity in owning, collecting, and selling healthcare data. The potential for significant network effects is driving its plans for Azure.

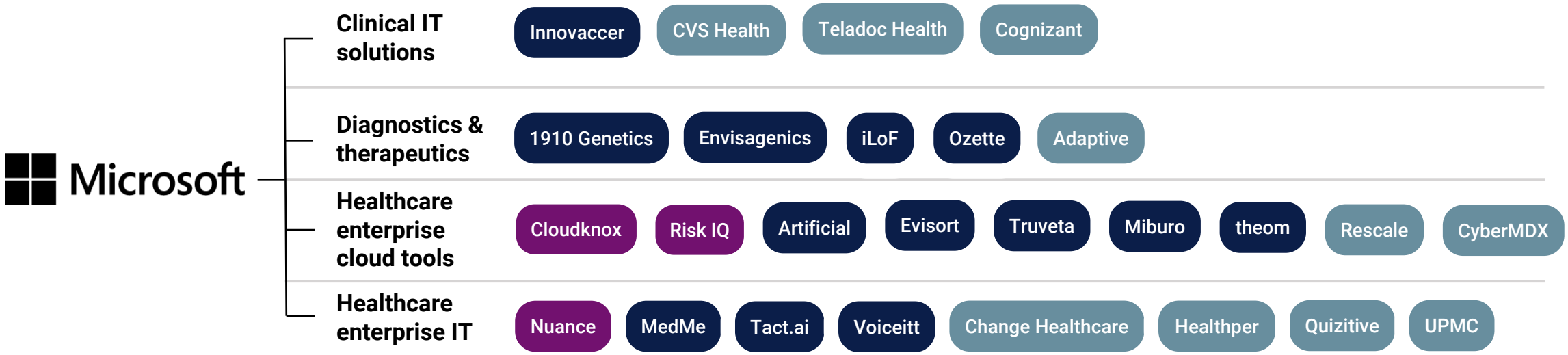
Doubling down on security and privacy

Protecting healthcare organizations and data is essential to building trust and maintaining relationships. Microsoft is investing heavily in trying to protect its customers.

Microsoft prioritizes provider development tools

2020 – 2022 (as of 9/30/2022)

Acquisition Investment Partnership



These designations are not exhaustive of Microsoft's investment and partnership activity in the analyzed period.

Theme 1: Courting enterprise software developers

Microsoft is developing for developers

Building tools for healthcare IT

Patient/consumer engagement

tact.ai

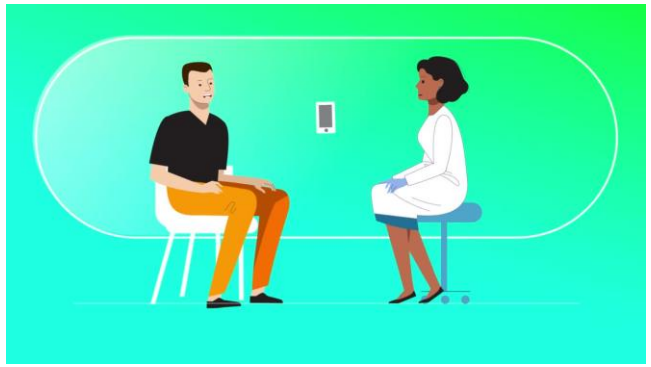
Relationship: Investment

Round backed: $33M Series E (9/20/2021)

About Tact.ai delivers consumer outreach and engagement using Microsoft Teams and Azure AI segmentation and profiling tools.

Voice analytics and APIs

NUANCE



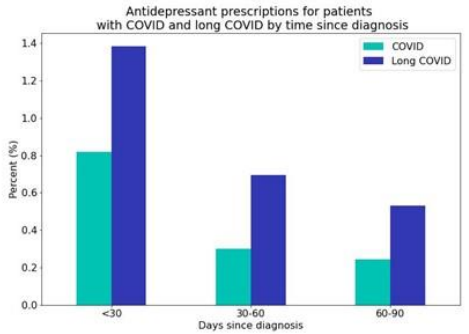
Relationship: Acquisition (3/4/2022)

Amount: $19.7B

About: Microsoft's blockbuster Nuance acquisition gives it real-time voice analysis and interface platforms, including automated documentation and APIs.

Real-world data and evidence

TRUVETA



Relationship: Investment

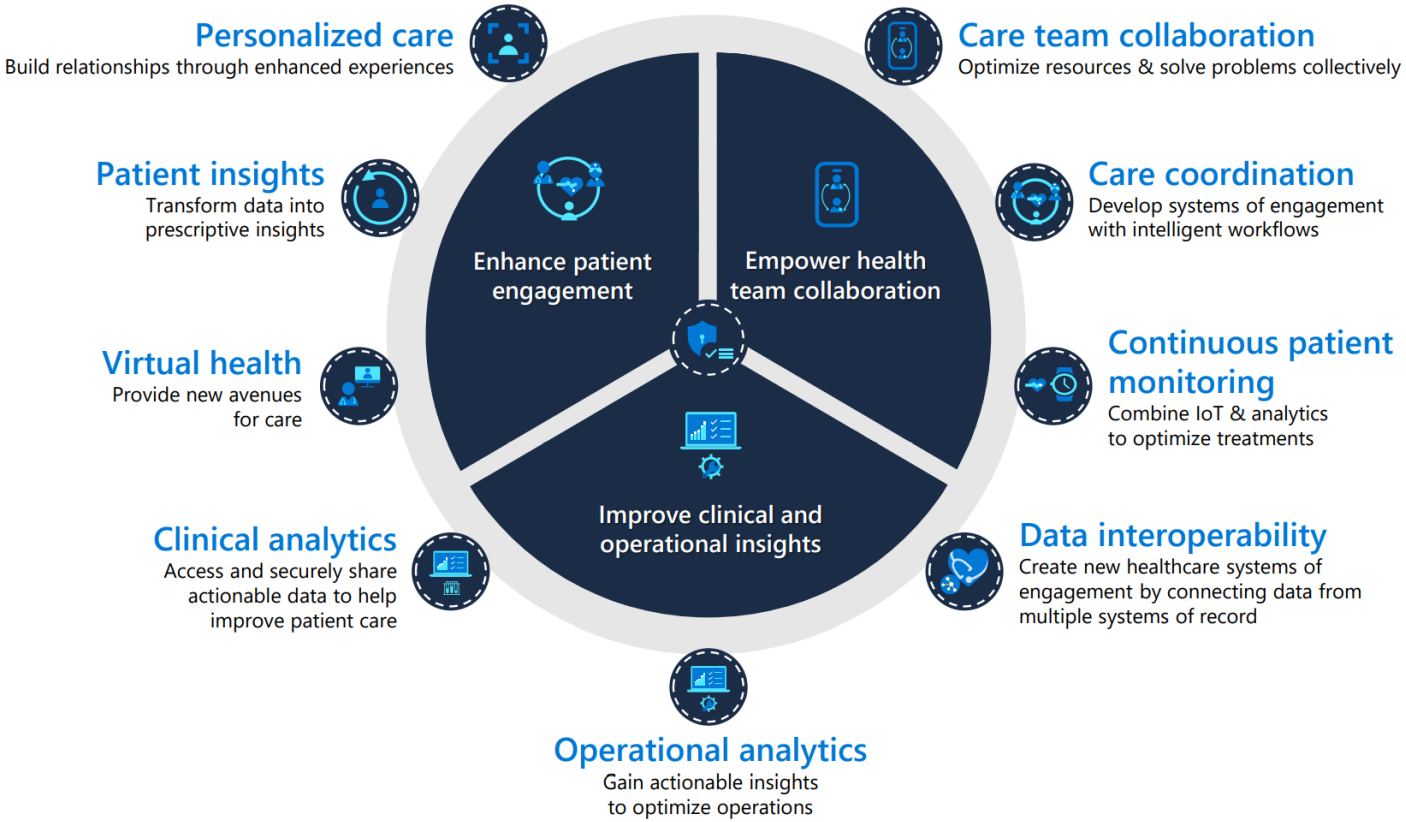
Round: Corporate minority (9/29/2021)

About: Truveta offers a provider-led data platform for de-identified patient records. It's now integrated into Cloud for Healthcare.

CBINSIGHTS

Source: Tact.ai, Nuance, Truveta

Expanding Cloud for Healthcare's offerings



With enterprise innovation tools pre-built for healthcare, as well as HIPAA-compliant features and healthcare data connectors, Microsoft is building a comprehensive software development platform for healthcare IT.

