MHEI Healthcare Leadership Conference

October 19, 2018

The Disruptors: How Google, CVS, and Amazon Plan to Change the Face of Healthcare

Ron Galloway

mhei
Lead. Educate. Inform.

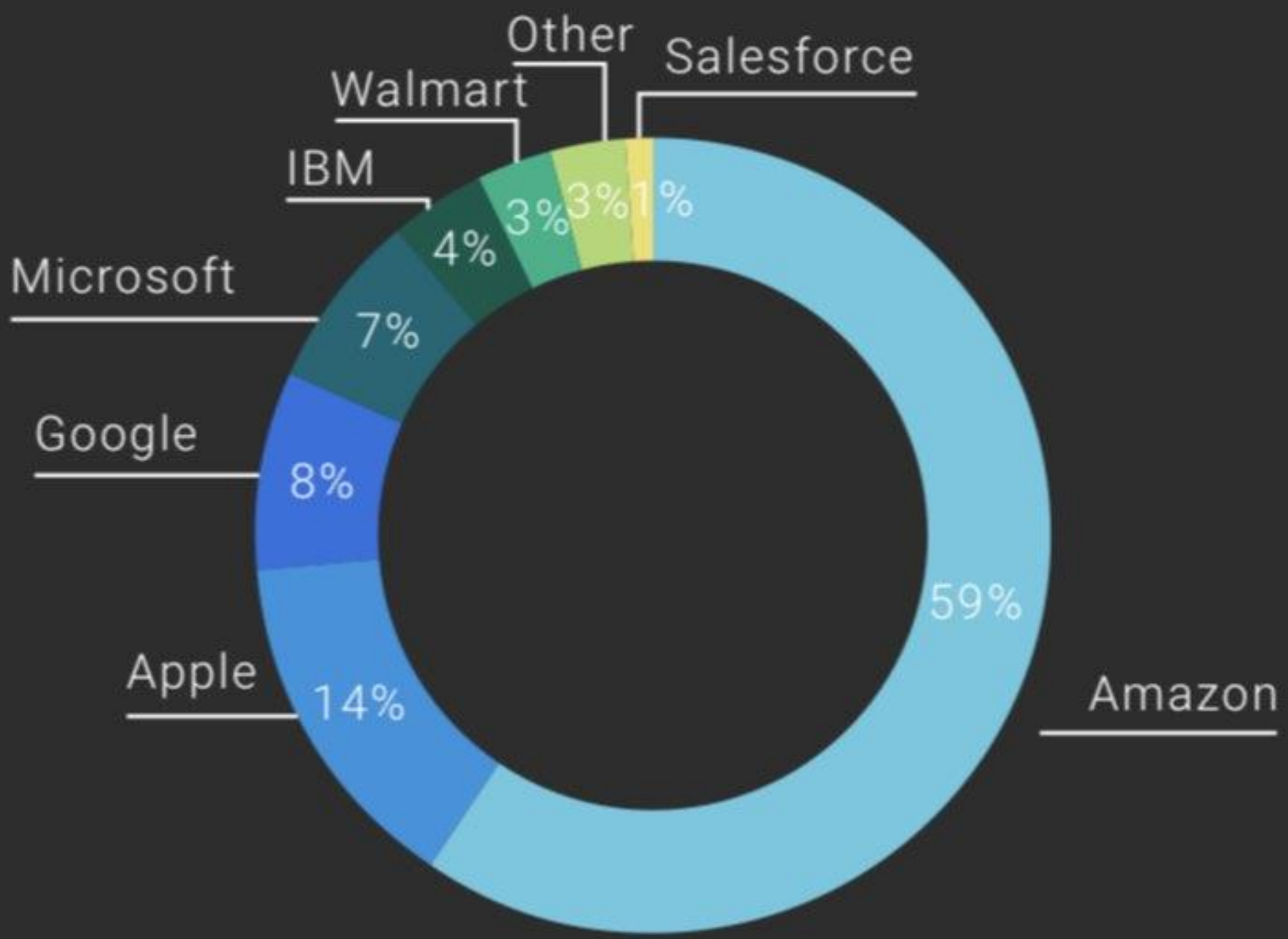
The Disruptors

amazon

CVS Health

Google

Which Entrant Will Have The Biggest Impact?



Which Technologies Will Have The Biggest Impact?

"The most influential business thinker on Earth."
—*The New Yorker*

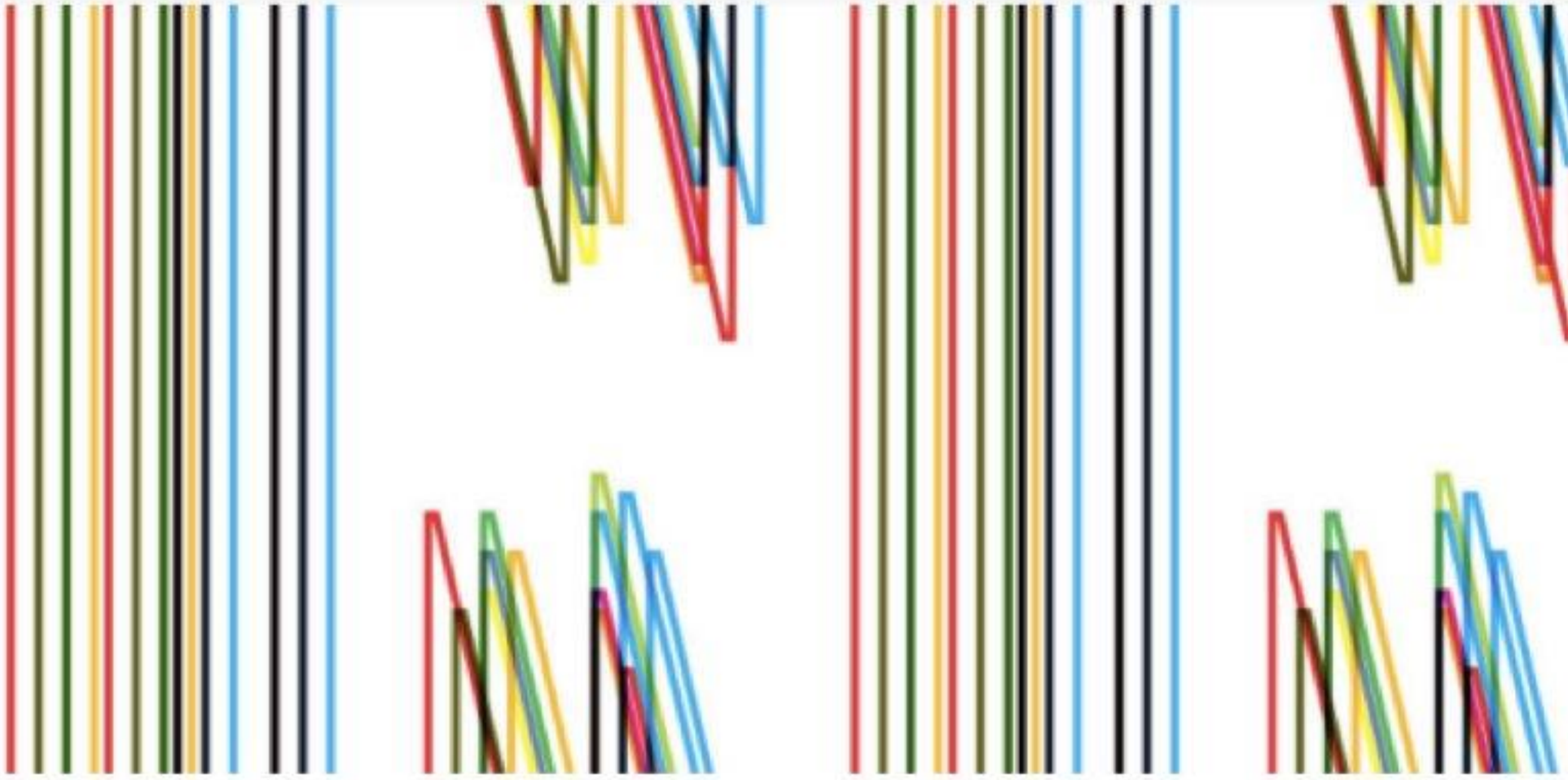
THE INNOVATOR'S DILEMMA

WHEN NEW TECHNOLOGIES CAUSE GREAT FIRMS TO FAIL //

CLAYTON M. CHRISTENSEN

HARVARD BUSINESS REVIEW PRESS

Harvard Business Review



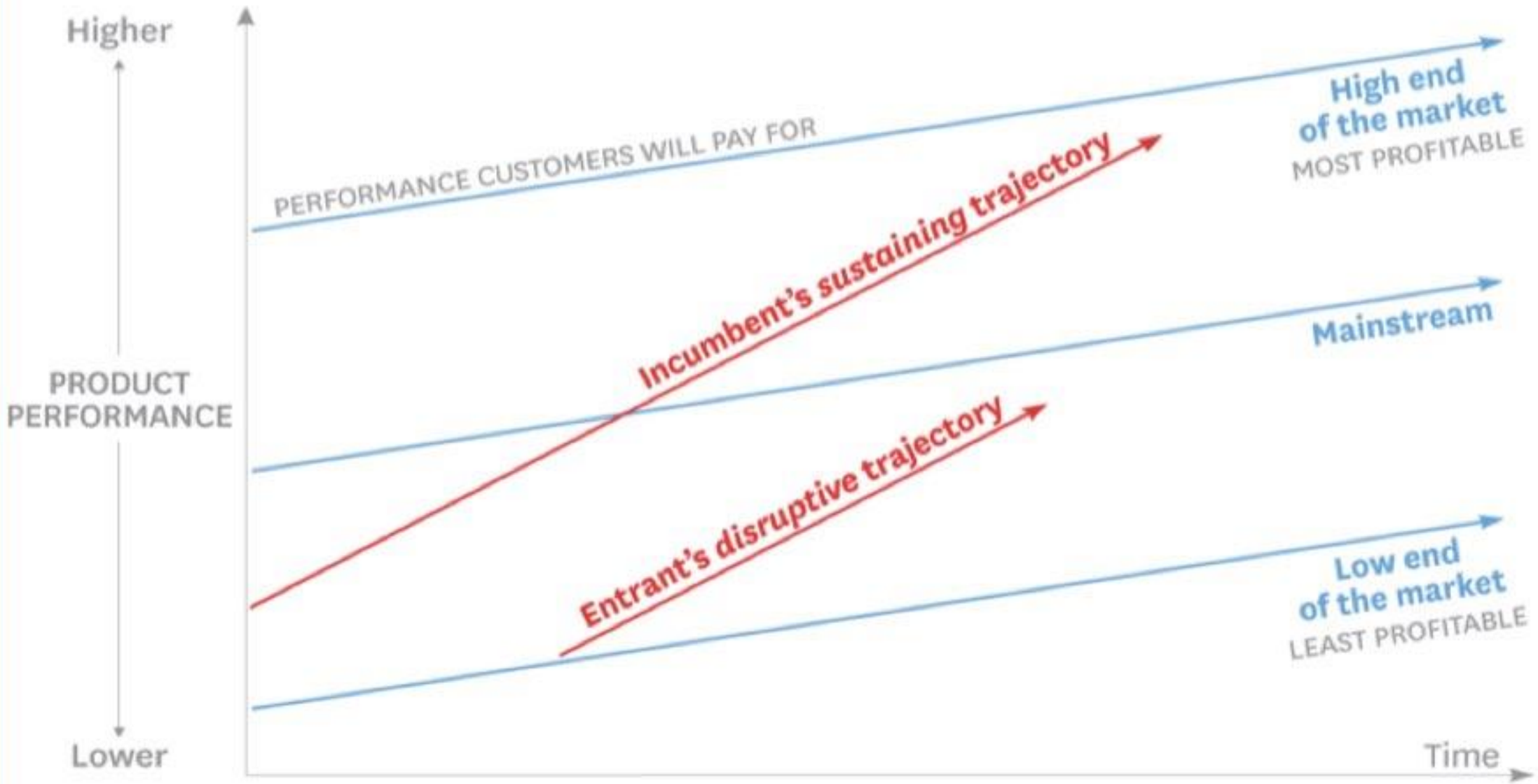
DISRUPTIVE INNOVATION

What Is Disruptive Innovation?

by Clayton M. Christensen, Michael E. Raynor, and Rory McDonald

The Disruptive Innovation Model

This diagram contrasts *product performance trajectories* (the red lines showing how products or services improve over time) with *customer demand trajectories* (the blue lines showing customers' willingness to pay for performance). As incumbent companies introduce higher-quality products or services (upper red line) to satisfy the high end of the market (where profitability is highest), they overshoot the needs of low-end customers and many mainstream customers. This leaves an opening for entrants to find footholds in the less-profitable segments that incumbents are neglecting. Entrants on a disruptive trajectory (lower red line) improve the performance of their offerings and move upmarket (where profitability is highest for them, too) and challenge the dominance of the incumbents.



SOURCE CLAYTON M. CHRISTENSEN, MICHAEL RAYNOR, AND RORY MCDONALD
FROM "WHAT IS DISRUPTIVE INNOVATION?" DECEMBER 2015

© HBR.ORG

dis·rup·tion

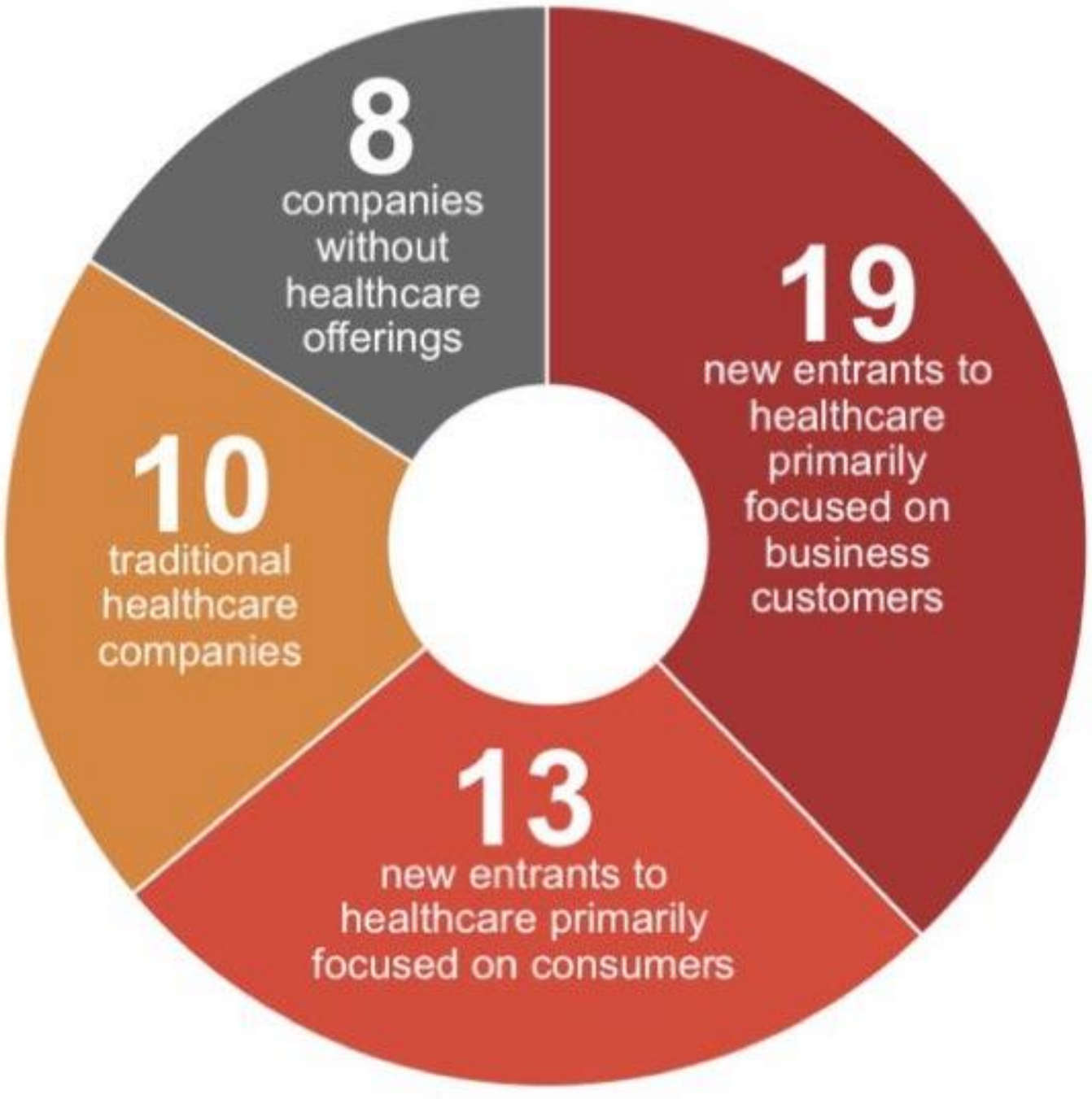
/disˈrəpSH(ə)n/

noun

disturbance or problems that interrupt an event, activity, or process.
"the schedule was planned to minimize disruption"

NETFLIX

84% of the Fortune 50 have healthcare-related offerings



Company type

- **10** healthcare
- **10** technology
- **8** financial services
- **8** retailers and consumers
- **4** manufacturing & automotive
- **2** energy

ALPHAGO

TRIBECA FILM FEST 2017 · BFI LONDON FILM FESTIVAL OFFICIAL SELECTION 2017 · WINNER TRAVERSE CITY FILM FESTIVAL 2017 · OFFICIAL SELECTION MILL VALLEY FILM FESTIVAL 2017 · Official Selection WARSAW FILM FESTIVAL · VIFF Official Selection 2017