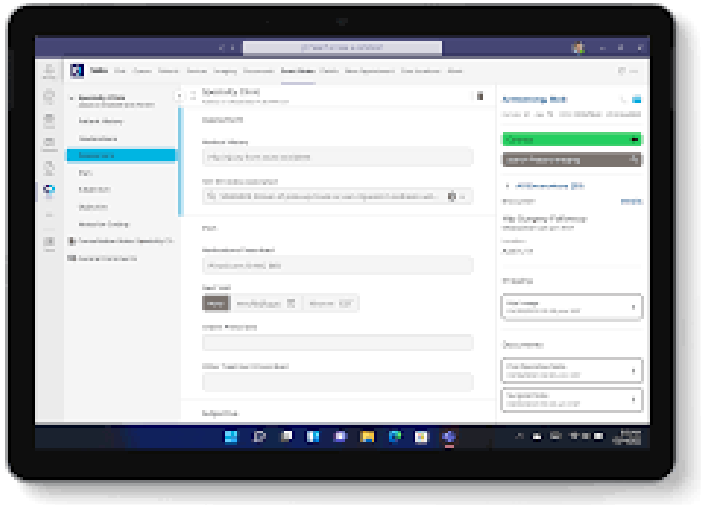
Cloud for Healthcare tools include:

- Azure
- Azure AI & machine learning
- Synapse analytics
- Healthcare APIs
- Azure IoT
- High-performance compute
- Dynamics 365
- Office 365
- Teams
- Power Platform

Source: Microsoft

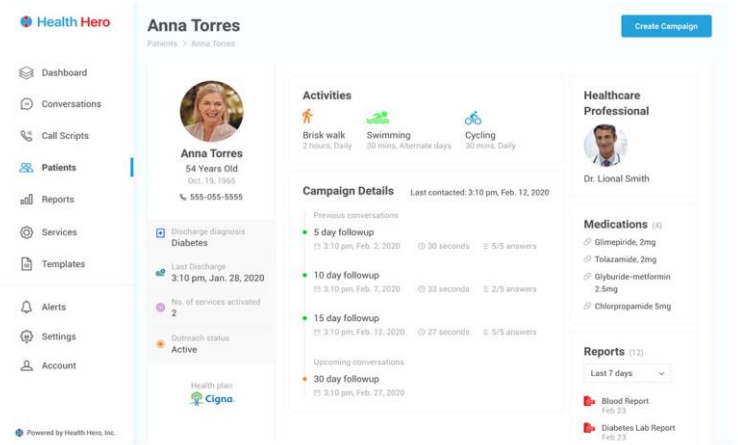
Integrating tools and partners

Companies like Teladoc, Change Healthcare, and Health Hero have launched products using Microsoft Cloud for Healthcare



Teladoc Solo through Microsoft Teams

Change Healthcare's Connected Consumer Health suite



Health Hero for Dynamics 365

HoloLens 2 for healthcare

By experimenting with AR/VR, Microsoft hopes to solve challenges in surgical training

AR/VR in healthcare is still in the hype stage.

With its HoloLens VR headset, partnerships, and pilots, Microsoft is hoping to build a case and make its platform the standard.

Microsoft's VR partners include:

NHS Alder Hey Children's NHS Foundation Trust

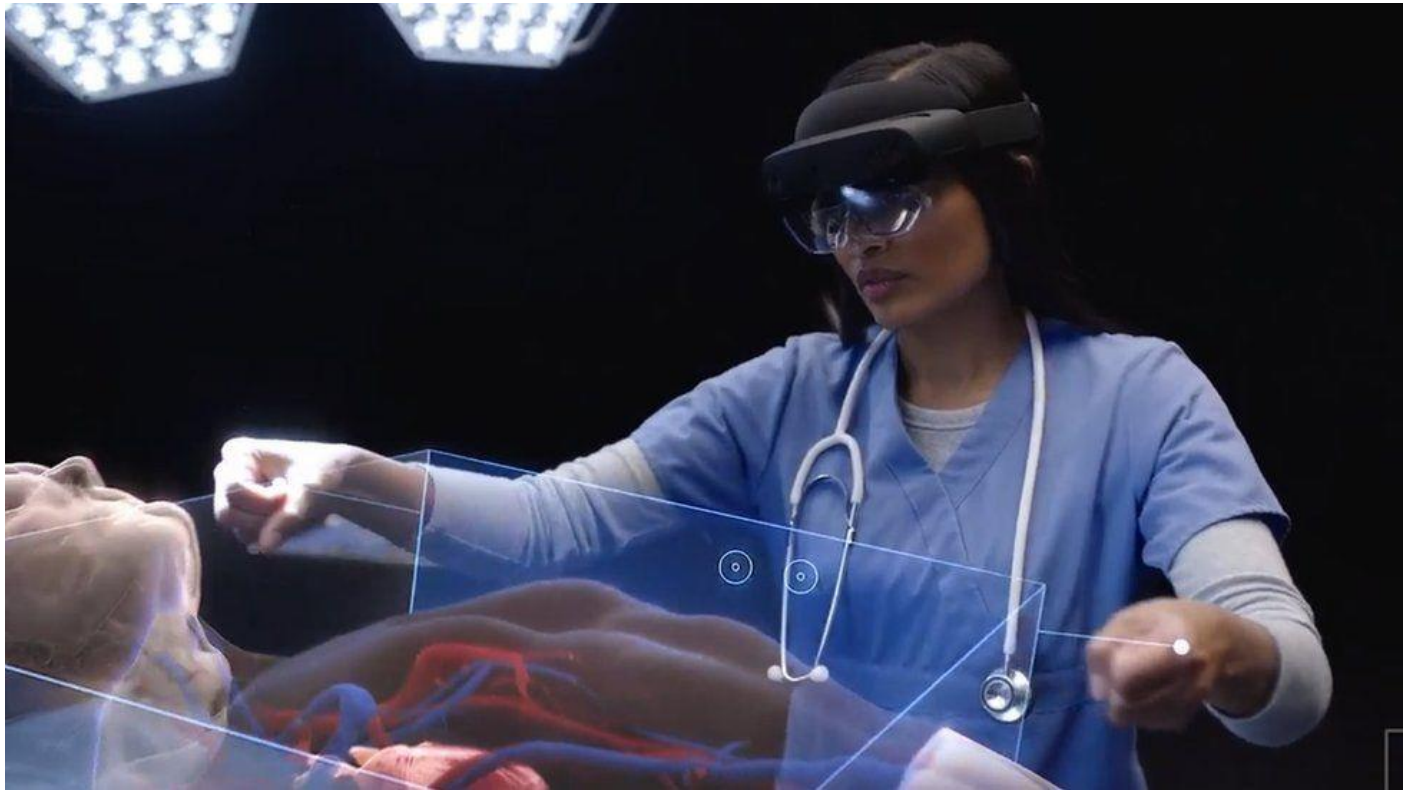
CAE

CHRU HÔPITAUX DE TOURS

NHS Imperial College Healthcare NHS Trust

medlab

Mount Sinai



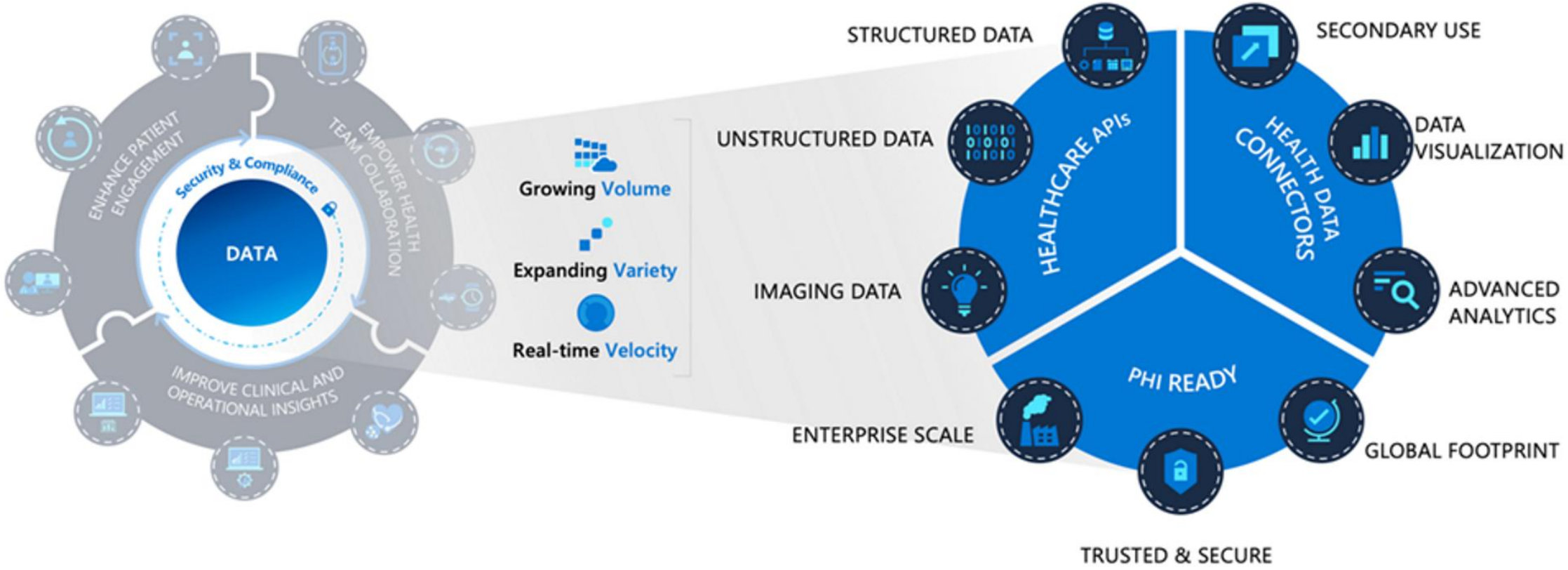
Source: BBC

Theme 2: Developing Azure's data and AI capabilities

Making Azure a hub for provider activity

Optimizing Azure for incoming data

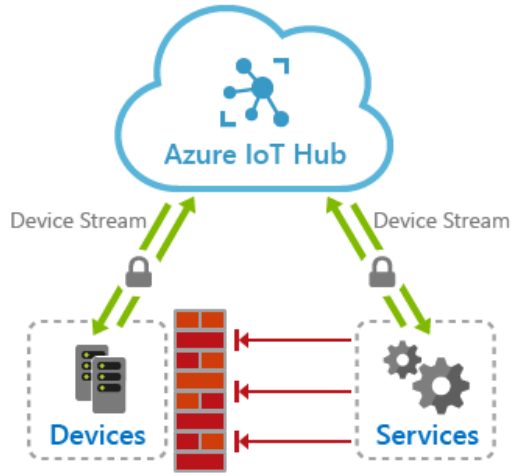
APIs, data connectors, and data transformation tools act as the foundation for Microsoft and independent developers to build on



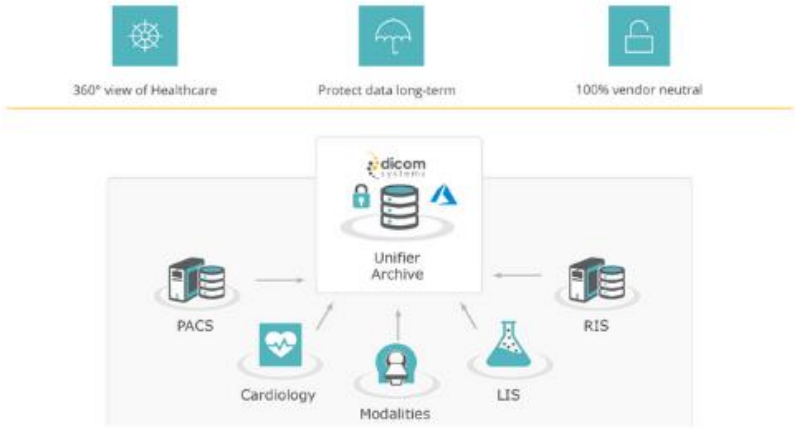
Source: Microsoft

Azure services for healthcare

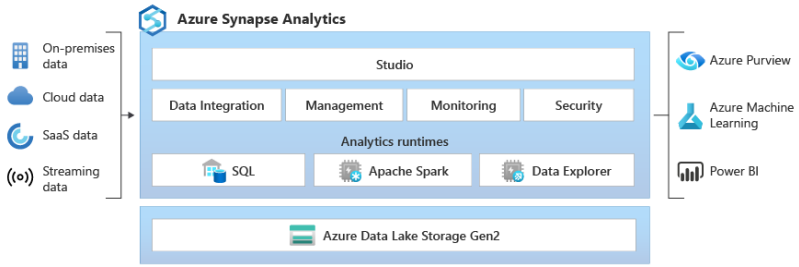
Azure incentivizes provider use and data storage by offering more than 180 services in a HIPAA- & GDPR-compliant, HITRUST- and MARS-E-certified platform



Azure IoT for remote monitoring



Medical imaging server for DICOM image formats

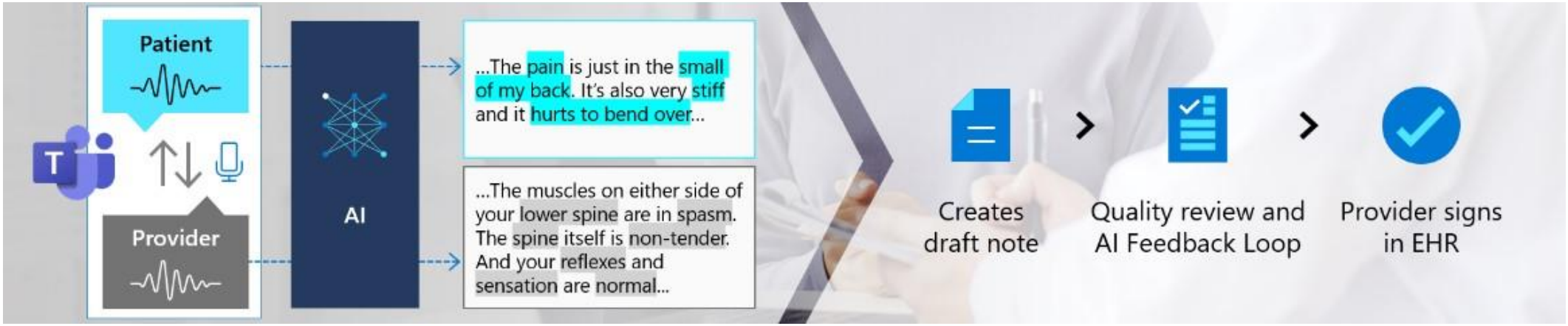


Azure Synapse Analytics

Source: Microsoft

Azure-native provider support tools

With its $19.7B acquisition of Nuance in March 2022, Microsoft gained an innovative solution for providers



Nuance's Dragon Ambient eXperience (DAX) is an ambient tool for provider workflow. A conversational encounter can be documented, added to structured notes and data fields, and used to create orders.

An AI/ML feedback loop runs for both organizations and individual providers, checking for accuracy, omissions, and appropriateness.