Move 37

Google

人機世紀之戰

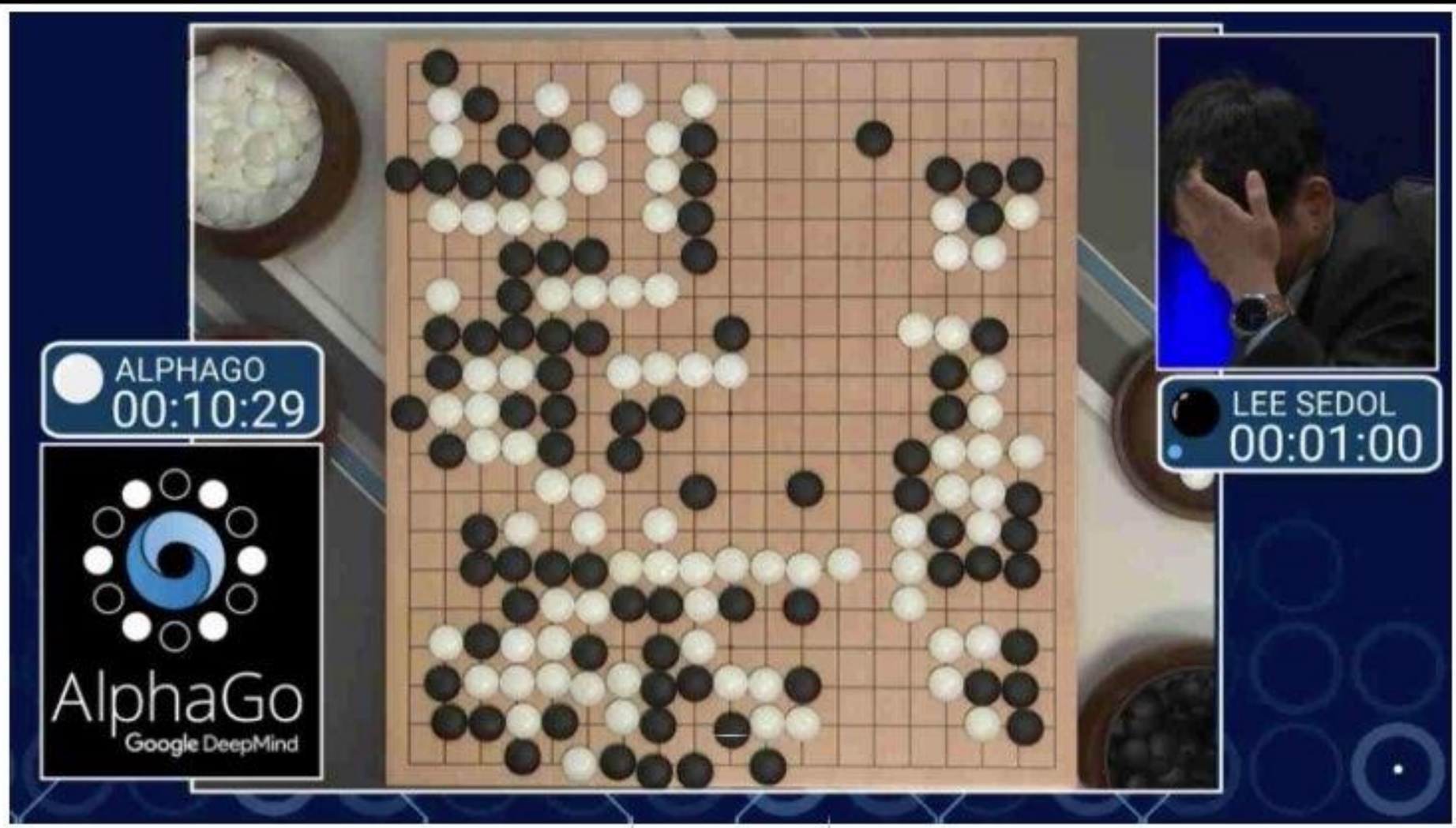
AlphaGo

VS.

李世石

3/10 (四) 12:00 Round 2

必PO TV LIVE 全程中文直播

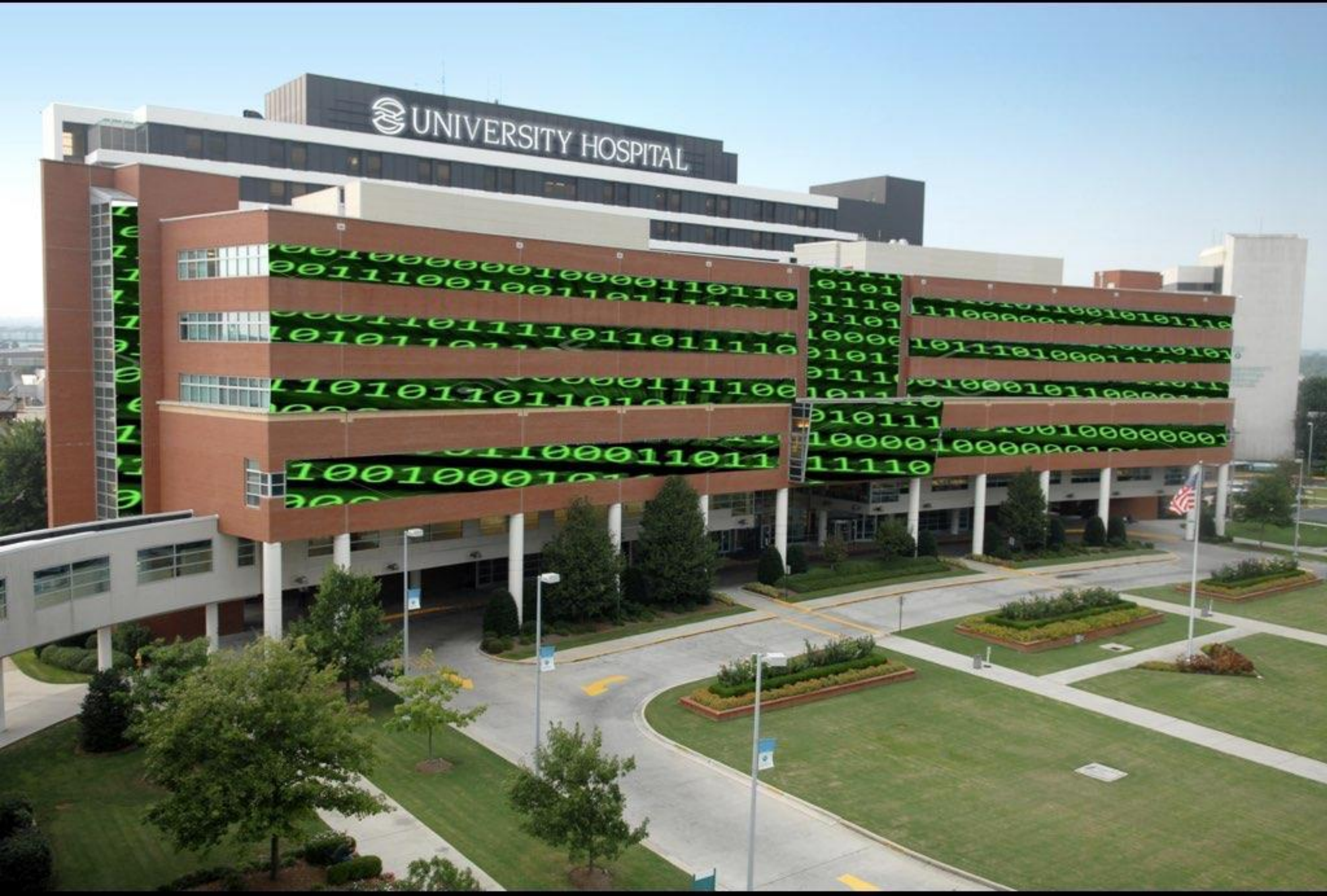


Posted 25th July 2016 by - John Straw
Co Founder

Disrupted Humanity – Move 37

Was Move 37 the seminal moment in human development?

UNIVERSITY HOSPITAL


UNIVERSITY HOSPITAL

Compete or Augment?

IF

IfSeenThisBefore()

{Relax()}

ELSE

{ RunLikeHell()}

We are hardwired to fear novelty and to seek out comfort in familiarity

Google

CVS Health®

amazon

Morgan Stanley

September 18, 2017

Amazon Disruption Symposium

Where so Far? Where to Next? Who is Safe?

MORGAN STANLEY RESEARCH
North America

Ten years ago...

Wal-Mart's Goals & Intentions In Health Care

Recent News

AFX News Limited

Wal-Mart says could open up to 2,000 in-store health clinics in 5-7 years

04.24.07, 2:26 PM ET

Sam's Club®

Health Care Services

Sam's Club has partnered with some of the best in their fields to offer the most affordable health care and employee benefit solutions to our Members.

Health and Medical Discounts:
Save 5% to 50% on health care products and services from HealthAllies, A UnitedHealth Group Company.

Life Insurance*:
Affordable protection for your family.

Health Insurance:
Save on average 25–30% on health insurance coverage with a range of insurance plans.

Pharmacy:
Save up to 25% over traditional drug stores.

*The Health and Life Insurance Services program for Sam's Club Members is provided through Extend Benefits Group, LLC, which offers health and life insurance through its licensed insurance subsidiary Extend Insurance Services LLC. Prices are subject to change and all products, including the ExtendChoice program, may not be available in all states.

Featured Services

Heath and Medical Discount Program

Save 5% to 50% on health care products and services.

Health Insurance

Save an average of 25-30% on a wide range of health insurance plans.

MEMORIAL HOSPITAL

The Role Of the $4 Prescription Plan

Wal-mart & The Art Of Scale

Wal-Mart is an I.T. Company

THE WALL STREET JOURNAL.
U.S. Edition ▼ | May 20, 2018 | Today's Paper | Video

Walmart in Early-Stage Acquisition Talks With Humana

If companies do strike deal, it would be retail giant's largest by far

Anna Wilde Mathews • Updated March 29, 2018 8:02 p.m. ET

The Right Care at the Right Time: Expanding Our Centers of Excellence Network

Press Kit

Starting next year, Walmart will double the number of world-class medical facilities available to our associates who have been told they need a spine surgery. Whether you're a cashier in Wyoming who's been with the company for six months or you're a 20-year associate running a store in Miami, if you have Walmart health insurance, you have this benefit.

We are adding the Mayo Clinic facilities in Arizona, Minnesota and Florida to our current list of Centers of Excellence (COE) for spine surgeries, which are Mercy Hospital Springfield in Missouri, Virginia Mason Medical Center in Washington and Geisinger Medical Center in Pennsylvania. Our COE program is about more than just access to these facilities and their specialists; it covers these procedures at 100%, including travel, lodging and an expense allowance for the patient and a caregiver.

Related News & Press

More Free Health Screenings, More Free Health Resources Than Ever Before at Walmart Wellness Event on Sept. 22

September 18, 2018

Anthem Announces Collaboration with Walmart

August 20, 2018

Walmart Introduces Additional Measures to Help Curb Opioid Abuse and Misuse

May 7, 2018

Walmart started offering this benefit in 2013 and our data tells us we are making a difference for our people, but we want to do more. That's one of the reasons for adding more eligible medical facilities to the program. Other reasons these medical facilities were selected are that each facility:

- Fosters a culture of following evidence-based guidelines, and as a result, only performs surgeries when necessary.
- Structures surgeons' compensation so they are incentivized on providing care based on what's most appropriate for each individual patient and looking at surgery as a last option.
- Is geographically located throughout the country to provide high-quality care to participants in one of Walmart's health benefits plans.

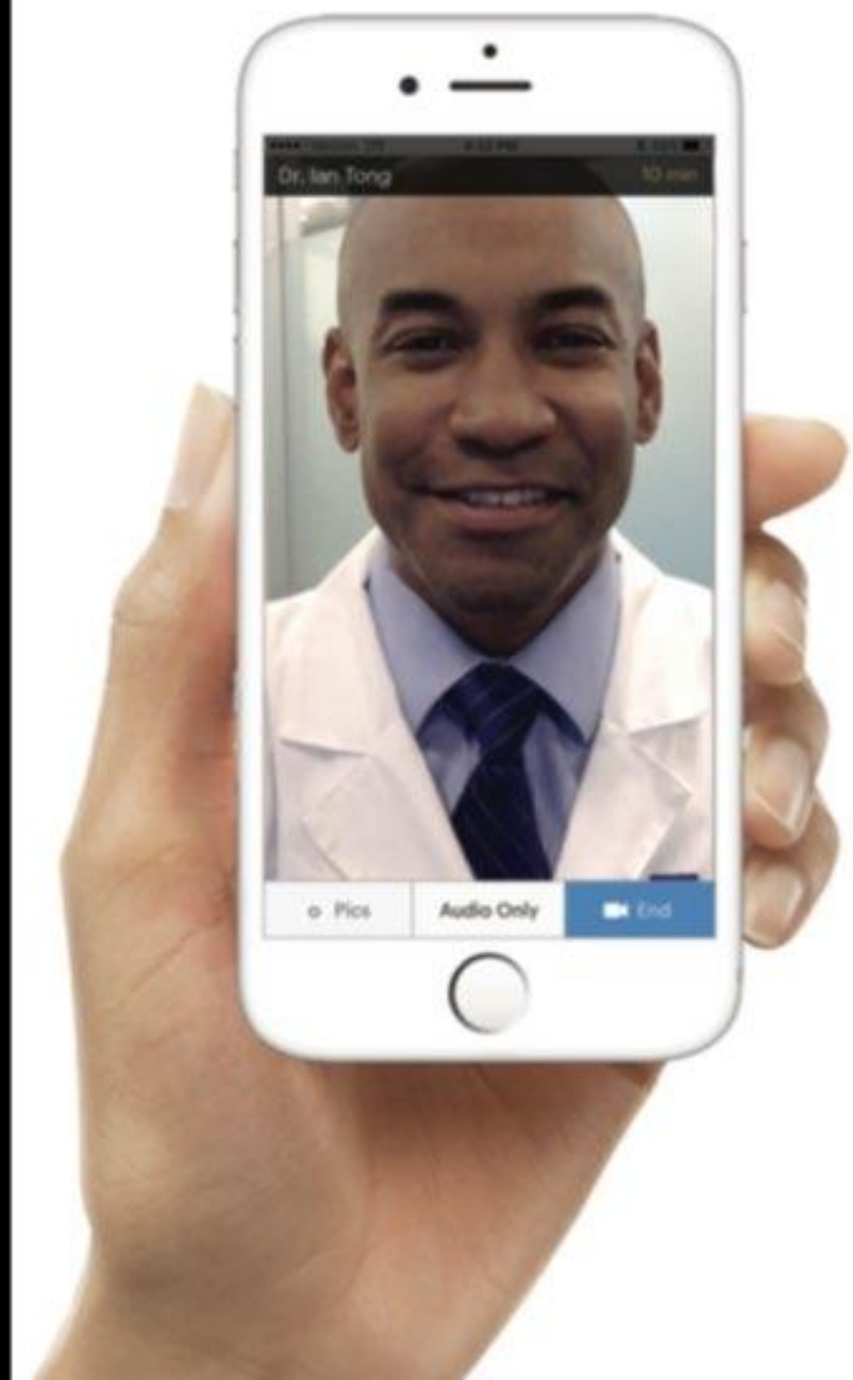
Why would Walmart offer a benefit like this? It's pretty simple – we care about our people and want them to receive the right care at the right time. Research, as well as our own internal data, shows about 30% of the spinal procedures done today are unnecessary. By utilizing the Centers of Excellence program, our associates are assessed by specialists who are incentivized differently to get to the root cause and prescribe appropriate treatment.

dr. on demand

Walmart

A doctor who is with you always — every day.

Connect in minutes with board-certified doctors and psychologists over live video. Available 24/7 without the hassle of the waiting room.



Easy to use

Download the app and connect instantly with doctors or psychologists using your phone, tablet, or computer. You can also schedule appointments.

Lower cost & less waiting

Avoid the high cost and long wait times of urgent care or the ER. Your price through Walmart's medical plan is just $40 for a medical visit and $50 for a psychologist visit.*

	dr.	Office Visit	Urgent Care	E.R.
Visit Cost	**$40***	$100	$180	$700
Wait Time	**<5 min**	3 weeks	40 min	2 hours

What we can treat

- Cough, cold & flu
- Skin issues & rashes
- Urinary tract infections
- Stomach issues
- Sore throat
- Allergies
- Anxiety & stress
- Pink eye & more

2018 Walmart Centers of Excellence

Walmart's Centers of Excellence (COE) program gives you access to world-class specialists for:

- Certain heart surgeries, like cardiac bypass and valve replacements
- Certain spine surgeries, like spinal fusions and removal of spinal discs (discectomy)*
- Hip and knee replacements*
- Medical record review for breast, lung and colorectal cancer to determine if you would benefit from travel to a Centers of Excellence hospital – and an onsite visit, if recommended
- Certain weight-loss surgeries, like gastric bypass and gastric sleeve procedures**
- Organ and tissue transplants (except kidney, cornea and intestinal)**

Cardiac

- Cleveland Clinic (Cleveland, Ohio)
- Geisinger Medical Center (Danville, Pennsylvania)
- Virginia Mason Medical Center (Seattle, Washington)

Breast, lung and colorectal cancer

- Mayo Clinic Arizona (Scottsdale, Arizona)
- Mayo Clinic Florida (Jacksonville, Florida)
- Mayo Clinic Minnesota (Rochester, Minnesota)

Food Traceability Initiative
Fresh Leafy Greens

Walmart | Sam's Club

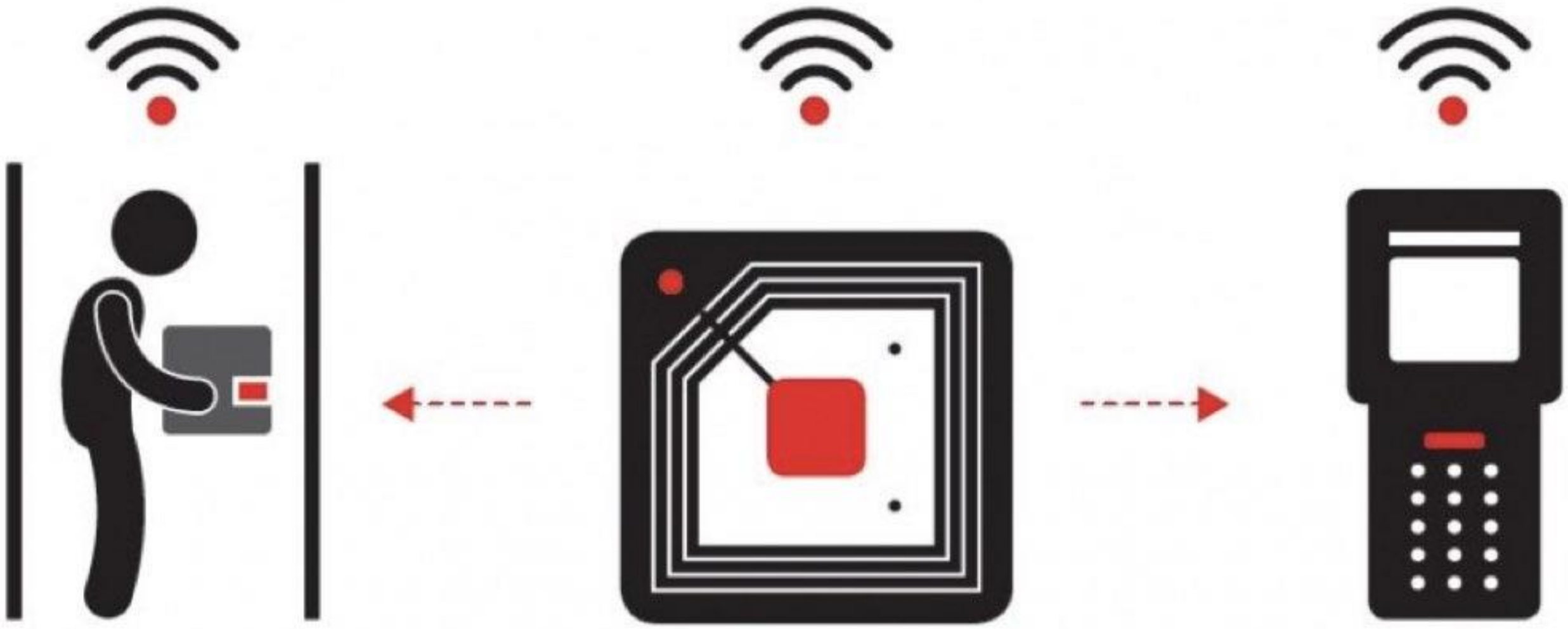
September 24, 2018

Dear Leafy Greens Supplier,

At Walmart, we are committed to providing our customers with safe, affordable foods. As food safety is a shared responsibility, one way in which we achieve this is through collaboration with our suppliers.