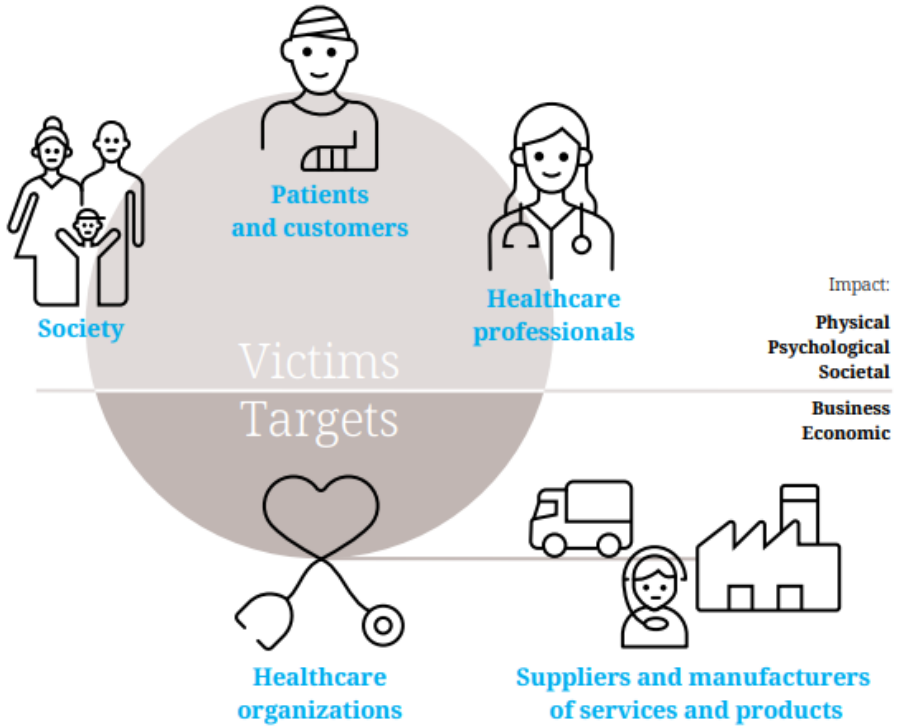
Source: Microsoft

Theme 3: Doubling down on security and privacy

Cybersecurity and AI transparency

Security and privacy threats are growing

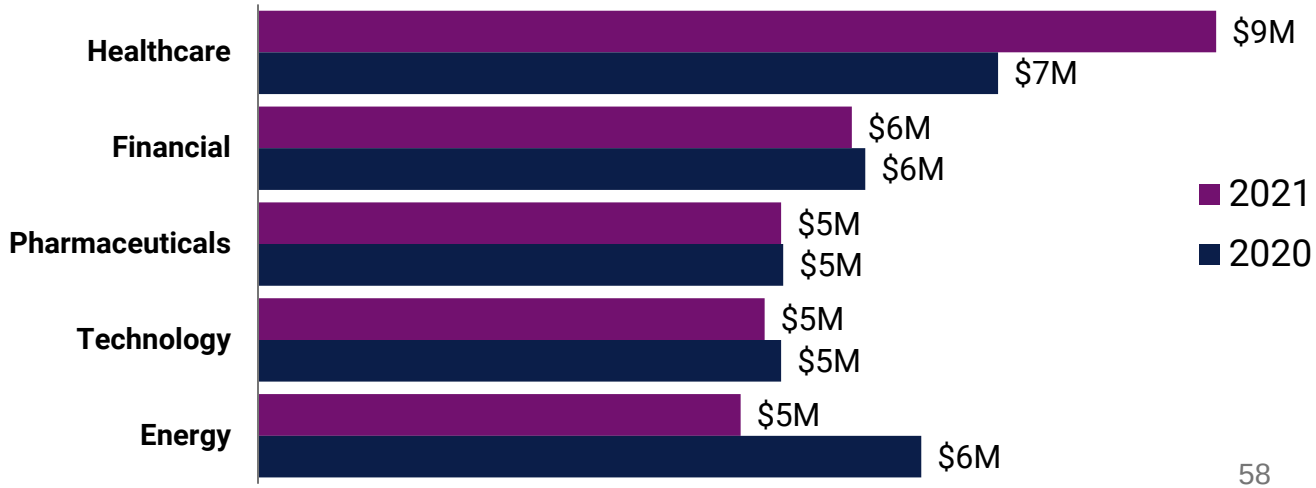
Ransomware and other attacks, which are becoming more frequent, can lead to extreme costs for healthcare stakeholders



"All of our cathlabs except for one are down and our sister hospital has no cathlabs. They are transferring patients to our facility. No anesthesia services. It took out the outpatient offices as well. I'm here trying to figure out how to find out what's going on with my patients."

— Anonymous, in the immediate aftermath of a ransomware attack on Universal Health Services in September 2020

Average total cost of a data breach by industry



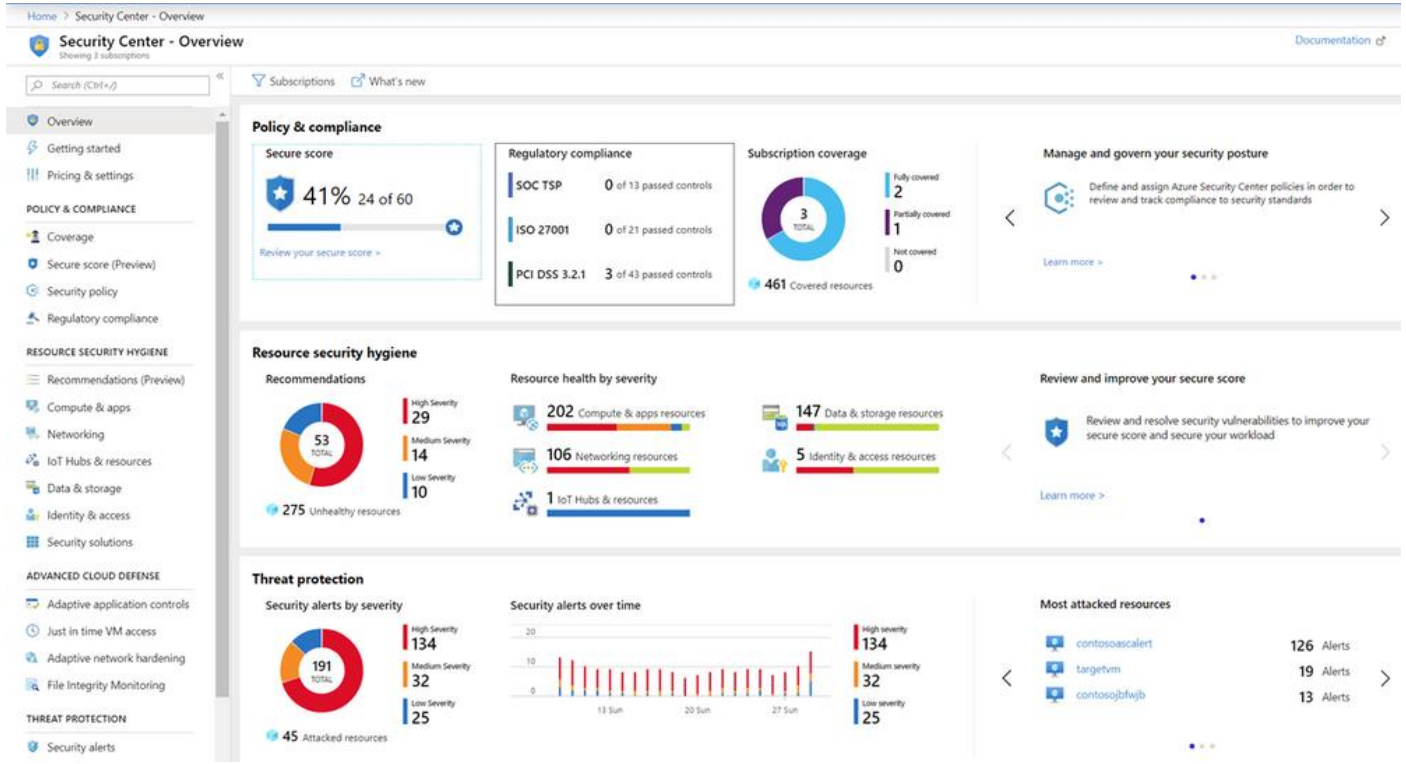
Source: Microsoft, IBM Security

Azure offers defense-in-depth

Cooperation and layered protections provide better security and reduce the risk of intrusion and abuse

Microsoft's security strategy and investment portfolio are rooted in "defense-in-depth" — multiple layers of protection across multi-factor authentication, firewalls, encryption, and more.

Ensuring that security policies are consistent within an organization is key to protection. Since most organizations have a multi-cloud strategy, Microsoft has extended its Cloud Security Posture Management and Cloud Workload Protection capabilities to AWS.



Azure Security Center dashboards help manage policies, identify bad configurations, and provide recommendations and automation to address vulnerabilities.

Source: Microsoft

Microsoft is investing heavily in protection

Microsoft uses acquisitions to bolster its cybersecurity segment, which generated $15B in revenue in 2021

Threat detection

MIBURO

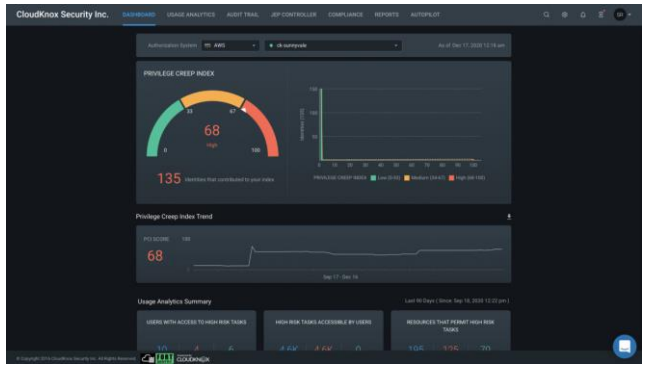
Relationship: Acquisition (06/14/2022)

Amount: Undisclosed

About Miburo provides threat detection and analysis across foreign actors and information operations.

Identity and access management

CLOUDKNOX



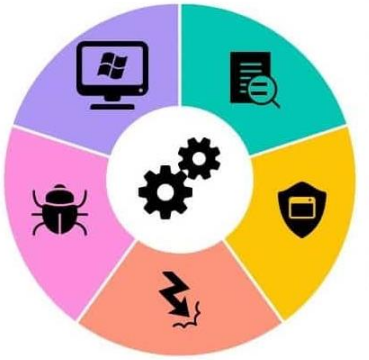
Relationship: Acquisition (07/22/2021)

Amount: Undisclosed

About: CloudKnox's platform manages organizational identity privileges across multiple cloud environments.

Risk assessment and management

RISKIQ



Relationship: Acquisition (7/11/2021)

Amount: $500M

About: RiskIQ offers cloud-based software to detect and respond to online security threats like phishing, malware, and fraud.