That's why Walmart is today announcing a new, blockchain-enabled **Walmart Food Traceability Initiative** that will increase transparency in the food system and create shared value for the entire leafy green farm to table continuum.

12345 67890



Food Traceability Initiative
Fresh Leafy Greens

Walmart | Sam's Club

September 24, 2018

Dear Leafy Greens Supplier,

At Walmart, we are committed to providing our customers with safe, affordable foods. As food safety is a shared responsibility, one way in which we achieve this is through collaboration with our suppliers.

That's why Walmart is today announcing a new, blockchain-enabled **Walmart Food Traceability Initiative** that will increase transparency in the food system and create shared value for the entire leafy green farm to table continuum.

Walmart

Over the past 18 months, Walmart has piloted new technology in collaboration with numerous suppliers and IBM and we have demonstrated that meaningful enhancements to food traceability is possible.

Using the IBM Food Trust network that relies on blockchain technology, we have shown that we can reduce the amount of time it takes to track a food item from a Walmart Store back to source in seconds, as compared to days or sometimes weeks.

Walmart

With blockchain, research that used to take 7 days can now take as little as 2.2 seconds,

tracing contaminated foods to their source, fast.

Walmart

As part of our new **Walmart Food Traceability Initiative:**

All fresh leafy greens suppliers are expected to be able to trace their products back to farm(s) (by production lot) in seconds – not days. To do this, suppliers will be required to capture digital, end-to-end traceability event information using the IBM Food Trust network.

We understand that this may require you to work with your suppliers too. Therefore, we are allowing this requirement to be met in two phases.

1. **Direct Suppliers** – our direct suppliers are required to conform to one-step back traceability on the blockchain network by Jan 31, 2019.
2. **End-to-End** – thereafter, our suppliers are expected to work within their vertical systems or with their suppliers to enable end-to-end traceability back to farm by September 30, 2019.

When WalMart pushes a new technology hard,
it tends to become a standard

INVESTOR'S BUSINESS DAILY

Walmart, Not Amazon, May Turn Out To Be The Real Health Care Disruptor

JED GRAHAM

Every **Amazon** (AMZN) flirtation toward the health care industry has sent hearts racing on Wall Street. Yet Amazon appears to be having commitment issues, and others have leapt while Jeff Bezos hesitated. Now comes a possible **Walmart** (WMT)-**Humana** (HUM) merger. A Walmart acquisition of the insurer could fundamentally reshape health care delivery in ways that Amazon may have trouble matching.

CVS Health®

9,800 retail locations, more than 1,100 walk-in health care clinics, a pharmacy benefits manager with more than 94 million plan members, a dedicated senior pharmacy care business serving more than one million patients per year.

MinuteClinic - As of December 31, 2017, we operated 1,134 MinuteClinic ® locations in 33 states and the District of Columbia, of which 1,050 were located in our retail pharmacy stores, and 79 were located in Target stores. We opened 15 new clinics during 2017.

CVS Health Corporation, together with its subsidiaries is a pharmacy innovation company helping people on their path to better health.

CVS Form 10-K 2018

Changes in market dynamics or the actions of competitors or manufacturers, including industry consolidation, the emergence of new competitors and strategic alliances, and the exclusion from new narrow or restricted networks, could materially and adversely impact us.

CVS Form 10-K 2018

CVS Health-Aetna Combination Will Help Address U.S. Health Care System Challenges

Growth in Health Care Expenditures	Aging U.S. Population	Increasing Health Care Consumerism	Movement To Value-Based Care
• Integrating medical and pharmacy benefits with consumer touchpoints to improve outcomes and lower costs	• More competitive Medicare Advantage and Part D offerings enable efficiencies and complementary expertise	• Broad market access • Unique customer touchpoints • Digital assets to drive patient engagement	• Combined assets promote lower-cost sites of care and enhanced clinical care programs

CVS Health + Aetna will result in significant benefits to stakeholders

CVS Health-Aetna Combination Will Help Address U.S. Health Care System Challenges

Growth in Health Care Expenditures	Aging U.S. Population	Increasing Health Care Consumerism	Movement To Value-Based Care
• Integrating medical and pharmacy benefits with consumer touchpoints to improve outcomes and lower costs	• More competitive Medicare Advantage and Part D offerings enable efficiencies and complementary expertise	• Broad market access • Unique customer touchpoints • Digital assets to drive patient engagement	• Combined assets promote lower-cost sites of care and enhanced clinical care programs

CVS Health + Aetna will result in significant benefits to stakeholders

CVS Health-Aetna Combination Will Help Address U.S. Health Care System Challenges

Growth in Health Care Expenditures	Aging U.S. Population	Increasing Health Care Consumerism	Movement To Value-Based Care
• Integrating medical and pharmacy benefits with consumer touchpoints to improve outcomes and lower costs	• More competitive Medicare Advantag and Part D offerings enable efficiencies and complementary expertise	• Broad market access • Unique customer touchpoints • Digital assets to drive patient engagement	Combined assets promote lower-cost sites of care and enhanced clinical care programs

CVS Health + Aetna will result in significant benefits to stakeholders

CVS Health and Aetna Bring Unique and Differentiated Capabilities to the Combination

CVS Health

- ✓ Unparalleled reach that positions us as the front door to health care
- ✓ Ability to support patients, payors and providers with innovative, channel-agnostic solutions
- ✓ Broad capabilities to holistically manage patients
- ✓ Deep clinical expertise and insights
- ✓ Leading provider of pharmacy services in long-term care
- ✓ Unmatched scale in the U.S. making us low-cost provider

Aetna

- ✓ World class consumer health and engagement model
- ✓ Leading health financing platform
- ✓ Best-in-class service
- ✓ Targeted solutions to improve health and wellness
- ✓ Differentiated provider collaboration experience – equipping providers with tools to succeed
- ✓ Innovative plan designs

Extensive Consumer Reach Across Many Platforms

Active Patient Base

Number of unique patients that fill an Rx each year in retail Pharmacy

65M

Clinical Message Reach

Automated calls or texts delivered to patients per year

1B

Phone Number Accuracy

Percent of patients with an accurate number on file

95%

ExtraCare Emails

Number of emails in ExtraCare database

55M

Text Message Enrollment

Number of active patients enrolled in text messaging

48M

Auto-Fulfillment Usage

Number of scripts filled via ReadyFill or ScriptSync / yr

144M

Patient Consultation

Number of pharmacist consultations per year in stores

140M

ExtraCare Offers

Number of ExtraCare offers issued in the last year

21B

QUARTZ

THE BEZOS EFFECT

The CVS-Aetna deal is actually all about Amazon

By Sarah Todd | December 03, 2017

“CVS would never admit it, but this sort of pivot is Amazon’s doing,” Trip Miller, managing partner at Gullane Capital Partners, a minor shareholder in Amazon, told The Street. “What they’re doing now is definitely based on Amazon’s interest.”

https://qz.com/1145594

"It's not quite explicit yet what they're planning on doing but whatever it is, it's scaring CVS," Rowe said about Amazon.

Amazon is 'scaring' CVS, says former Aetna CEO about Aetna-CVS deal

There are three things that are triggering the CVS-Aetna deal and one of them is Amazon, former Aetna CEO John Rowe told CNBC on Monday.

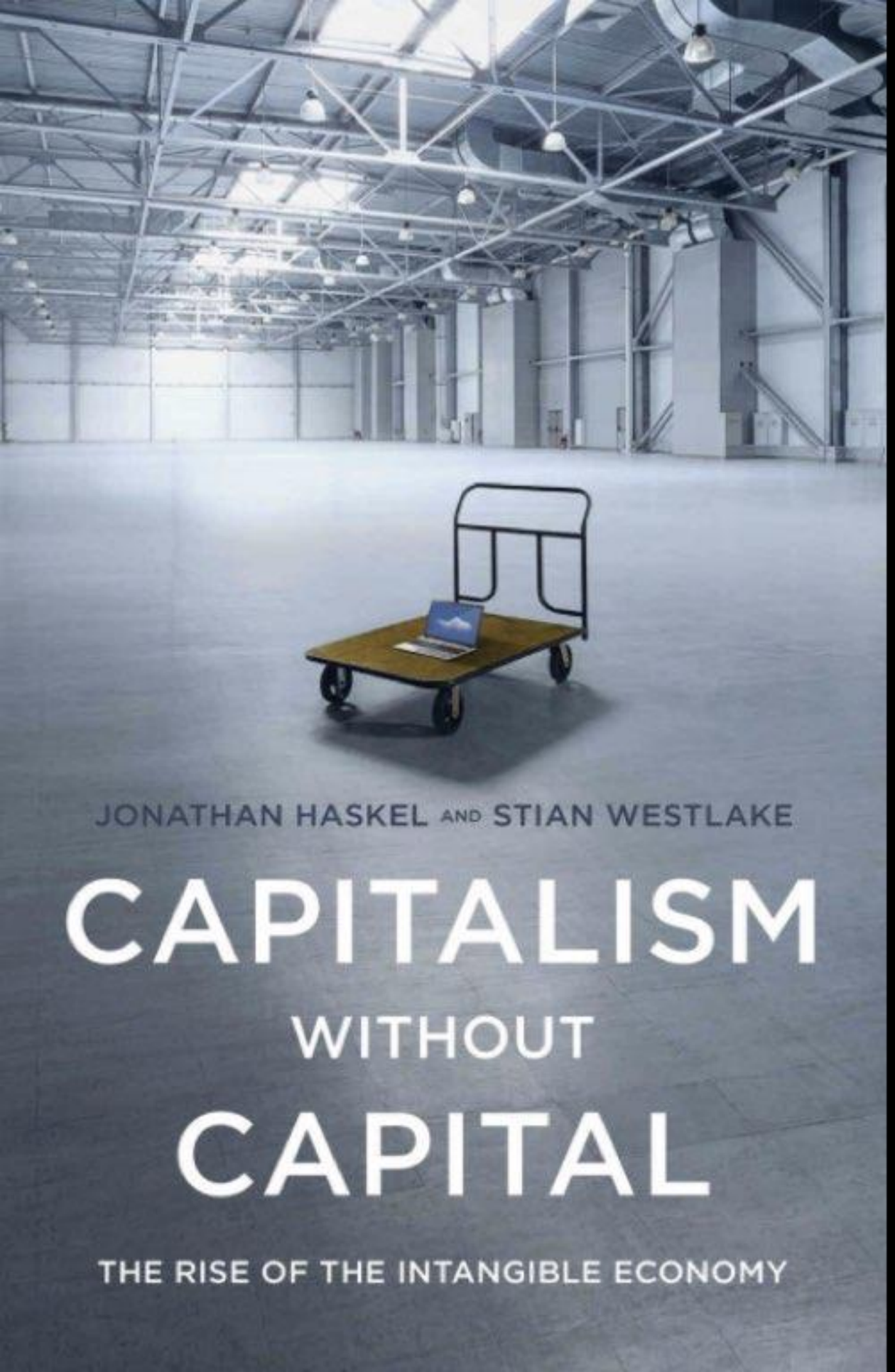
Michelle Fox • 5:27 PM ET Mon, 4 Dec 2017 | 03:20

The failure of recent horizontal mergers, like Aetna-Humana deal, has forced companies to think more vertically across sectors to increase their footprint

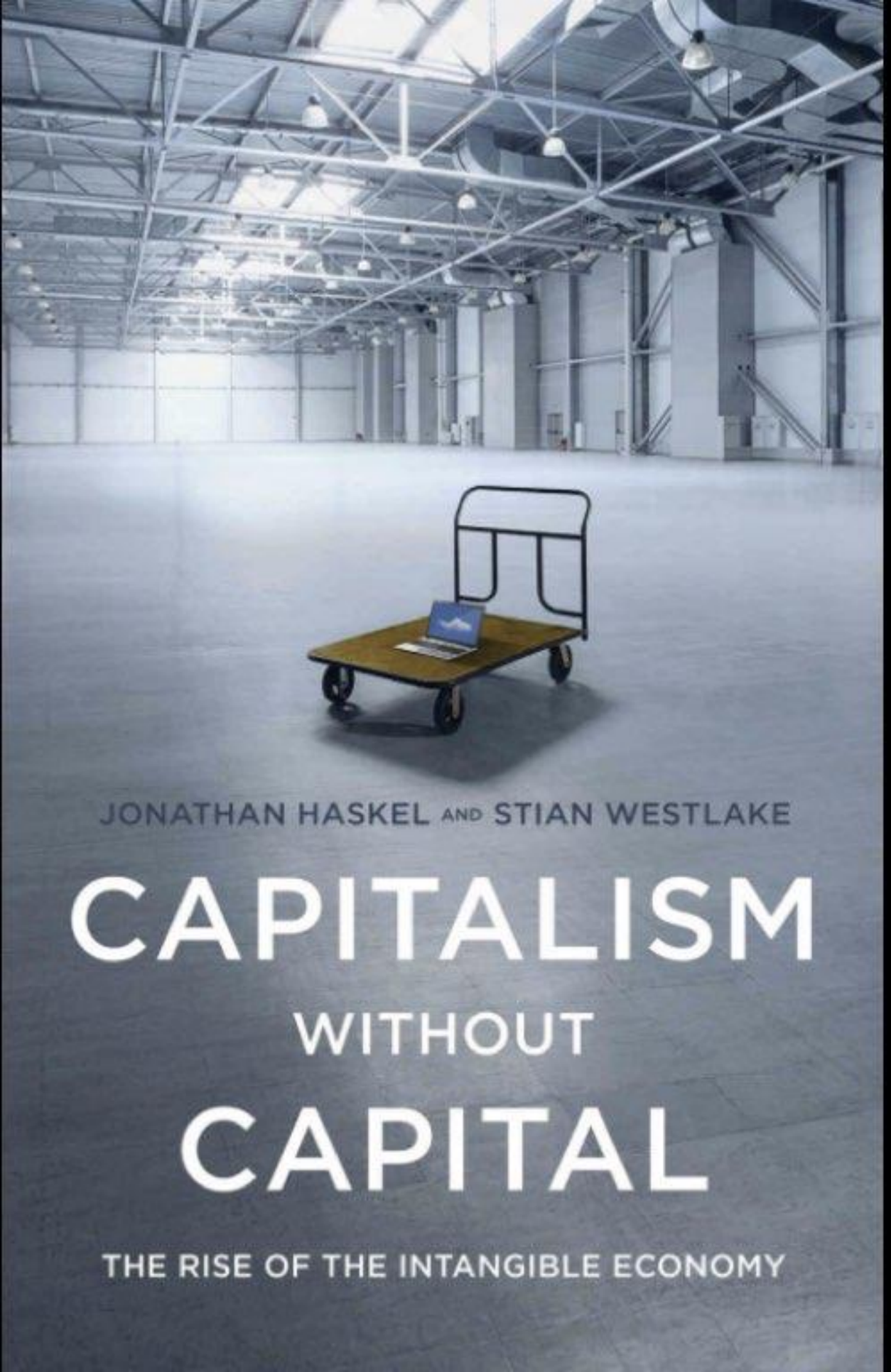
CVS is reacting, not innovating with Aetna deal. They are going vertical, not horizontal

The Economist

Because it will swallow Aetna's records on patient medical care, its physical outlets will have access to far more information about patients' chronic illnesses. As Aetna's boss, Mark Bertolini, put it, "We have 10,000 new front doors to the health-care system."



The integration of intangibles takes time, their benefits will not be observed overnight. This is one reason why it has taken as long as it has for these combinations to take place. The integration of these different resources must be executed efficiently, and their successful organization is not always obvious.



The rationale for the CVS-Aetna merger may not be all that clear in the present climate, especially the ability for it to be successfully executed, but it signals new opportunities.

CVS Pharmacy Launches Free, Same-Day Prescription Delivery in Manhattan

Share this:

Wednesday, December 6, 2017

WOONSOCKET, R.I., Dec. 6, 2017 /PRNewswire/ -- CVS Pharmacy (NYSE: CVS) introduced free, same-day delivery for prescriptions and certain over-the-counter items in Manhattan this week. The new free delivery service makes it easier for customers to save time and stay healthy. Free, same-day delivery in Manhattan is one of CVS Pharmacy's national network of delivery solutions. Same-day delivery in additional cities and next-day, nationwide delivery will be launching in early 2018.

Media Contacts

CVS Health

CVS Pharmacy - Retail Products Services, ExtraCare, Digital

CVS Caremark PBM Services, CV Specialty

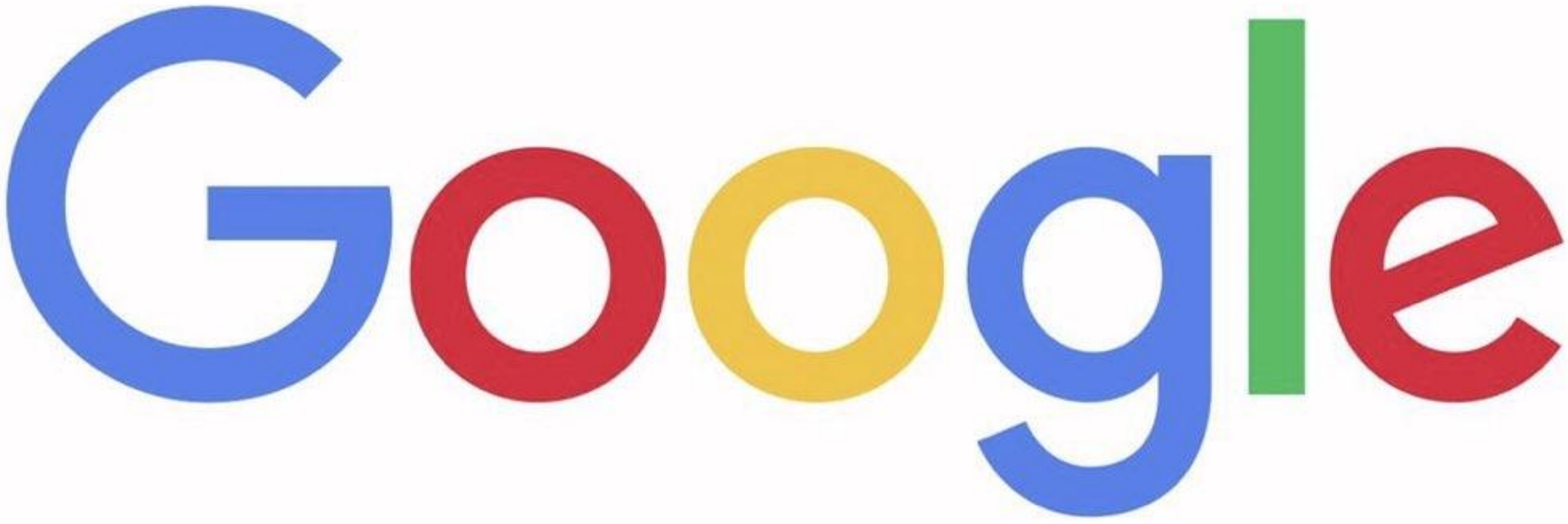
MinuteClinic

Corporate Social Responsibility

Investor Relations

CVS Health and Aetna $69 Billion Merger Is Approved With Conditions

Oct. 10, 2018


Google

Google

Google Cloud

Apigee Health API

GSuite for healthcare

Google Genomics

Google Fit

Google Search

Google Research

Calico

Deep Mind

Verily

Scalable and accurate deep learning for electronic health records

Alvin Rajkomar*[1,2], Eyal Oren*[1], Kai Chen[1], Andrew M. Dai[1], Nissan Hajaj[1], Peter J. Liu[1], Xiaobing Liu[1], Mimi Sun[1], Patrik Sundberg[1], Hector Yee[1], Kun Zhang [1], Yi Zhang[1], Gavin E. Duggan[1], Gerardo Flores[1], Michaela Hardt[1], Jamie Irvine[1], Quoc Le[1], Kurt Litsch[1], Jake Marcus[1], Alexander Mossin[1], Justin Tansuwan[1], De Wang[1], James Wexler[1], Jimbo Wilson[1], Dana Ludwig[2], Samuel L. Volchenboum[4], Katherine Chou[1], Michael Pearson[1], Srinivasan Madabushi[1], Nigam H. Shah[3], Atul J. Butte[2], Michael Howell[1], Claire Cui[1], Greg Corrado[1], and Jeff Dean[1]

[1]Google Inc, Mountain View, California
[2]University of California, San Francisco, San Francisco, California
[3]Stanford University, Stanford, California
[4]University of Chicago Medicine, Chicago, Illinois

January 2018

Abstract

Predictive modeling with electronic health record (EHR) data is anticipated to drive personalized medicine and improve healthcare quality. Constructing predictive statistical models typically requires extraction of curated predictor variables from normalized EHR data, a labor-intensive process that discards the vast majority of information in each patient's record. We propose a representation of patients' entire, raw EHR records based on the Fast Healthcare Interoperability Resources (FHIR) format. We demonstrate that deep learning methods using this representation are capable of accurately predicting multiple medical events from multiple centers without site-specific data harmonization. We validated our approach using de-identified EHR data from two U.S. academic medical centers with 216,221 adult patients hospitalized for at least 24 hours. In the sequential format we propose, this volume of EHR data unrolled into a total of 46,864,534,945 data points, including clinical notes. Deep learning models achieved high accuracy for tasks such as predicting in-hospital mortality (AUROC across sites 0.93-0.94), 30-day unplanned readmission (AUROC 0.75-0.76), prolonged length of stay (AUROC 0.85-0.86), and all of a patient's final diagnoses (frequency-weighted AUROC 0.90). These models outperformed state-of-the-art traditional predictive models in all cases. We also present a case-study of a neural-network attribution system, which illustrates how clinicians can gain some transparency into the predictions. We believe that this approach can be used to create accurate and scalable predictions for a variety of clinical scenarios, complete with explanations that directly highlight evidence in the patient's chart.

Abstract

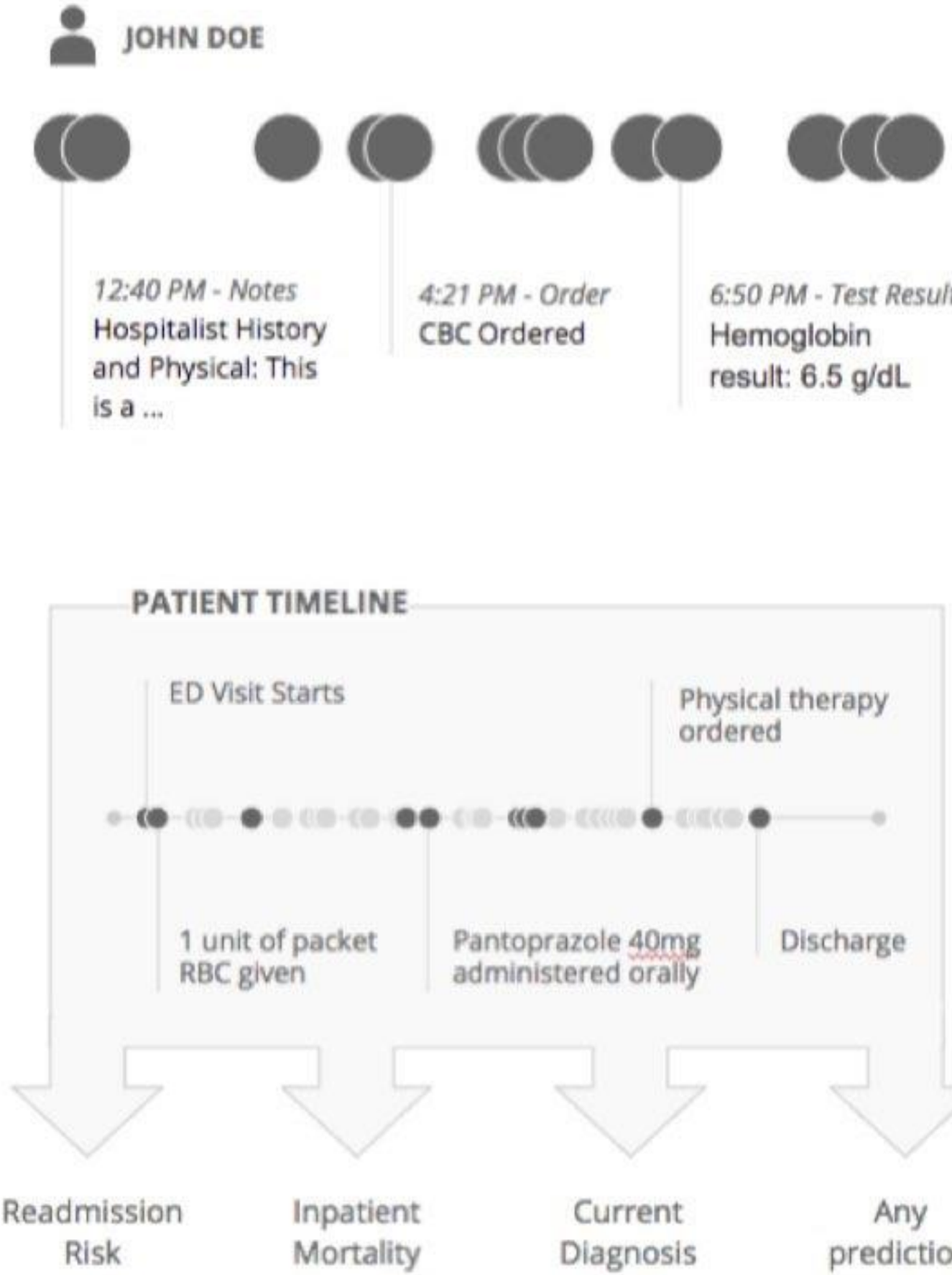
Predictive modeling with electronic health record (EHR) data is anticipated to drive personalized medicine and improve healthcare quality. Constructing predictive statistical models typically requires extraction of curated predictor variables from normalized EHR data, a labor-intensive process that discards the vast majority of information in each patient's record. We propose a representation of patients' entire, raw EHR records based on the Fast Healthcare Interoperability Resources (FHIR) format. We demonstrate that deep learning methods using this representation are capable of accurately predicting multiple medical events from multiple centers without site-specific data harmonization. We validated our approach using de-identified EHR data from two U.S. academic medical centers with 216,221 adult patients hospitalized for at least 24 hours. In the sequential format we propose, this volume of EHR data unrolled into a total of 46,864,534,945 data points, including clinical notes. Deep learning models achieved high accuracy for tasks such as predicting in-hospital mortality (AUROC across sites 0.93-0.94), 30-day unplanned readmission (AUROC 0.75-0.76), prolonged length of stay (AUROC 0.85-0.86), and all of a patient's final diagnoses (frequency-weighted AUROC 0.90). These models outperformed state-of-the-art traditional predictive models in all cases. We also present a case-study of a neural-network attribution system, which illustrates how clinicians can gain some transparency into the predictions. We believe that this approach can be used to create accurate and scalable predictions for a variety of clinical scenarios, complete with explanations that directly highlight evidence in the patient's chart.

Abstract

Predictive modeling with electronic health record (EHR) data is anticipated to drive personalized medicine and improve healthcare quality. Constructing predictive statistical models typically requires extraction of curated predictor variables from normalized EHR data, a labor-intensive process that discards the vast majority of information in each patient's record. We propose a representation of patients' entire, raw EHR records based on the Fast Healthcare Interoperability Resources (FHIR) format. We demonstrate that deep learning methods using this representation are capable of accurately predicting multiple medical events from multiple centers without site-specific data harmonization. We validated our approach using de-identified EHR data from two U.S. academic medical centers with 216,221 adult patients hospitalized for at least 24 hours. In the sequential format we propose, this volume of EHR data unrolled into a total of 46,864,534,945 data points, including clinical notes. Deep learning models achieved high accuracy for tasks such as predicting in-hospital mortality (AUROC across sites 0.93-0.94), 30-day unplanned readmission (AUROC 0.75-0.76), prolonged length of stay (AUROC 0.85-0.86), and all of a patient's final diagnoses (frequency-weighted AUROC 0.90). These models outperformed state-of-the-art traditional predictive models in all cases. We also present a case-study of a neural-network attribution system, which illustrates how clinicians can gain some transparency into the predictions. We believe that this approach can be used to create accurate and scalable predictions for a variety of clinical scenarios, complete with explanations that directly highlight evidence in the patient's chart.

Abstract

Predictive modeling with electronic health record (EHR) data is anticipated to drive personalized medicine and improve healthcare quality. Constructing predictive statistical models typically requires extraction of curated predictor variables from normalized EHR data, a labor-intensive process that discards the vast majority of information in each patient's record. We propose a representation of patients' entire, raw EHR records based on the Fast Healthcare Interoperability Resources (FHIR) format. We demonstrate that deep learning methods using this representation are capable of accurately predicting multiple medical events from multiple centers without site-specific data harmonization. We validated our approach using de-identified EHR data from two U.S. academic medical centers with 216,221 adult patients hospitalized for at least 24 hours. In the sequential format we propose, this volume of EHR data unrolled into a total of 46,864,534,945 data points, including clinical notes. Deep learning models achieved high accuracy for tasks such as predicting in-hospital mortality (AUROC across sites 0.93-0.94), 30-day unplanned readmission (AUROC 0.75-0.76), prolonged length of stay (AUROC 0.85-0.86), and all of a patient's final diagnoses (frequency-weighted AUROC 0.90). These models outperformed state-of-the-art traditional predictive models in all cases. We also present a case-study of a neural-network attribution system, which illustrates how clinicians can gain some transparency into the predictions. We believe that this approach can be used to create accurate and scalable predictions for a variety of clinical scenarios, complete with explanations that directly highlight evidence in the patient's chart.



2

All available data for each patient is converted to events recorded in containers based on the Fast Healthcare Interoperability Resource (FHIR) specification.

3

The FHIR resources are placed in temporal order, depicting all events recorded in the EHR (i.e. timeline). The deep learning model uses this full history to make each prediction.

Table 2: Prediction Accuracy of Each Task Made at Different Time Points

	Hospital A	Hospital B
Inpatient Mortality, AUROC[1](95% CI)		
24 hours before admission	0.87 (0.85-0.89)	0.81 (0.79-0.83)
At admission	0.90 (0.88-0.92)	0.90 (0.86-0.91)
24 hours after admission	**0.95**(0.94-0.96)	**0.93**(0.92-0.94)
Baseline (aEWS[2]) at 24 hours after admission	0.85 (0.81-0.89)	0.86 (0.83-0.88)
30-day Readmission, AUROC (95% CI)		
At admission	0.73 (0.71-0.74)	0.72 (0.71-0.73)
24 hours after admission	0.74 (0.72-0.75)	0.73 (0.72-0.74)
At discharge	**0.75**(0.75-0.78)	**0.76**(0.75-0.77)
Baseline (mHOSPITAL[3]) at discharge	0.70 (0.68-0.72)	0.68 (0.67-0.69)
Length of Stay at least 7 days AUROC (95% CI)		
At admission	0.81 (0.80-0.82)	0.80 (0.80-0.81)
24 hours after admission	**0.86**(0.86-0.87)	**0.85**(0.85-0.86)
Baseline (mLiu[4]) at 24 hours after admission	0.76 (0.75-0.77)	0.74 (0.73-0.75)
Discharge Diagnoses, (weighted AUROC)		
At admission	0.87	0.86
24 hours after admission	0.89	0.88
At discharge	**0.90**	**0.90**

[1] Area under the receiver operator curve
[2] augmented early warning score
[3] modified HOSPITAL score
[4] modified Liu score

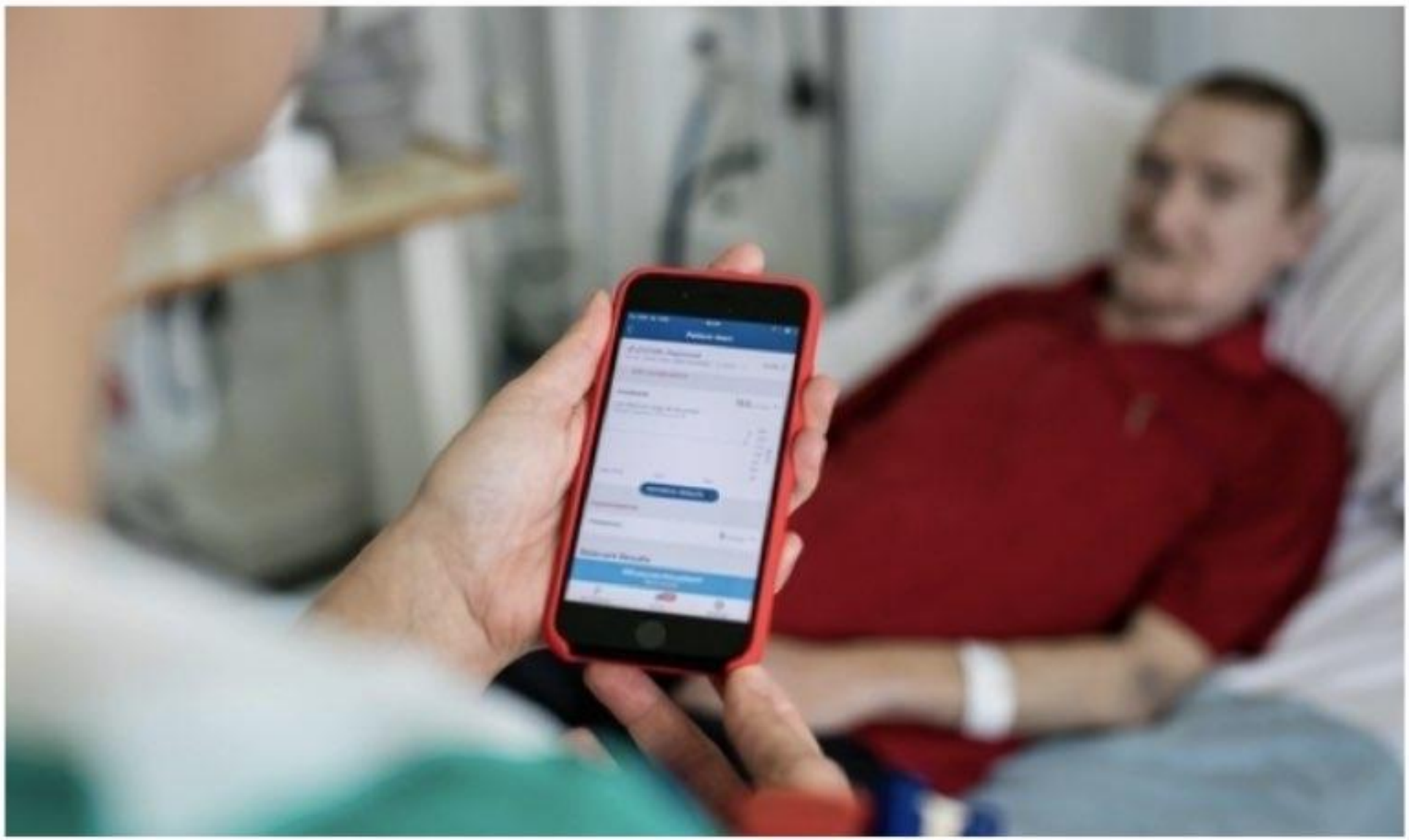
About DeepMind Health

Our relationship with Google

Google acquired DeepMind in 2014, because they were excited about the potential for our technology. As part of this acquisition, we agreed that DeepMind would continue to operate independently, and that we would put our technology at the service of other groups like the NHS in line with our social mission. DeepMind Health is our first effort to achieve this.

Most importantly, NHS patient data will only ever be used to help improve hospital care. No NHS patient data will ever be connected to Google accounts or services, and it won't ever be used for any commercial purposes like advertising or insurance. Doing so would be illegal, and would go against the ethical code that underpins our culture and work.

Google DeepMind's Streams technology branded 'phenomenal'



An NHS consultant nurse who is part of a team using an app which helps to detect early signs of kidney failure has branded it 'phenomenal'.

It should be made clear that the DeepMind Streams product does NOT use any AI. It's AKI alerting uses the standard NHS AKI algorithm (based on blood results + age).