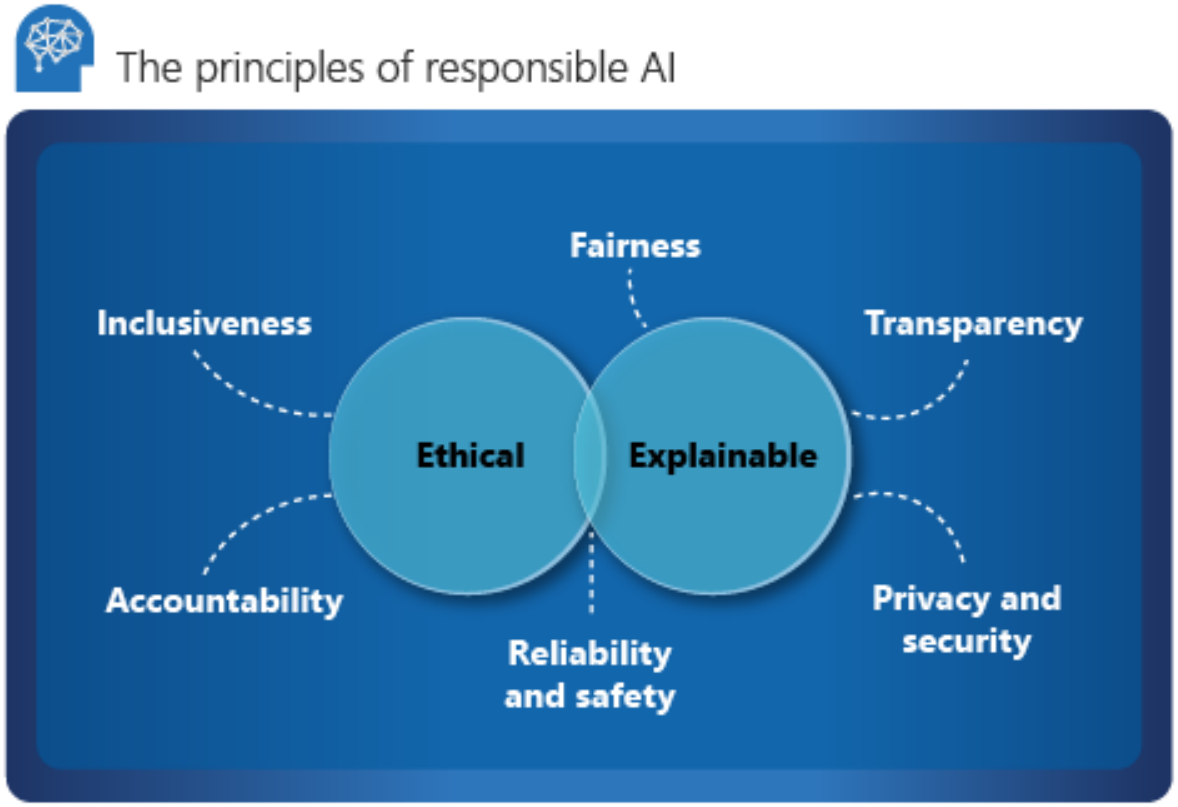
Source: Microsoft, CloudKnox, RiskIQ

Microsoft tackles AI/ML transparency and bias

Transparency is likely to become a requirement for patient-facing AI in software-as-a-medical-device uses, while bias is a threat to healthcare algorithms' broad use and adoption

In June 2022, Microsoft issued its Responsible AI Standard v2 to guide its internal development strategy and drive the larger conversation on AI. The Microsoft AI standard includes:

- Transparency goals to design AI systems that support stakeholder needs for system behavior intelligibility
- Fairness goals to identify demographic groups at risk of inferior care from potentially flawed algorithms or those trained on flawed data
- Requirements for AI systems to allocate resources toward minimizing disparities in outcomes for identified demographic groups



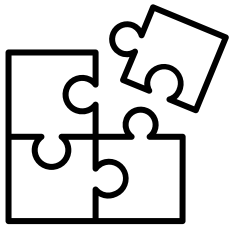
Source: Microsoft

Microsoft’s plans point to key trends for 2023

	Courting enterprise software developers	Developing Azure’s data and AI capabilities	Doubling down on security and privacy
Summary	Microsoft is targeting independent software vendors with its Cloud for Healthcare. As the product becomes more central to healthcare IT development, Microsoft’s customer base and datasets will grow.	With its focus on the provider market, Microsoft is building out its ability to deliver real-time data analysis and emergent reporting.	Microsoft is dedicated to bolstering its cybersecurity portfolio, which is essential to its cloud data role. Microsoft is taking a defense-in-depth approach.
Implications	Microsoft will continue to add provider-focused tools and functionalities, especially if they can be leveraged by third-party healthcare applications via APIs.	Native AI/ML tools that leverage Azure datasets will continue to be a priority. While practice acquisitions like One Medical or Signify Health are unlikely, massively depressed telehealth stocks may be appealing targets for Microsoft to build out Cloud for Healthcare functions.	Microsoft will continue to invest heavily in security startups. With the growing RPM market, device and edge security could be upcoming areas of focus.

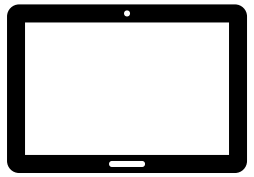
Apple

Where Apple is focusing



Centralizing health data

Apple is using its devices to create a central repository for health data that will attract patients, vendors, and developers alike.



Combining clinical & consumer needs

Apple wants its consumer electronics devices to double as mainline clinical tools for both patients and providers.

Theme 1: Centralizing health data

Placing Health at the center of healthcare data

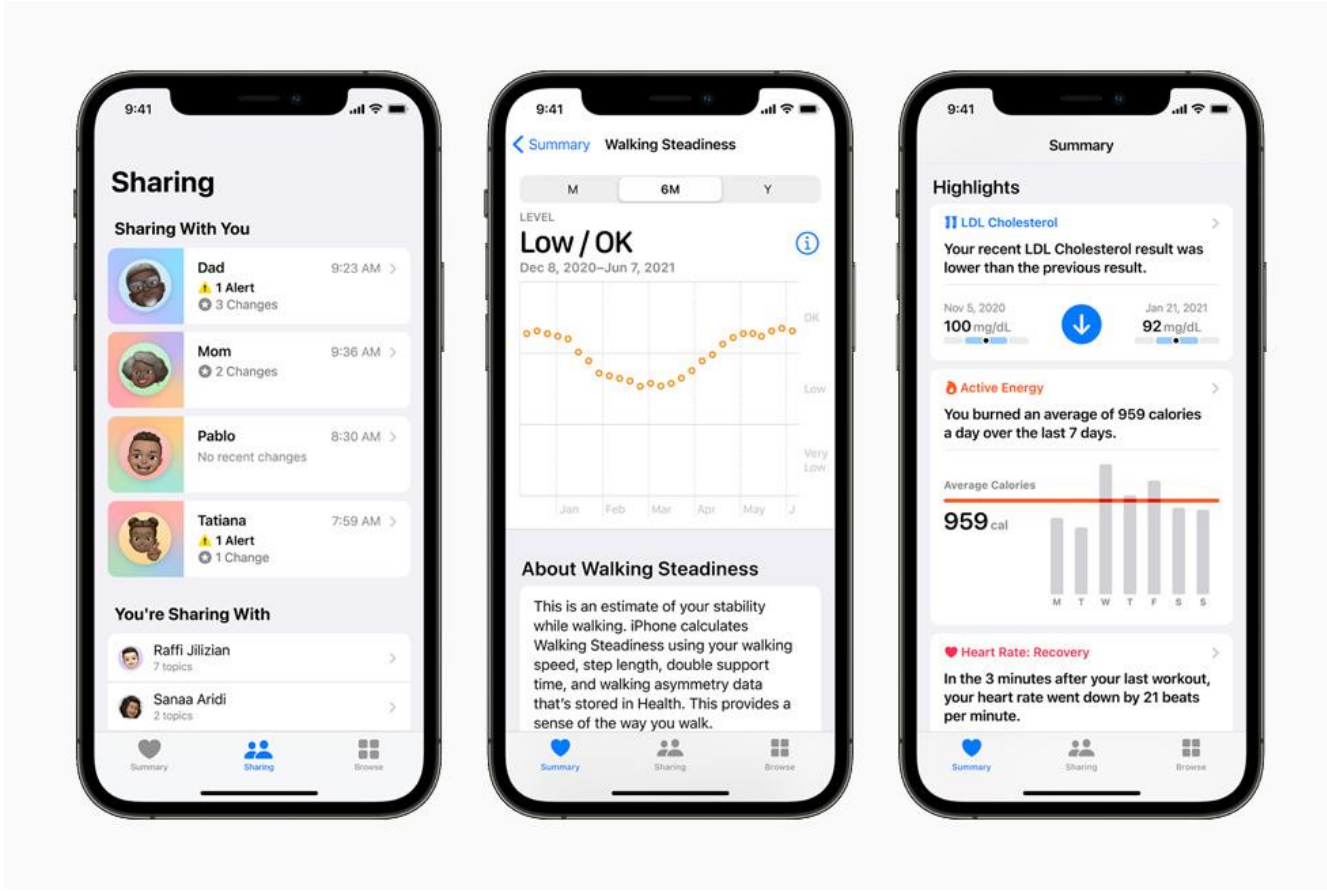
The Health app

Apple's one-stop solution for consumer health, offering fitness reporting, wearables integration, health records storage, and health sharing

The Health app aggregates EHR records from hospitals in the US, UK, and Canada.