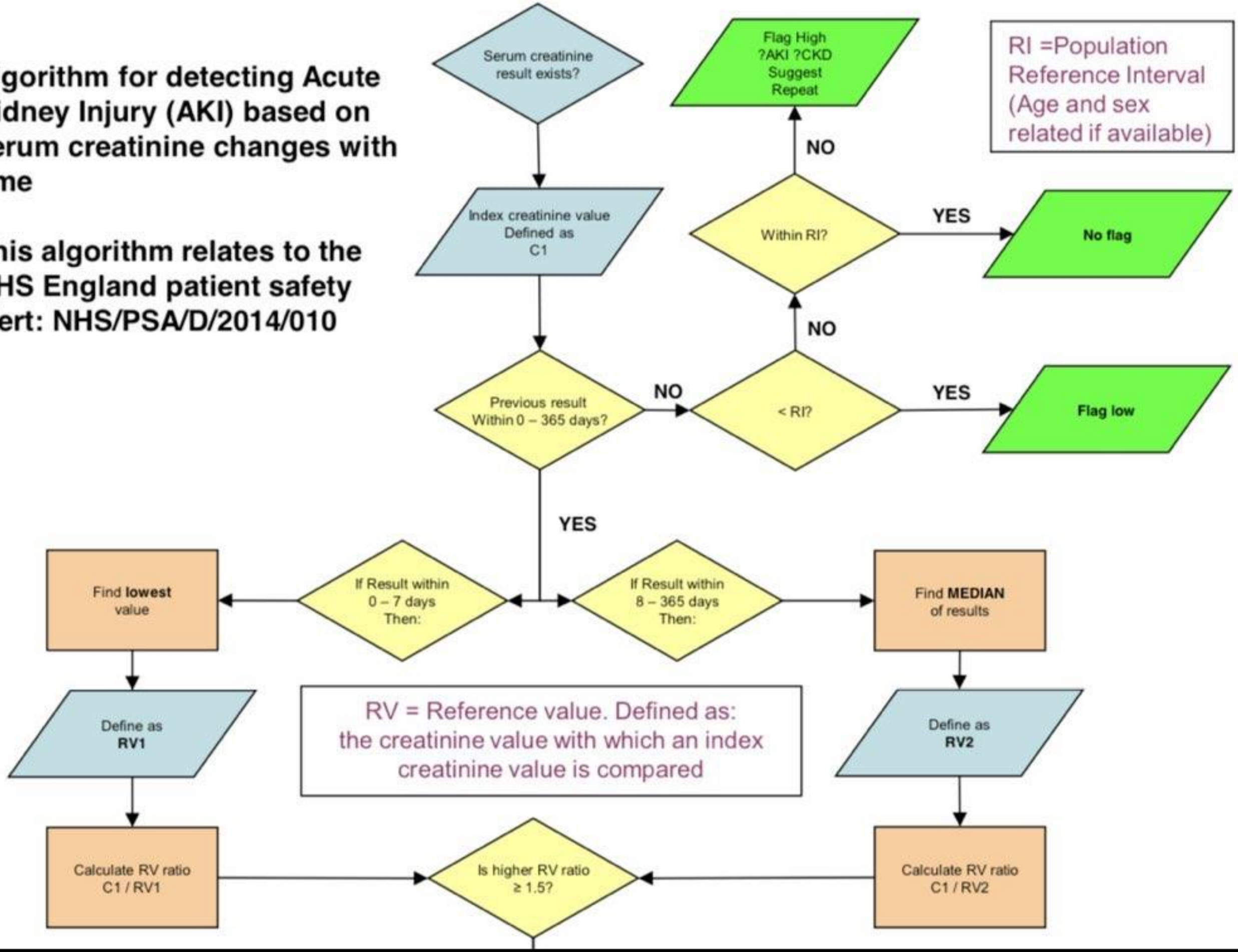
Royal Free (and presumably other customers) already use the AKI algorithm anyway, and the difference Streams makes is in facilitating the notification.

It should be made clear that the DeepMind Streams product does NOT use any AI. It's AKI alerting uses the standard NHS AKI algorithm (based on blood results + age).

Royal Free (and presumably other customers) already use the AKI algorithm anyway, and the difference Streams makes is in facilitating the notification.

Algorithm for detecting Acute Kidney Injury (AKI) based on serum creatinine changes with time

This algorithm relates to the NHS England patient safety alert: NHS/PSA/D/2014/010



Is age < 18 years?

YES

Serum creatinine > x3 ULRI?

NO

YES

ULRI = upper limit of reference interval

NO

Serum creatinine > 354 µmol/L?

YES

ALERT! ?AKI 3

NO

Has change occurred Within 48hrs?

NO

Report without alert. Send to authorisation Q If creatinine has Increased > 26 µmol/L In < 7 days. Consider requesting repeat if CKD unlikely.

YES

Is D > 26 µmol/L?

NO

Report without alert

YES

Is higher RV ratio ≥ 3.0?

YES

NO

Is higher RV ratio ≥ 2.0 and < 3.0?

YES

Alert! ?AKI 2

NO

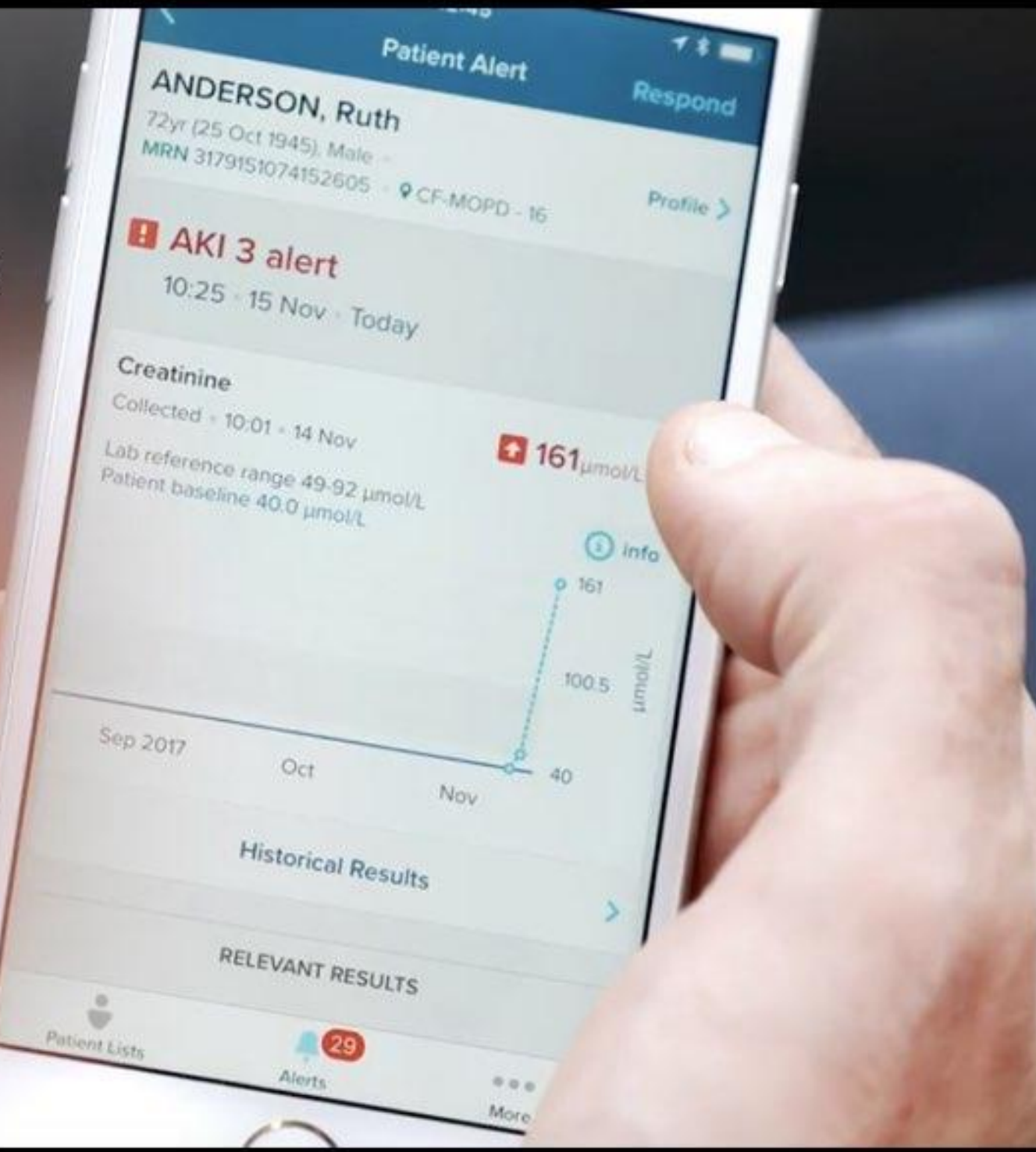
Is higher RV ratio ≥ 1.5 and < 2.0?

YES

ALERT! ?AKI 1

D = difference between current and lowest previous result within 48hrs

DeepMind's Streams app was designed in close collaboration with doctors and nurses to best meet their clinical needs



G Suite by Google Cloud

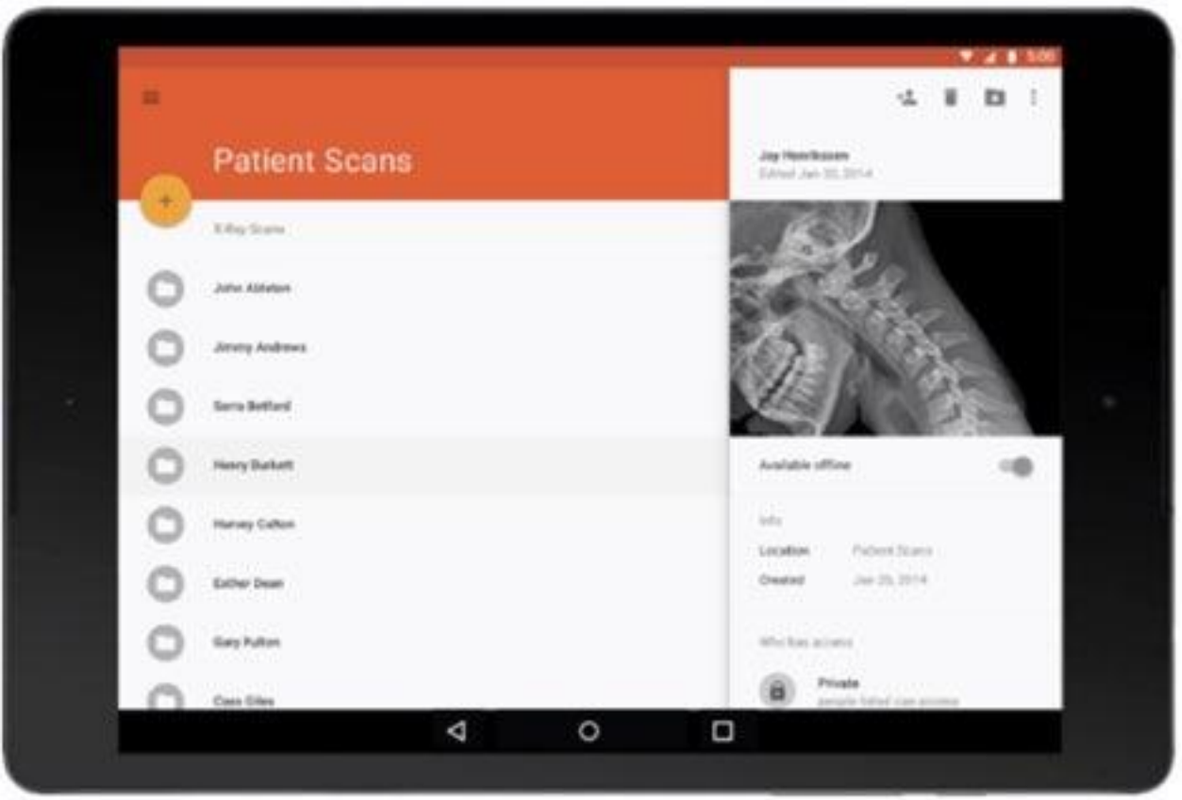
CONTACT US GET STARTED

Pricing Security Resources Support Sign in

Give patients fast, efficient service while meeting the strict requirements of regulations like HIPAA.

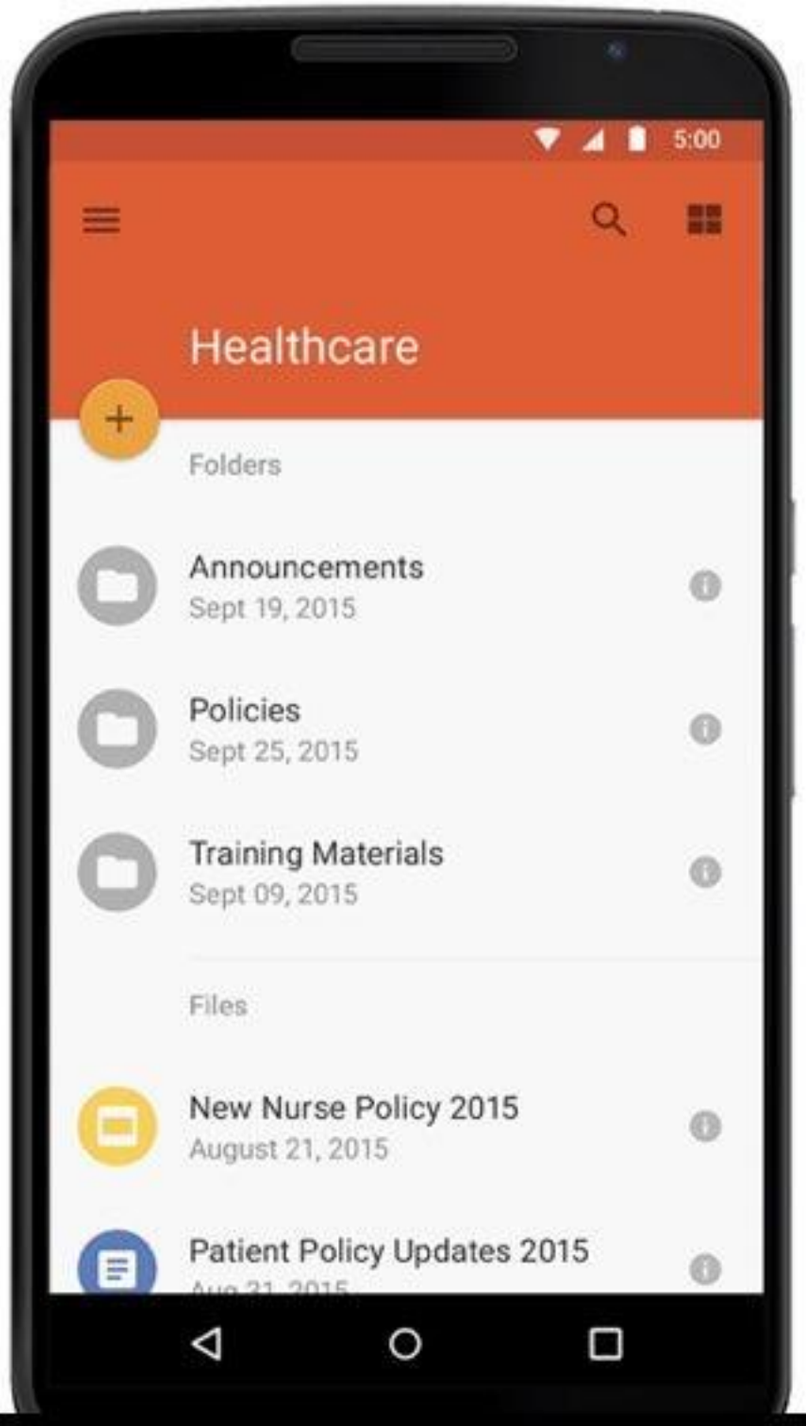
Provide HIPAA-compliant access to patient information.

- Store patient data files in a HIPAA-compliant repository in Google Drive.
- Use Google's mobile device management and encryption to keep the data secure.
- Allow authorized employees to access the information from any corporate-managed device.



Streamline operations by going paperless.

- Collaborate more efficiently by sharing X-rays, CT scans, and voice and video messages as digital files (up to 5TB each) on Drive.
- Access files through Google's secure environment to minimize the constraints of EHR/EMR applications.
- Eliminate inconsistent and outdated versions of documents.

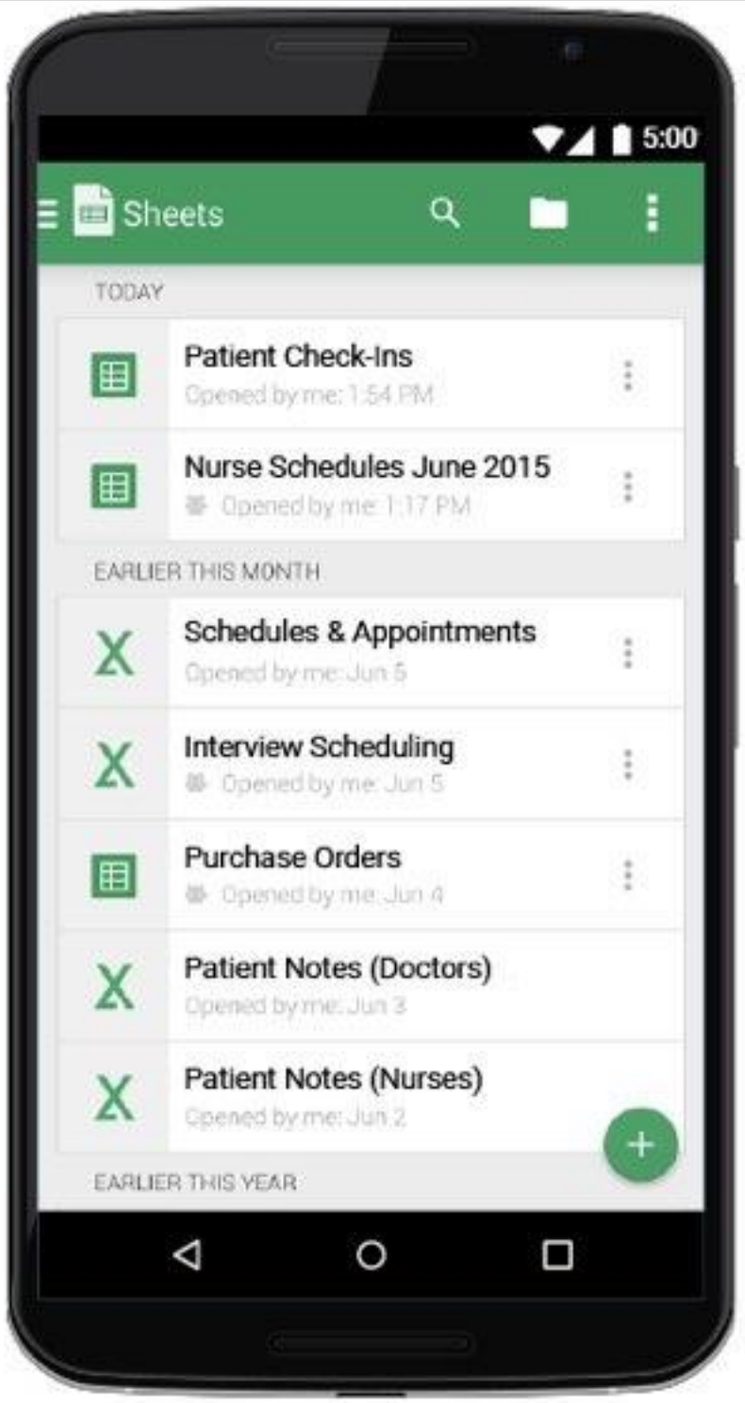


Create an information hub for important updates and documents.