It acts as a central portal for health and wellness data from other wearables and apps that connect to it via HealthKit APIs.

Meanwhile, third-party developers can use CareKit API integrations to build apps and tools for users to manage and track their health.



Source: Apple

51 features and counting

Apple is continuing to add tracking measures and new categories to its Health app offering

ACTIVITY
- Activity rings
- Activity coaching
- Workout tracking with validated metrics
- Activity sharing
- Activity competitions
- Fitness+
- Fitness app on iPhone

HEART HEALTH
- High/low heart rate notifications
- Resting, walking, and post-workout heart rate
- Heart rate variability
- ECG app
- Irregular rhythm notifications
- Cardio Fitness
- Cardio Recovery
- AFib History

MINDFULNESS
- Mindfulness app
- Meditation in Fitness+
- Focus

EDUCATION
- Articles in the Health app
- Mobility exercises in the Health app and Fitness+

COVID-19 RELATED
- Exposure notifications
- Verifiable COVID-19 vaccination and test result records

HANDWASHING
- Automatic handwashing detection and reminders

SAFETY
- Emergency SOS
- Medical ID
- Crash Detection

SLEEP
- Wind Down
- Sleep tracking
- Sleep stages

RESPIRATORY
- Respiratory rate during sleep
- Blood Oxygen

MOBILITY
- Fall Detection
- Walking Steadiness and notifications
- Mobility metrics like double support time, step length, six-minute walk, and more

HEARING HEALTH
- Headphone audio levels and notifications
- Noise app and notifications
- Environmental sound reduction by AirPods Pro
- Adaptive Transparency on AirPods Pro 2nd Generation

WOMEN'S HEALTH
- Cycle Tracking
- Period prediction and fertile window prediction
- Symptom tracking
- Cycle factors
- Workouts for Pregnancy and Get Back to Fitness After Having a Baby Fitness+ programs
- Retrospective Ovulation Estimates
- Cycle Deviations
- Cycle Detail view and PDF

MEDICATIONS
- Set up a medications schedule and reminders
- Medications education and alerts for potential critical interactions

RESEARCH
- Research app, including Apple Women's Health Study, Apple Heart and Movement Study, Apple Hearing Study
- ResearchKit
- CareKit

Source: Apple

Study and research integrations

The Research app is enabling self-enrollment in clinical and academic studies

Apple Heart and Movement Study

A collaboration with the American Heart Association and Brigham and Women's Hospital

Apple Women's Health Study

A collaboration with the National Institute of Environmental Health Sciences and the Harvard T.H. Chan School of Public Health

Apple Hearing Study

A collaboration with the University of Michigan and World Health Organization

Source: Apple

Theme 2: Combining clinical & consumer needs

Apple’s health device ecosystem

Apple is positioning itself as a leader in consumer health wearables

With new features like fall detection, heart rate monitoring, and ECG sensing, the Apple Watch can function as a stand-alone monitoring device or as part of Apple's broader device ecosystem. Apple Watch 8 adds skin temperature sensors and crash detection.

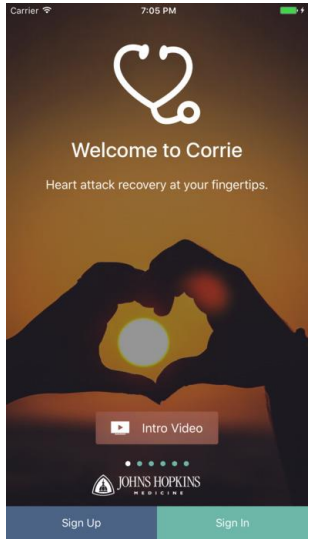
Meanwhile, the Health app and Fitness+ subscription link to iPhones and iPads.

With FDA changes enabling over-the-counter hearing aid purchases, Apple could market AirPods as hearing aids. The Apple Watch Noise app monitors ambient sound levels and can adjust headphone audio or manage active sound reduction. Edge processing on AirPods can reduce sudden noise exposure.

Source: Ars Technica

An Apple a day for providers, too

Apple is creating new features for providers and enabling third-party developers to do the same



HealthKit and CareKit are being used to create home care and patient management tools

Corrie Health is a cardiac recovery app that uses smart watch sensors and a connected blood pressure cuff

Access to sensors and software is enabling novel portable devices

Butterfly IQ+ is a portable ultrasound device that processes imaging directly on a smartphone or tablet

Connected devices can be used for real-time alerts and recommendations

Triton AI uses the iPhone infrared camera and edge AI frameworks to estimate surgical blood loss in real time

Source: Apple

Subsidy partnerships are expanding the user base

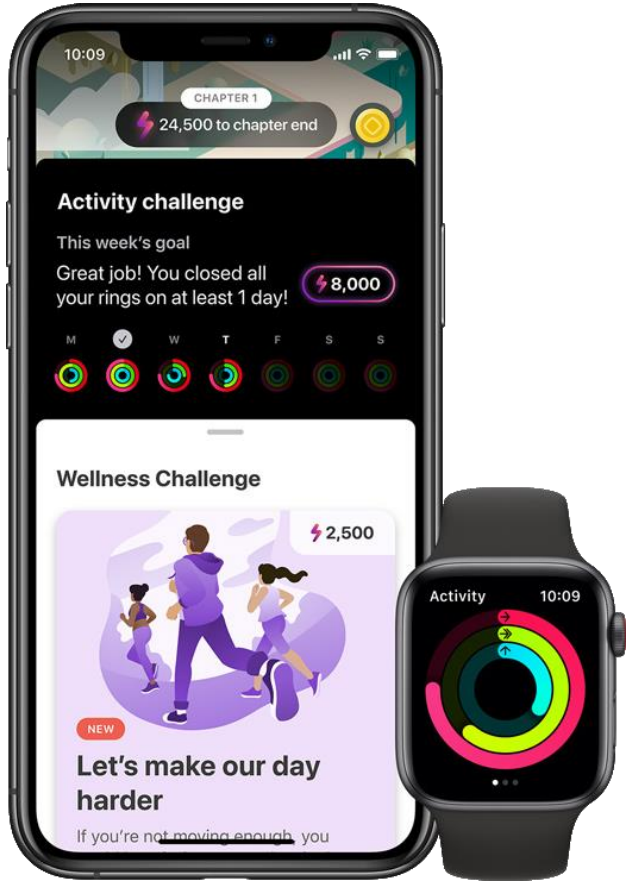
Payer and employer incentive programs are offering free or discounted Apple Watches and Fitness+ subscriptions

Healthcare organizations, fitness companies, and health insurers are using Apple Watches as incentives to foster healthier behavior.

Apple Watch Connected, for instance, is specifically targeted at gyms and fitness centers.

Insurers like Aetna, UnitedHealthcare, and John Hancock provide free or discounted Apple Watches to improve their members' long-term health.

Apple Watch is becoming an increasingly important driver of revenue and a key buy-in for Apple's broader device ecosystem.



Source: Apple

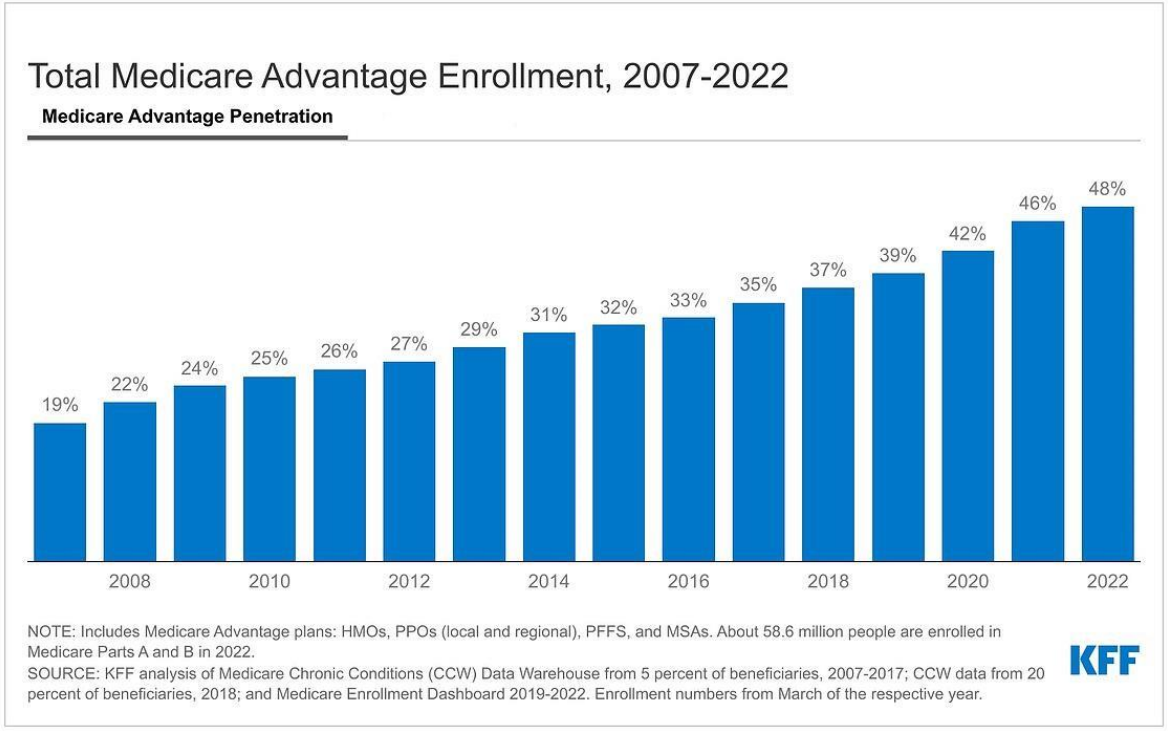
Medicare Advantage is a natural growth point

With Medicare Advantage (MA) poised to cover the majority of Medicare beneficiaries before 2025, fitness and health tools will be essential to drive plan adoption

Medicare Advantage plans give insurers the opportunity to add additional offerings, features, and devices to encourage beneficiaries to choose their plan.

Devoted Health was the first insurer to provide subsidized Apple Watches to a Medicare Advantage plan. Several Medicare Advantage plans are said to be considering similar subsidies.

Proving long-term health benefits and related cost savings would make the combination of Medicare Advantage and the Apple Health ecosystem a natural fit for a rapidly growing demographic.



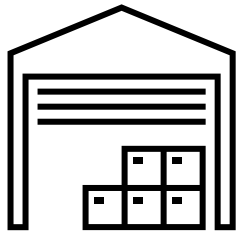
Source: Kaiser Family Foundation

Apple’s plans point to key trends for 2023

	Centralizing health data	Combining clinical & consumer needs
Summary	The Health app, combined with iPhone and Apple Watch functions, aims to bring in and retain users by catering to their daily health and wellness needs.	Apple is attempting to cross the gap between consumer demand and clinical needs. Combining patient- and provider-facing solutions could help drive institutions to purchase devices.
Implications	As other big tech players enter this space, Apple will be forced to move more quickly to protect market share — likely by lowering price points and advancing technology across new models.	Improved edge AI tools and processing will help push innovation and drive adoption. Expect Apple to notch partnerships and incentive agreements with payers, especially focused on the Medicare Advantage segment.

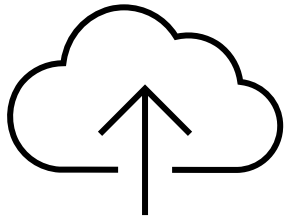
Oracle

Where Oracle is focusing



Centralizing Cerner

Oracle is working to pull back from Cerner's highly modular approach and previous partnerships to better integrate its own offerings.



Building cloud presence & market share

Oracle is determined to become a major healthcare cloud player with storage, AI/ML functionality, and integrated software.

Theme 1: Centralizing Cerner

Bringing Cerner into the Oracle ecosystem

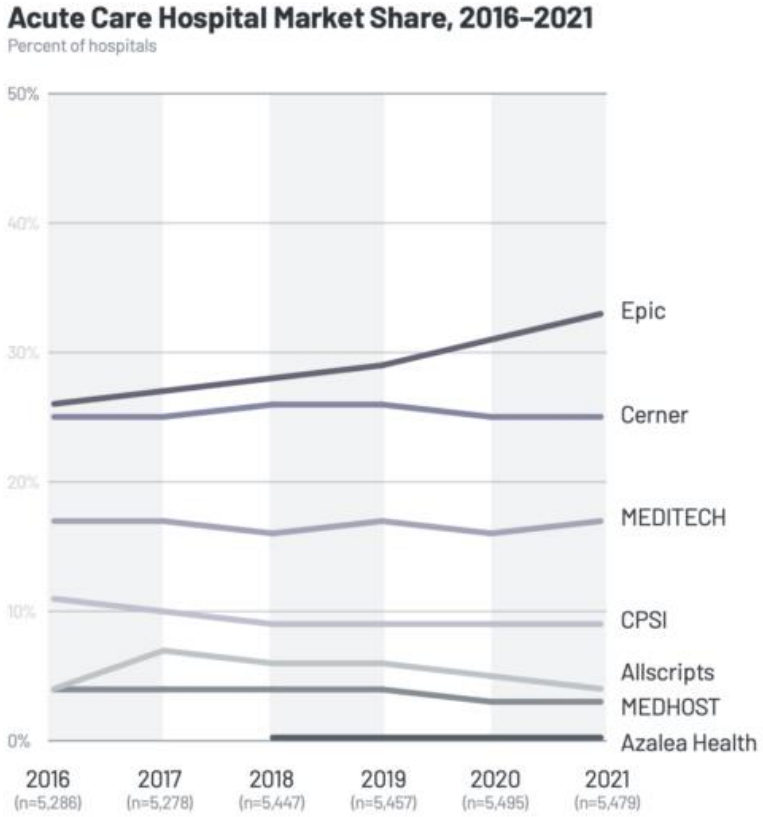
Getting Cerner under control

Oracle closed the $28.3B acquisition in June 2022. Now it needs to figure out what it has.

With approximately 25% of the US EHR market and an exclusive contract with the Department of Defense, the Cerner acquisition looked like a giant step in the right direction for Oracle to move on the healthcare industry.

Now Cerner is struggling to find new clients, losing existing ones, and facing scrutiny over its DoD and VA performance.

Oracle is pushing forward with new revenue cycle products while transitioning Cerner to Oracle's cloud, customer relationship management, enterprise resource planning, and other systems.



Source: MedCityNews

From modular platform to all-in-one health cloud

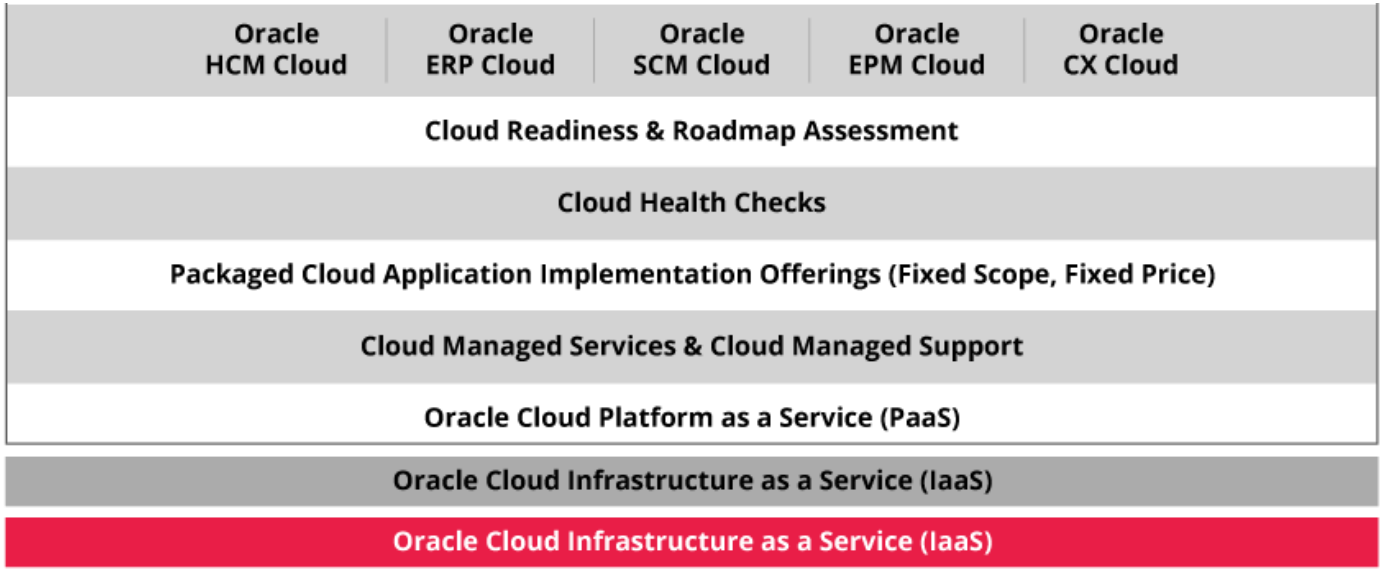
Whereas Cerner had taken a piecemeal approach — building central EHR functions while partnering for everything else — Oracle's looking to bring most functions in house

Cerner historically partnered with Salesforce for customer relationship management (CRM) and with AWS for AI/ML and cloud hosting.