- Move all your internal communications, announcements, policy updates and training materials to Drive.
- Link to everything from an easy-to-build Google Sites website.
- Give access to all employees, or just a select group.

Improve the patient experience with fast, simple service.

- Start every visit by having patients complete online Google Forms surveys to provide their intake information.
- Forms data goes straight into Google Sheets where doctors and nurses can add their own notes.
- Staff members see the information in real time and can follow up with patients immediately.



Make mobile healthcare easier.

- Keep patient information in Google Docs, Sheets or other files stored in Google Drive.
- Access and update the information from anywhere using laptops, tablets or smartphones.
- Get more face time with remote patients by using Google Hangouts for video conferencing.

apigee

Data Interoperability with Apigee Health APIx

Patients expect that their smartphone health and fitness apps will extend to interaction with their healthcare information and providers. The analysis of data collected from apps and wearable devices enables new treatments, better diagnosis and outcomes, and will help realize the promise of connected healthcare.

An Accelerator for Digital Healthcare

The Apigee Health APIx solution makes it easy for healthcare providers, including hospitals and clinics, to connect with app developers and health data partners to build new FHIR API-based digital services. It simplifies and accelerates interoperability and innovation by providing services that are ready for immediate use as well as cloud infrastructure to bootstrap internal and external innovation.

This solution is built on Apigee Edge, an enterprise-grade platform for managing, securing, and scaling APIs. It is FHIR-server agnostic, enabling healthcare companies to easily ingest health data from internal, external, or open-source FHIR-ready partners.

Introducing Apigee Health APIx: Advancing Patient Data Interoperability

FHIR STANDARD

Fast Healthcare Interoperability Resources

A standard that outlines data formats and APIs
for exchanging electronic health records

apigee

FHIR STANDARD

Fast Healthcare Interoperability Resources

2018

All patient data must be exposed via APIs.

Google is intent on becoming a force in EHRs, which is a business that is begging to be disrupted

MD Anderson Cancer Center to cut 900 jobs due to losses from EHR rollout

By Maria Castellucci | January 6, 2017

The University of Texas MD Anderson Cancer Center will cut about 800 to 900 people from its payroll, or 5% of its workforce, as it tries to recover from financial losses after implementing its electronic health record.

The Houston-based cancer center reported significant losses in fiscal 2016 partly because of a difficult adaptation of its new Epic Systems network, the Wall Street Journal reported.

RELATED CONTENT

MD Anderson looks for new ways to resolve faculty conflict

UMass Memorial posts earnings loss due to massive EHR rollout

MD Anderson Cancer Center President DePinho on why value-based care is about outcomes

EHRs steal primary care doctors face time with patients, study finds

New research determined that providers spend more than half of clinic visits working with their EHRs than they do interacting with patients.

GOOGLE GENOMICS

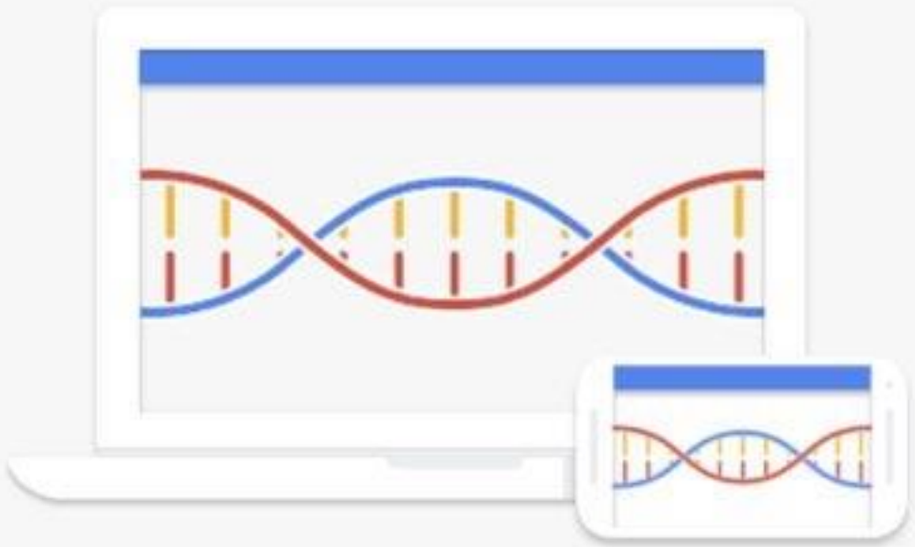
Ask bigger questions by efficiently processing up to petabytes of genomic data

TRY IT FREE

DOWNLOAD WHITEPAPER

Power Your Science

Google Genomics helps the life science community organize the world's genomic information and make it accessible and useful. Big genomic data is here today, with petabytes rapidly growing toward exabytes. Through our extensions to Google Cloud Platform, you can apply the same technologies that power Google Search and Maps to securely store, process, explore, and share large, complex datasets.

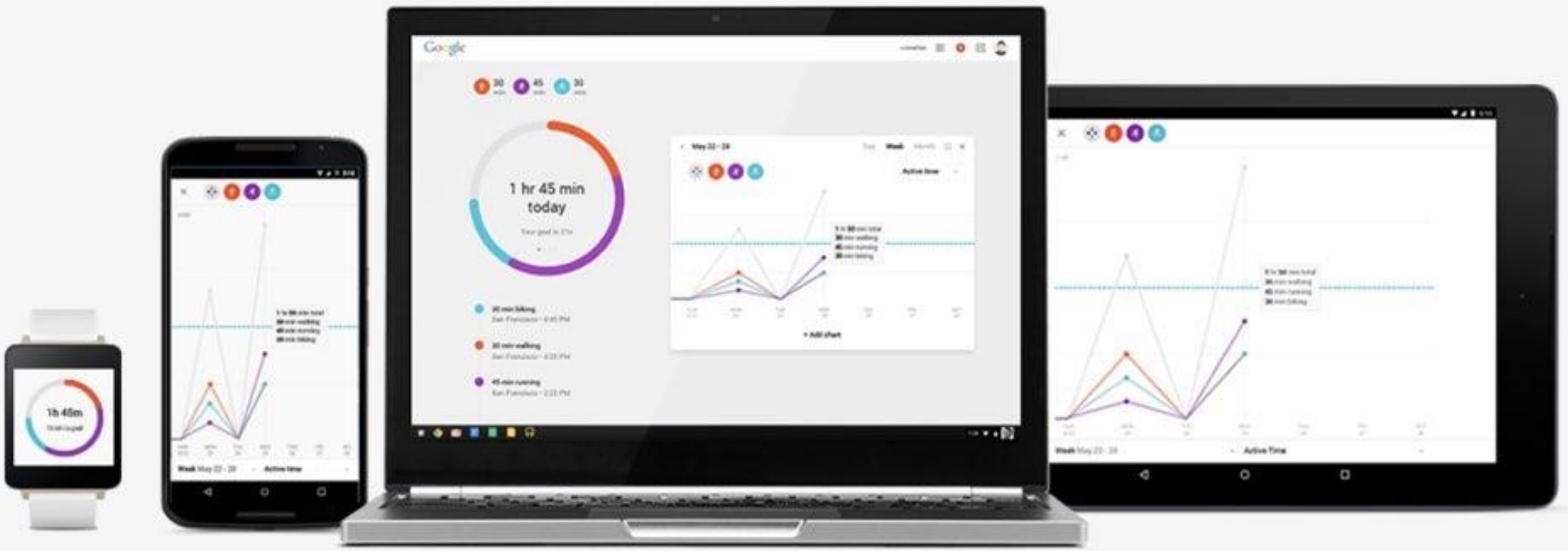


Google Fit

Get Google

Monitor progress from anywhere

Get daily, weekly, or monthly views of your fitness. Check your progress from your phone, tablet, computer, or Android Wear watch.



Google Research Blog

The latest news from Research at Google

Assisting Pathologists in Detecting Cancer with Deep Learning

Friday, March 03, 2017

Posted by Martin Stumpe, Technical Lead, and Lily Peng, Product Manager

A pathologist's report after reviewing a patient's biological tissue samples is often the gold standard in the diagnosis of many diseases. For cancer in particular, a pathologist's diagnosis has a profound impact on a patient's therapy. The reviewing of pathology slides is a very complex task, requiring years of training to gain the expertise and experience to do well.

Even with this extensive training, there can be substantial variability in the diagnoses given by different pathologists for the same patient, which can lead to misdiagnoses. For example, agreement in diagnosis for some forms of breast cancer can be as low as 48%, and similarly low for prostate cancer. The lack of agreement is not surprising given the massive amount of information that must be reviewed in order to make an accurate diagnosis. Pathologists are responsible for reviewing all the biological tissues visible on a slide. However, there can be many slides per patient, each of which is 10+ gigapixels when digitized at 40X magnification. Imagine having to go through a thousand 10 megapixel (MP) photos, and having to be responsible for every pixel. Needless to say, this is a lot of data to cover, and often time is limited.

Google Research Blog

The latest news from Research at Google

Deep Learning for Detection of Diabetic Eye Disease

Tuesday, November 29, 2016

Posted by Lily Peng MD PhD, Product Manager and Varun Gulshan PhD, Research Engineer

Diabetic retinopathy (DR) is the fastest growing cause of blindness, with nearly 415 million diabetic patients at risk worldwide. If caught early, the disease can be treated; if not, it can lead to irreversible blindness. Unfortunately, medical specialists capable of detecting the disease are not available in many parts of the world where diabetes is prevalent. We believe that Machine Learning can help doctors identify patients in need, particularly among underserved populations.

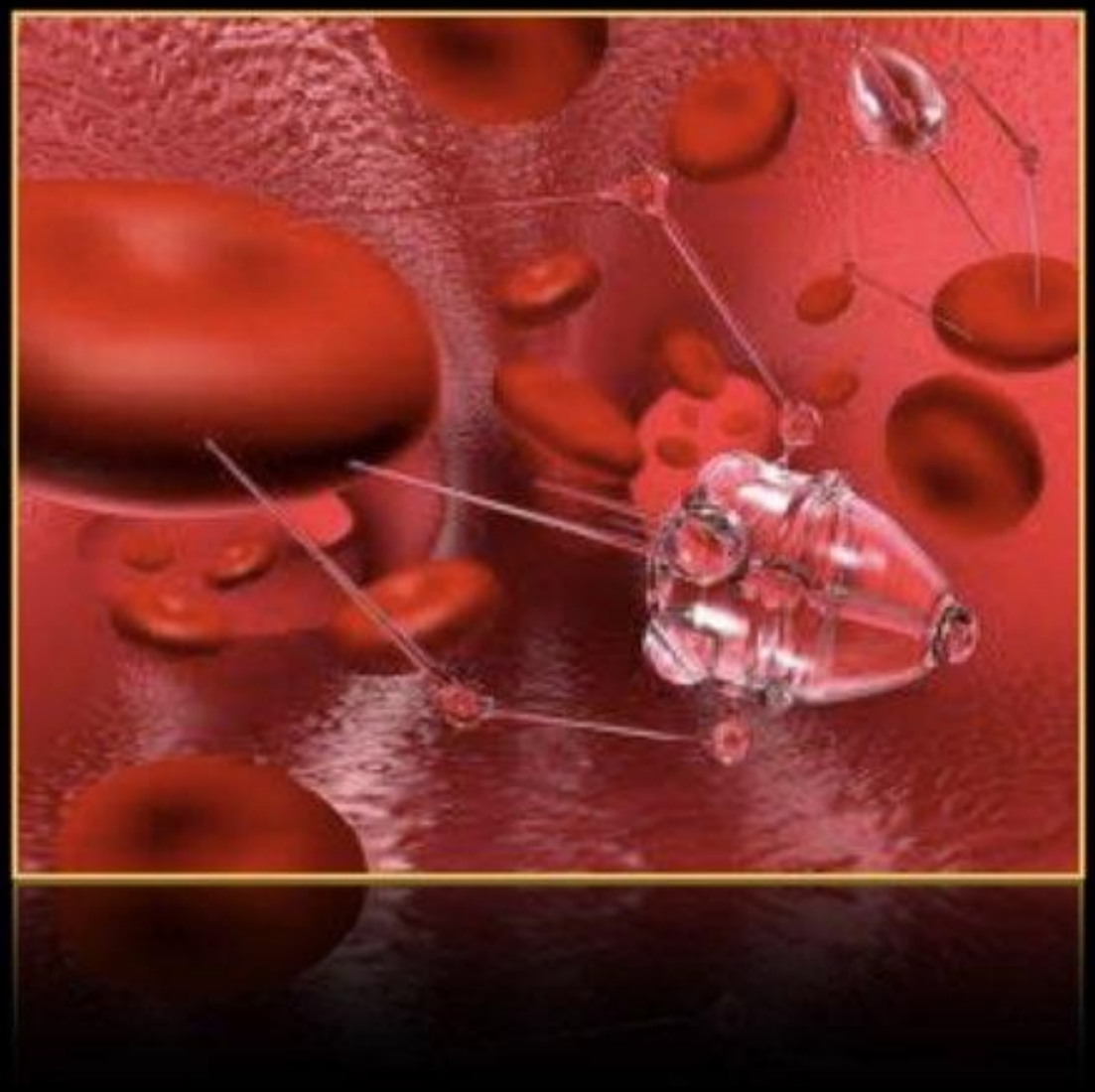
A few years ago, several of us began wondering if there was a way Google technologies could improve the DR screening process, specifically by taking advantage of recent advances in Machine Learning and Computer Vision. In "Development and Validation of a Deep Learning Algorithm for Detection of Diabetic Retinopathy in Retinal Fundus Photographs", published today in JAMA, we present a deep learning algorithm capable of interpreting signs of DR in retinal photographs, potentially helping doctors screen more patients in settings with limited resources.

We're tackling aging, one of life's greatest mysteries.

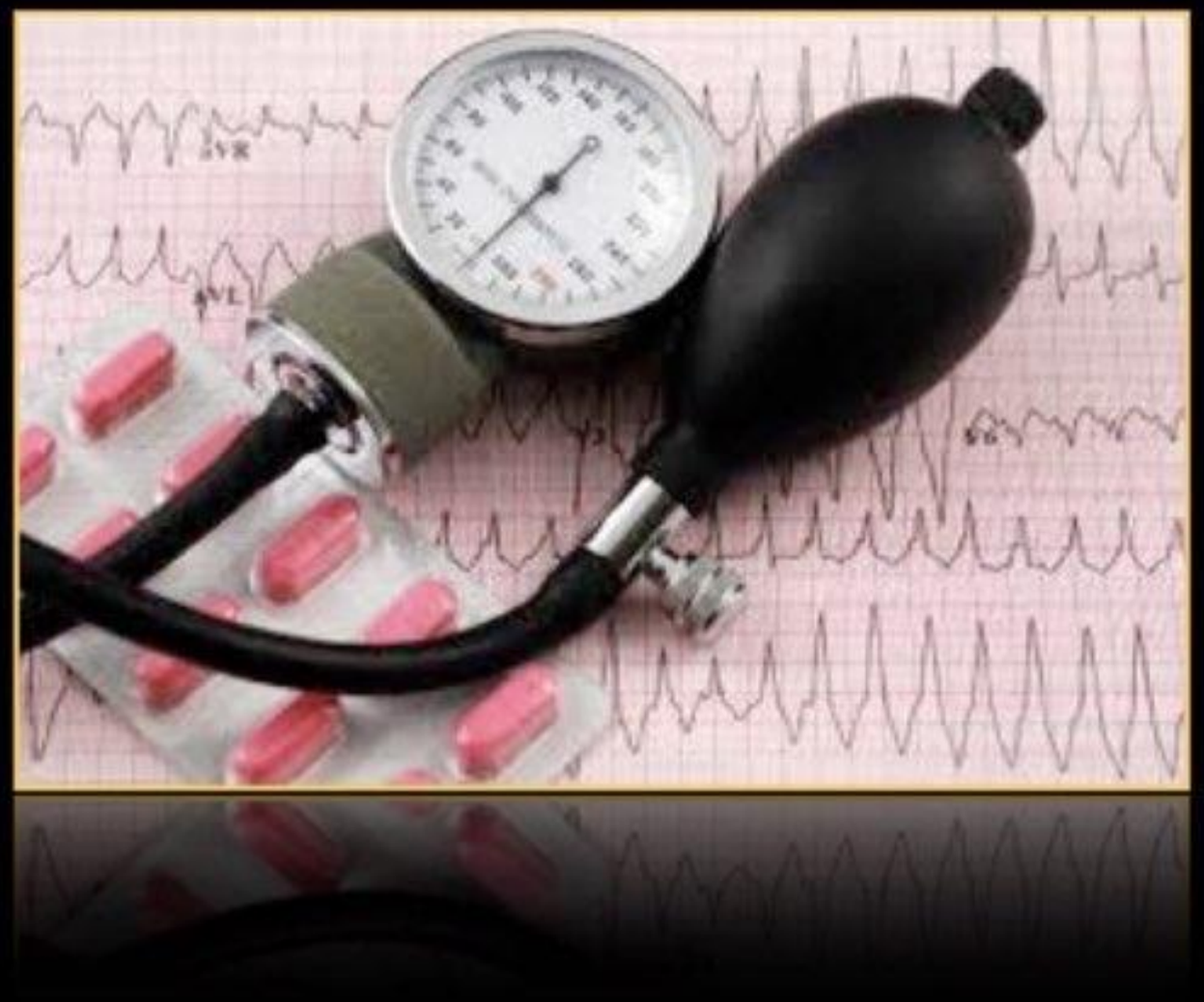
Calico is a research and development company whose mission is to harness advanced technologies to increase our understanding of the biology that controls lifespan. We will use that knowledge to devise interventions that enable people to lead longer and healthier lives. Executing on this mission will require an unprecedented level of interdisciplinary effort and a long-term focus for which funding is already in place.