Cerner customers, however, have been frustrated by how many additional apps and functions are needed in installs.

With healthcare buyers starting to prefer platform solutions over piecemeal ones, Oracle has an opportunity to turn Cerner into a more unified product. The transition could be a wise — but complex — move for Oracle.

Oracle Cloud and Software-as-a-Service (SaaS) solution offerings



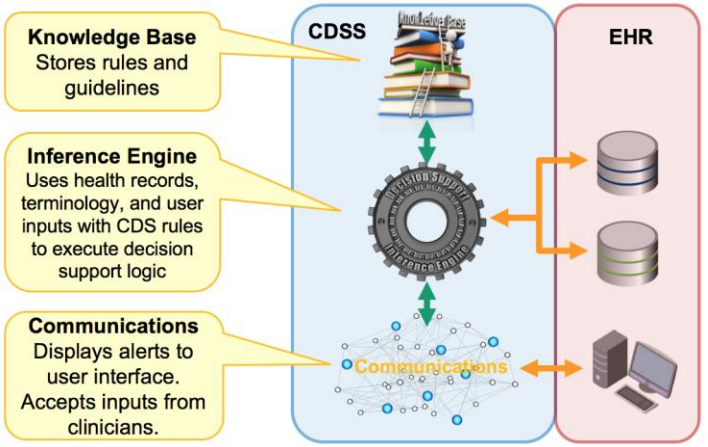
Source: HCL Tech

Upcoming Cerner functions

In the short term, Oracle is prioritizing adding more advanced functions, bringing Cerner closer to competitor functionality and taking advantage of its existing tech stack to keep the costs of modernization low

Integrated telemedicine

Provider voice interface

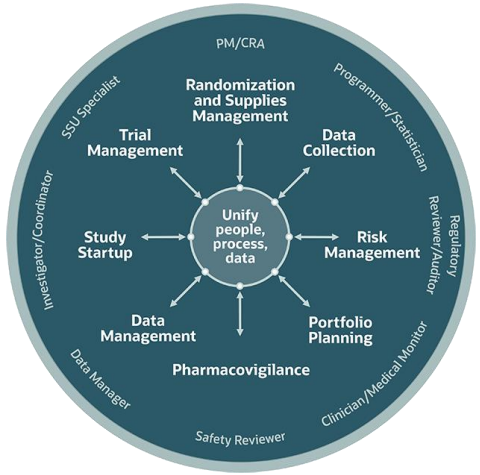


Disease-specific AI/ML modules

Source: Binary Fountain, WIRED, Confluence Mobile

Cerner Enviza + Oracle Life Sciences

Cerner acquired Kantar Health in 2021 and renamed it Enviza. As a complementary service and deep data source, it's a good match to increase the effectiveness and power of Oracle's existing life sciences business.



Oracle has a robust business in clinical trials, pharmacovigilance, drug discovery, and more.

Cerner Enviza offers access to its EHR real-world data and evidence, patient registries, and cohort studies.

Source: Oracle Cerner

Theme 2: Building cloud presence & market share

Developing Oracle’s health cloud

A shot in the arm for Oracle's cloud

Oracle is now the fastest-growing major cloud provider, though it still holds only a fraction of the total market

Since the Cerner acquisition, Oracle cloud growth has surged as Cerner clients and partners begin using Oracle software and infrastructure.

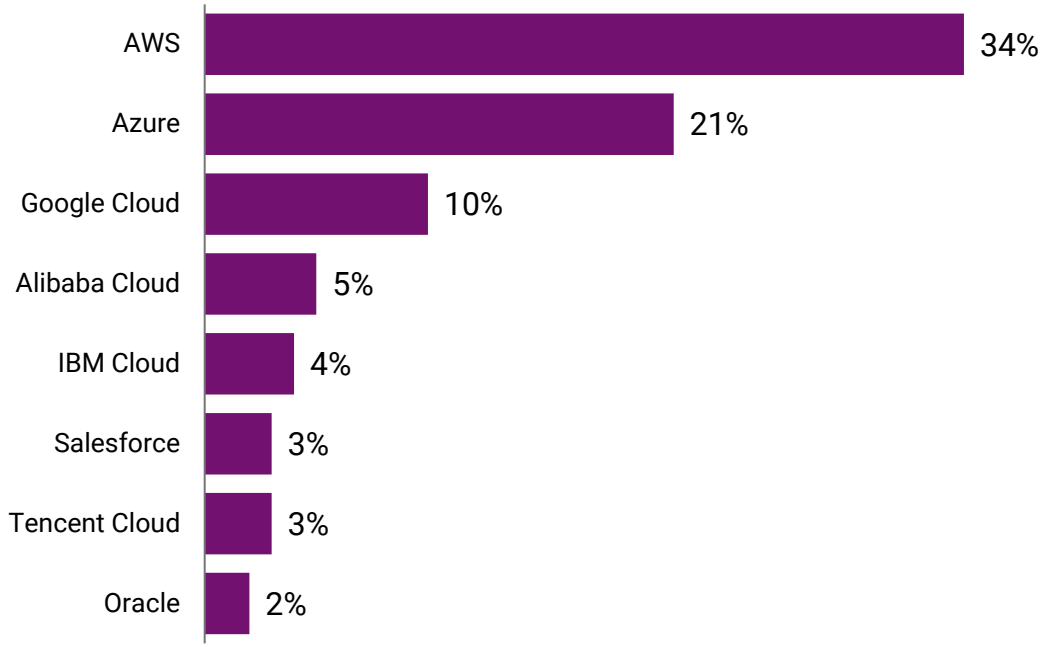
In September 2022:

- Cloud revenue was up 45% YoY
- Fusion ERP SaaS revenue was up 33% YoY
- NetSuite ERP SaaS revenue was up 27% YoY

While Oracle is growing faster than leaders like Google Cloud, Azure, or AWS, it still lags in total market share.

Worldwide market share of leading cloud infrastructure service providers

As of Q2'22



Source: Statista

Can Oracle build a national patient record?

If Oracle wants to own as much patient data as possible, Cerner's main value could be its data access.

Cerner has been building its patient database and the tools to take advantage of it through partnerships and product launches.

For instance, Cerner received the DoD Military Health System contract in 2016, giving it:

- 3.9M veteran records
- 10M DoD/MHS records

It also launched HealtheDataLab, a de-identified data solution, in 2019, which contains:

- 92M patient records

Oracle is planning a unified national healthcare database

June 2022 | BECKER'S HOSPITAL REVIEW

"Oracle aims to build a unified database for patient information, similar to the unified financial database with credit information, accessible to healthcare providers and public health officials.

The database would have anonymized data from hospitals, clinics and providers across the U.S. and provide up-to-the-minute information about patients' personal health as well as public health statistics…"

— Larry Ellison, June 2022

Oracle’s plans point to key trends for 2023

	Centralizing Cerner	Building cloud presence & market share
Summary	Since finalizing the purchase of Cerner, Oracle has been working to add functionality, export it to the cloud, and integrate its key products.	Oracle’s cloud business is suddenly booming, and it has big plans for the future. Integrating Cerner into the cloud ecosystem is going to be its biggest challenge now.
Implications	Oracle’s best shot at expanding Cerner may be bringing it to new markets overseas. Expect Oracle to close some Cerner business lines. Cerner Enviza is likely to be rolled into the larger Oracle life sciences portfolio.	Completing a migration of the Cerner Millennium EHR into Oracle Cloud will take years, but with multi-cloud approaches beginning to dominate, buyers will be able to make more gradual transitions. In the end, Cerner is likely to be cloud-agnostic — rather than restricted to Oracle Cloud products — but still tightly integrated into other Oracle products.