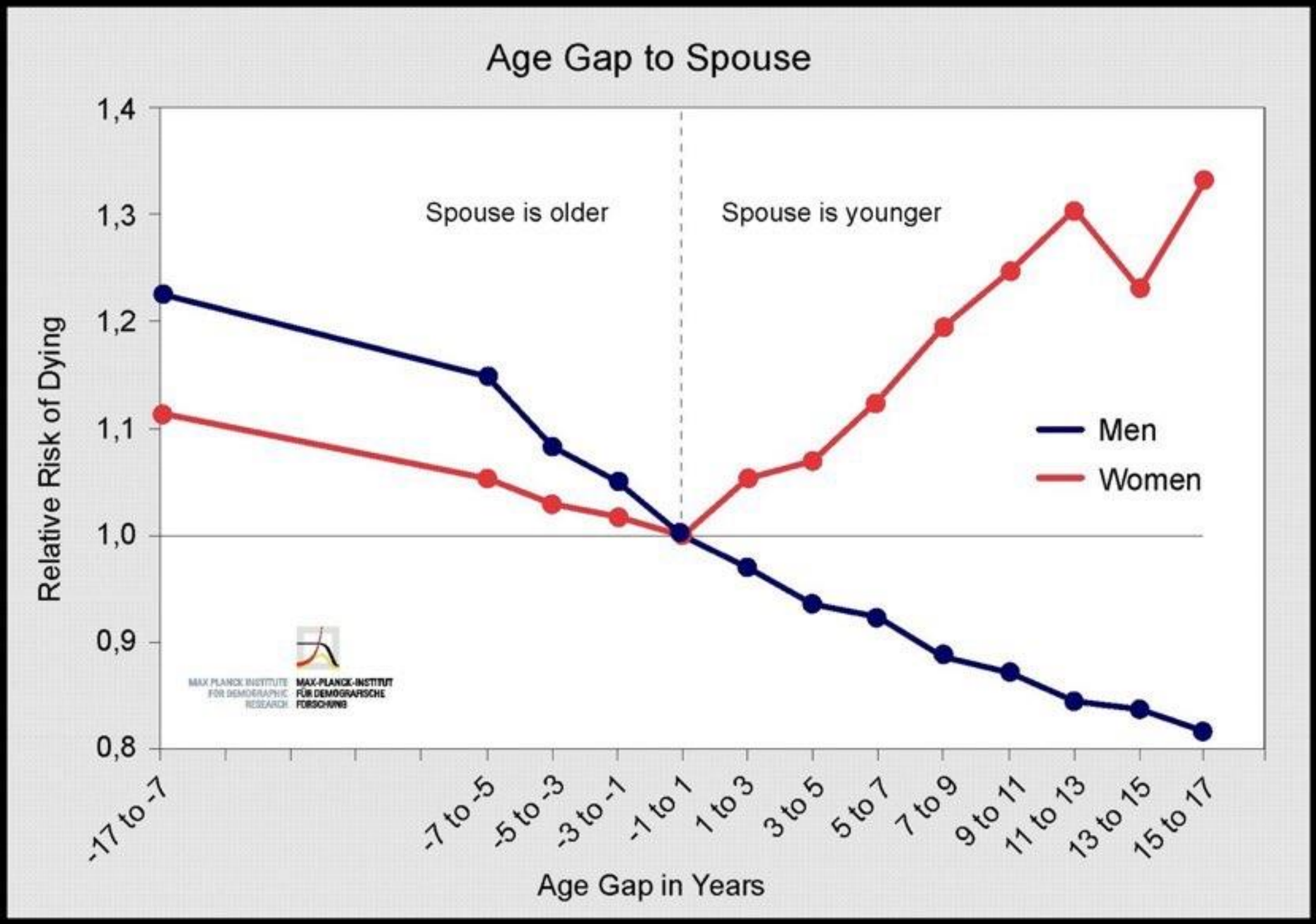
Jeanne Calmet - 122 years old

Nanotech



Happy Accidents




Age Gap to Spouse
Spouse is older
Spouse is younger
Men
Women
Relative Risk of Dying
1,4
1,3
1,2
1,1
1,0
0,9
0,8
MAX PLANCK INSTITUTE FOR DEMOGRAPHIC RESEARCH
MAX-PLANCK-INSTITUT FÜR DEMOGRAFISCHE FORSCHUNG
-17 to -7
-7 to -5
-5 to -3
-3 to -1
-1 to 1
1 to 3
3 to 5
5 to 7
7 to 9
9 to 11
11 to 13
13 to 15
15 to 17
Age Gap in Years

Drinking a cup of coffee may add nine minutes per day to your life

share

24

A daily cup of coffee could add months to your life, a new study suggests CREDIT: ALAMY

By **Sarah Knapton,** SCIENCE EDITOR

11 JULY 2017 • 7:10AM

Neurology®

The most widely read and highly cited peer-reviewed neurology journal

SHARE

May 02, 2018 ARTICLE

Sauna bathing reduces the risk of stroke in Finnish men and women

A prospective cohort study

Setor K. Kunutsor, Hassan Khan, Francesco Zaccardi, Tanjaniina Laukkanen, Peter Willeit, Jari A. Laukkanen

First published May 2, 2018, DOI: https://doi.org/10.1212/WNL.0000000000005606

FULL PDF CITATION PERMISSIONS COMMENT

Check for updates

Am score 923

Downloads 153

Those who hit the sauna at least four times a week were about 60 percent less likely to suffer a stroke over the next 15 years — versus people who had only one weekly sauna session.

Original Investigation

April 2015

Association Between Sauna Bathing and Fatal Cardiovascular and All-Cause Mortality Events

Tanjaniina Laukkanen, MSc[1]; Hassan Khan, MD, PhD[2]; Francesco Zaccardi, MD[3]; et al

Author Affiliations | Article Information

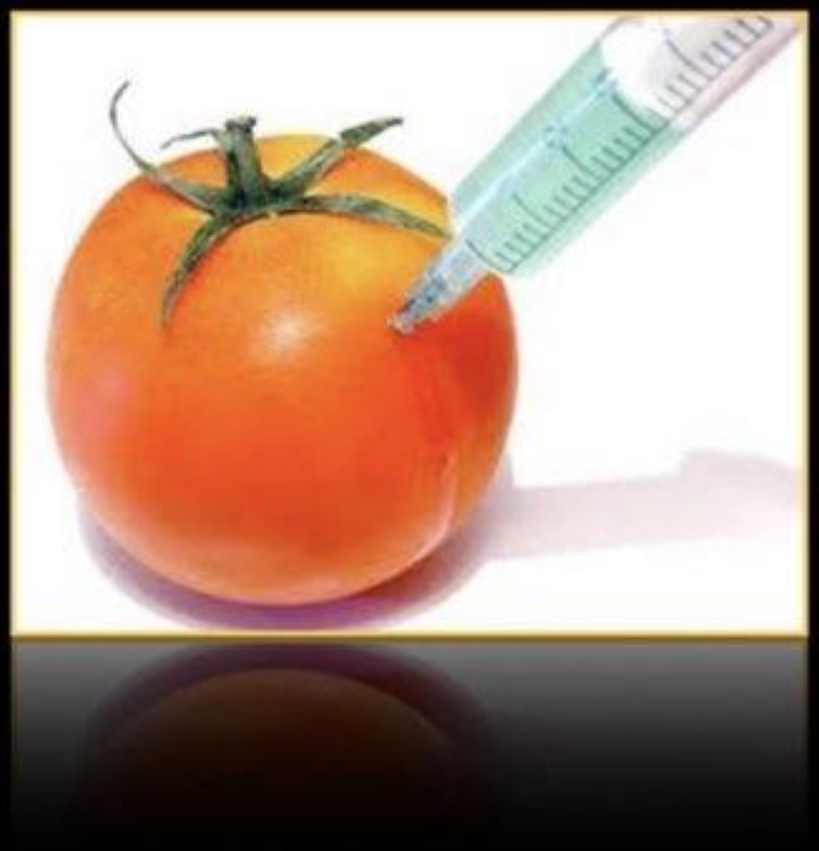
JAMA Intern Med. 2015;175(4):542-548. doi:10.1001/jamainternmed.2014.8187

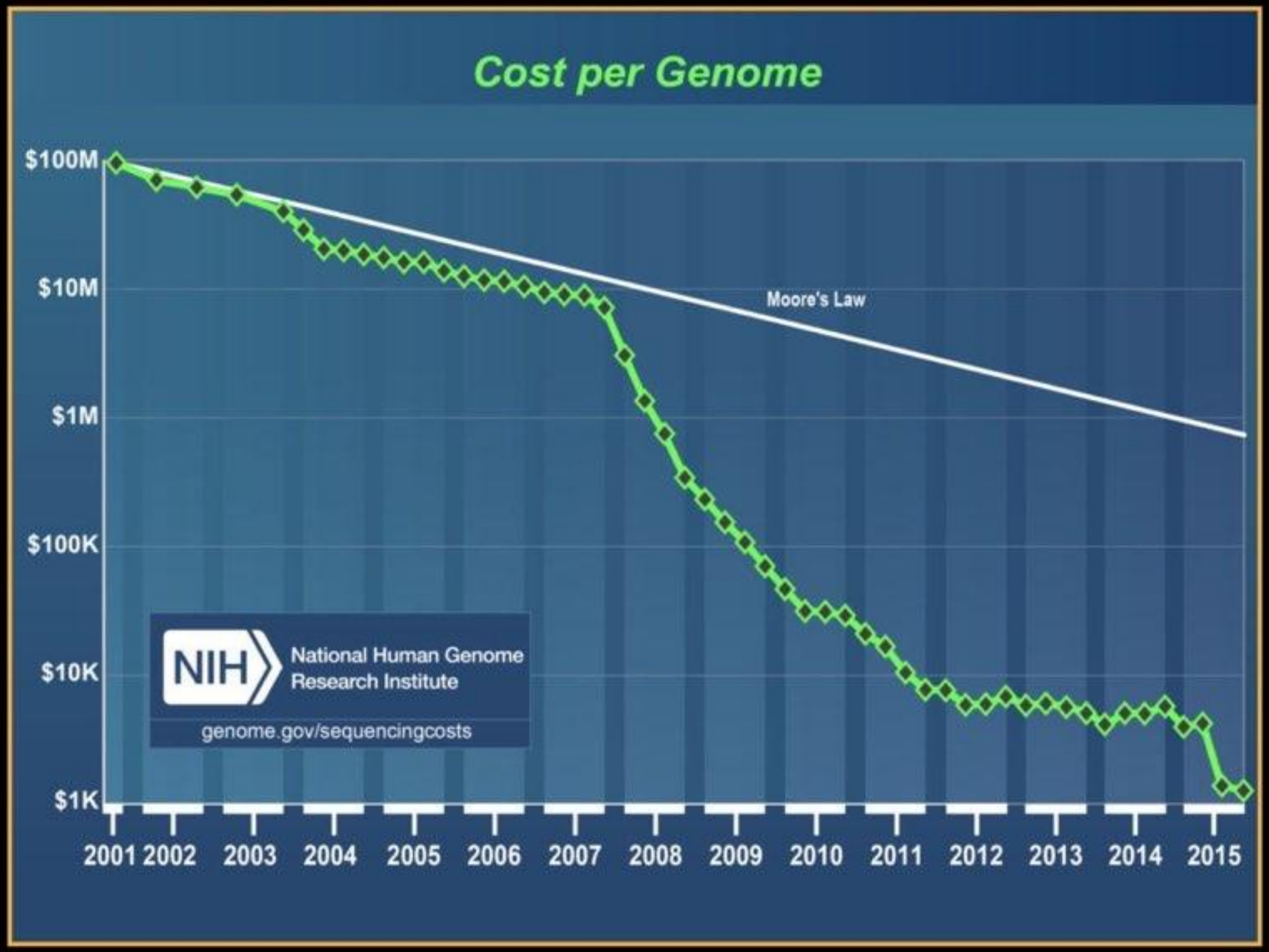
Men who utilized the sauna, two to three times weekly experienced **27% less** fatal cardiovascular events than those who only used the sauna one time per week.

Even more impressive, men who utilized saunas, four to seven times weekly were **50% less** likely to encounter fatal cardiovascular disease.

Fatal cardiovascular disease was not the only disease reduced by sauna use. The men who used the sauna, two to three times per week had a **24% lower all-cause mortality rate**, and those using it four to seven times had a **40% lower all-cause mortality rate**.

Genetic Tinkering

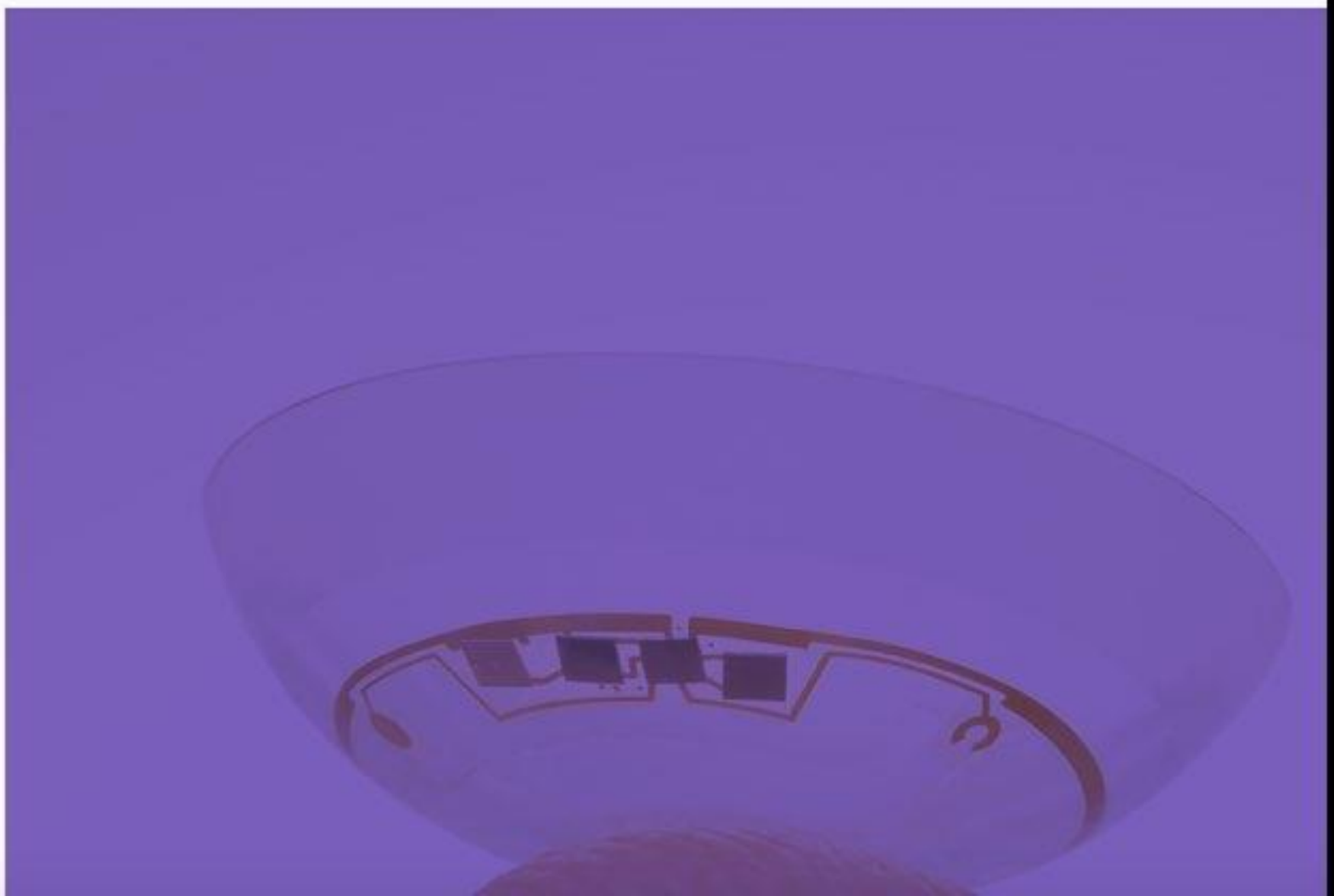



Cost per Genome
$100M
$10M
$1M
$100K
$10K
$1K
Moore's Law
NIH
National Human Genome Research Institute
genome.gov/sequencingcosts
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

Smart Lens Program

What is the smart lens program?

Verily and Alcon are working on smart ocular devices, including a glucose-sensing lens for continuous monitoring of glucose levels and an accommodating contact lens for people with presbyopia (age-related farsightedness). This ambitious program represents one of our strategies for helping patients: adding intelligence to objects that people use routinely in their everyday lives.



Study Watch

What is the program?

Study Watch is an investigational medical device intended for seamless and scalable data collection in clinical studies conducted by Verily and its research partners. The device is designed to leverage specialized sensors and robust cloud infrastructure to capture and analyze physiological and environmental data. Study Watch also features a premium industrial design and an always-on display to appeal to a broad range of users for long-term wear.

Interventions

Debug

Stopping the spread of disease-carrying mosquitoes by rearing and releasing millions of sterile males.

READ MORE

Galvani Bioelectronics

Creating bioelectronic medicines to tackle a wide range of chronic diseases with **GlaxoSmithKline**.

READ MORE

Liftware

Helping people with hand tremor or limited hand and arm mobility to eat with confidence and independence.

READ MORE

Retinal Imaging

Working with **Nikon** (including its subsidiary Optos) and Google Research to develop machine learning-enabled solutions for diabetes related eye disease.

READ MORE

Verb Surgical

Advancing surgical robotics to benefit surgeons, patients, and hospitals, in partnership with **Ethicon**, a division of Johnson & Johnson.

READ MORE

Precision medicine

MS Observational Study

Working with **Biogen** and **Brigham and Women's Hospital** to research environmental, biological and other contributing factors to multiple sclerosis to determine early intervention options.

READ MORE

One Brave Idea

Pioneering an unprecedented research award with the **American Heart Association** and **AstraZeneca** focused on preventing or reversing coronary heart disease and ultimately improving cardiovascular health.

READ MORE

Personalized Parkinson's Project

Researching the course of Parkinson's disease with **Radboud UMC** and **ParkinsonNet** to identify biological and physiological markers and inform better treatments.

READ MORE

Precision Medicine Initiative

Supporting development of the Data and Research Support Center for the **NIH**'s *All of Us* Research Program.

READ MORE

Project Baseline

Embarking on a landmark effort including a study with **Duke University** and **Stanford Medicine** to develop a rich dataset and research platform to better characterize transitions in health.

READ MORE

Project Baseline

APPLY

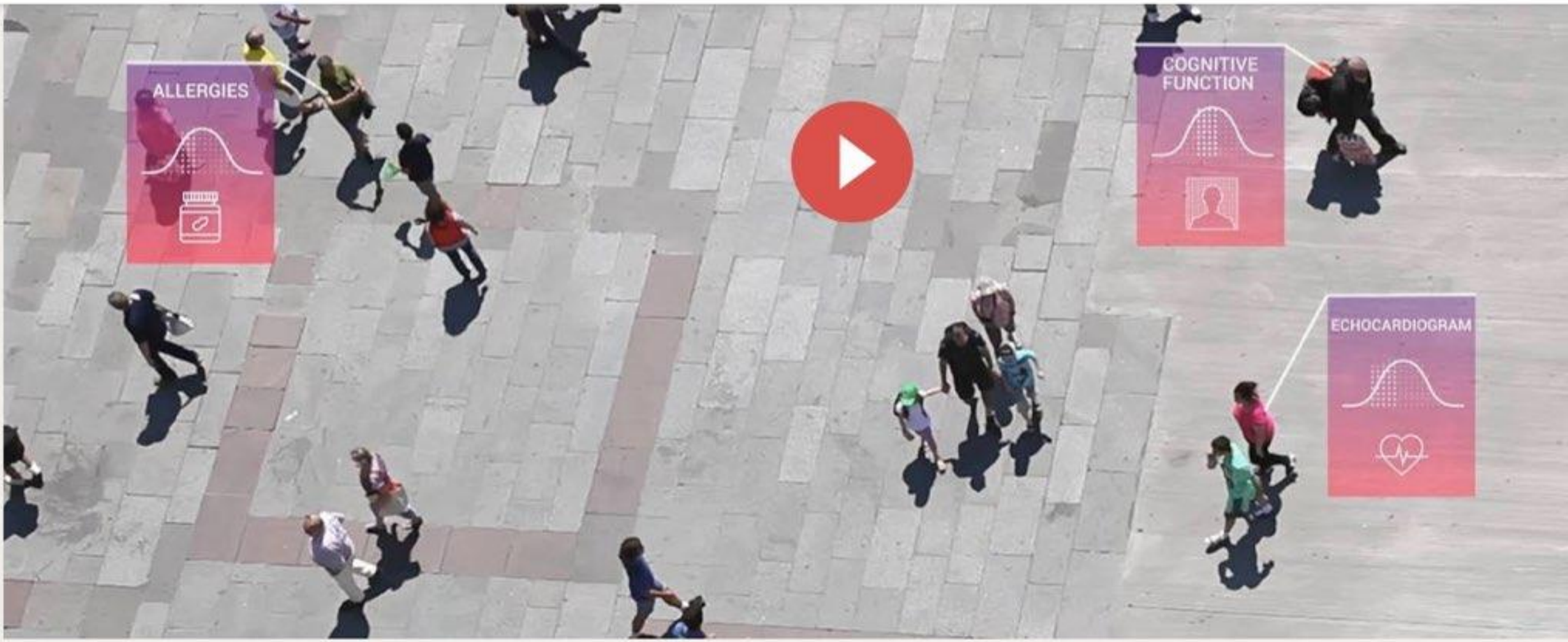
WE'VE MAPPED THE WORLD.
NOW LET'S MAP HUMAN HEALTH.

verily

Duke University School of Medicine

Stanford MEDICINE

Google



It begins with you.

The first initiative of Project Baseline is a study led by Verily, Duke University School of Medicine, Stanford Medicine, and Google. We are seeking around 10,000 people to represent different ages, backgrounds, and medical histories on behalf of humanity over four years. Starting in the US, if you are at least 18 years old, you may be eligible to:

X-RAY
ECHOCARDIOGRAM
SYMPTOMS
GENETICS
DIET TODAY

nature biomedical engineering

Altmetric: 1360 More detail »

Article

Prediction of cardiovascular risk factors from retinal fundus photographs via deep learning

Ryan Poplin, Avinash V. Varadarajan, Katy Blumer, Yun Liu, Michael V. McConnell, Greg S. Corrado, Lily Peng & Dale R. Webster

Nature Biomedical Engineering (2018)
doi:10.1038/s41551-018-0195-0
Download Citation

Cardiology | Computational science | Engineering | Risk factors

Received: 23 August 2017
Accepted: 12 January 2018
Published online: 19 February 2018

Google

Google Cloud

Apigee Health API

GSuite for healthcare

Google Genomics

Google Fit

Google Search

Google Research

Calico

Deep Mind

Verily

amazon

The attitude of most companies is

‘This thing runs at 10m/s. How can we make it run at 12 m/s?‘

Whereas Amazon takes the opposite view:

‘Are there any laws of physics that prevent this running at 100,000m/s? if not, how do we get it to do this?’

amazon

INTERFACE

PHARMA ⟷ SUPPLIES ⟷ EHR

The Economist

According to a survey by Cowen, an investment bank, 67% of Amazon Prime customers would like to buy prescription drugs on the website. Amazon could be earning as much as $10bn a year from drugs by 2023, it reckons.

Amazon's Advantages

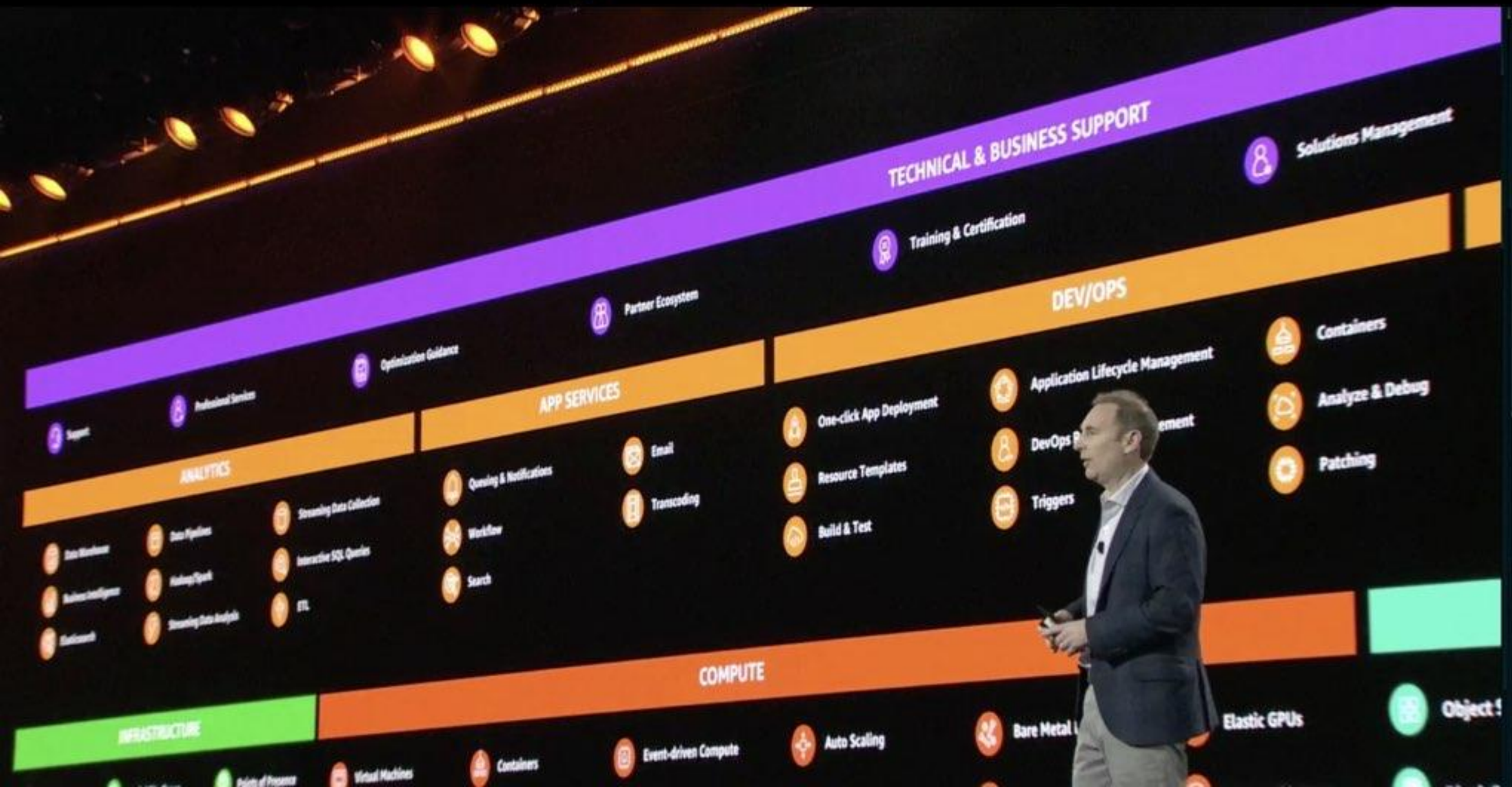
CUSTOMERS

Amazon's Advantages

LOGISTICS

Amazon's Advantages

BIG, BIG DATA



Amazon's Advantages

BIG, BIG DATA

Compute

EC2
Lightsail
Elastic Container Service
Lambda
Batch
Elastic Beanstalk

Storage

S3
EFS
Glacier
Storage Gateway

Database

Relational Database Service
DynamoDB
ElastiCache
Amazon Redshift

Migration

AWS Migration Hub
Application Discovery Service
Database Migration Service
Server Migration Service
Snowball

Networking & Content Delivery

VPC
CloudFront
Route 53
API Gateway
Direct Connect

Developer Tools

CodeStar
CodeCommit
CodeBuild
CodeDeploy
CodePipeline
Cloud9
X-Ray

Management Tools

CloudWatch
AWS Auto Scaling
CloudFormation
CloudTrail
Config
OpsWorks
Service Catalog
Systems Manager
Trusted Advisor
Managed Services

Media Services

Elastic Transcoder
Kinesis Video Streams
MediaConvert
MediaLive
MediaPackage
MediaStore
MediaTailor

Machine Learning

Amazon SageMaker
Amazon Comprehend
AWS DeepLens
Amazon Lex
Machine Learning
Amazon Polly
Rekognition
Amazon Transcribe
Amazon Translate

Analytics

Athena
EMR
CloudSearch
Elasticsearch Service
Kinesis
QuickSight
Data Pipeline
AWS Glue

Security, Identity & Compliance

IAM
Cognito
GuardDuty
Inspector
Amazon Macie
AWS Single Sign-On
Certificate Manager
CloudHSM
Directory Service
WAF & Shield
Artifact

Mobile Services

Mobile Hub
AWS AppSync
Device Farm
Mobile Analytics

AR & VR

Amazon Sumerian

Application Integration

Step Functions
Amazon MQ
Simple Notification Service
Simple Queue Service
SWF

Customer Engagement

Amazon Connect
Pinpoint
Simple Email Service

Business Productivity

Alexa for Business
Amazon Chime
WorkDocs
WorkMail

Desktop & App Streaming

WorkSpaces
AppStream 2.0

Internet Of Things

AWS IoT
IoT Analytics
IoT Device Management
Amazon FreeRTOS
AWS Greengrass

Game Development

Amazon GameLift

amazon

INTERFACE

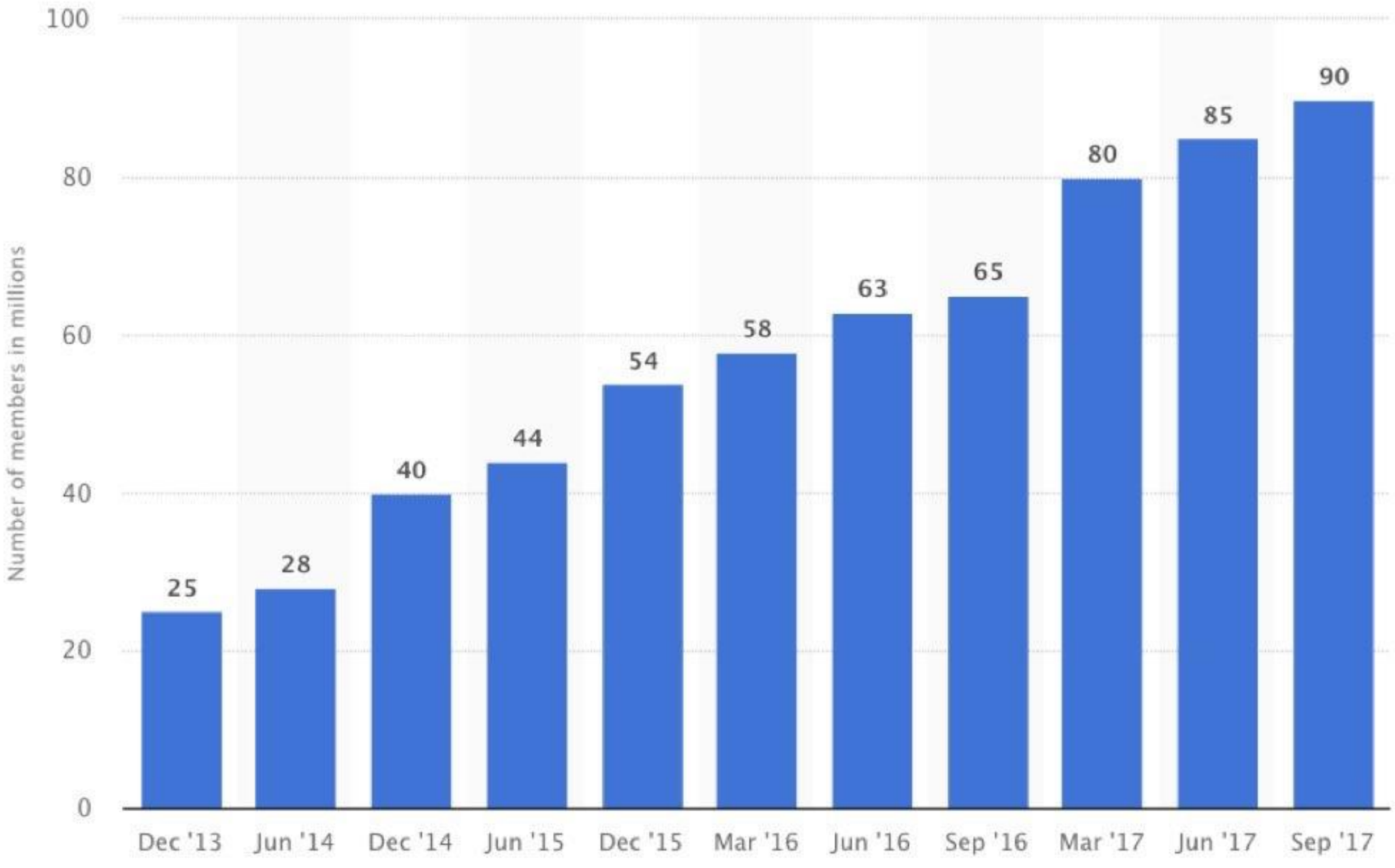
PHARMA ⟷ SUPPLIES ⟷ EHR

PHARMA

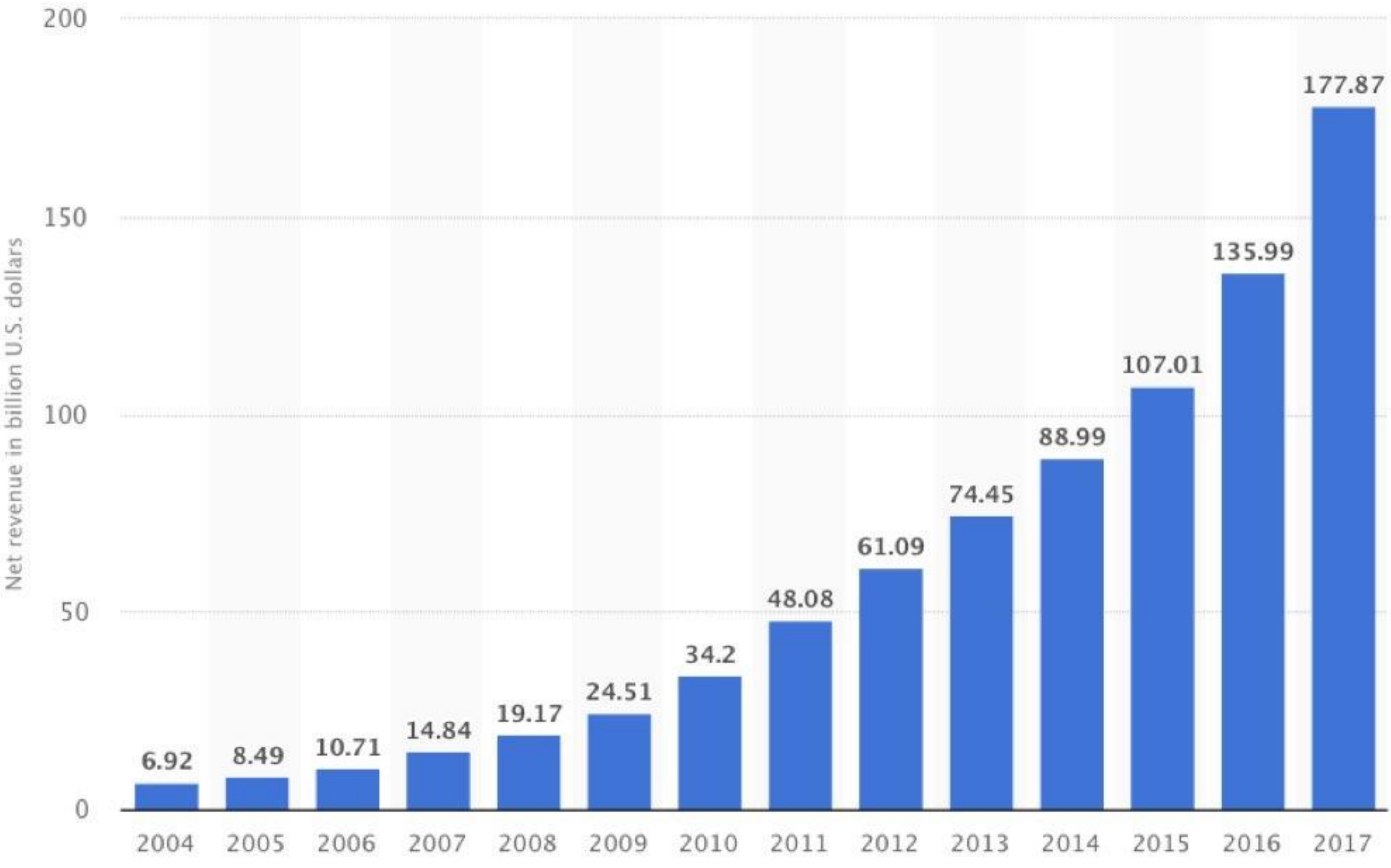
Amazon's Advantages

CUSTOMERS

Amazon Prime Members



Amazon Revenue



LIVE
NASDAQ
SQUAWK BOX
AMAZON CONSIDERING
ENTERING PHARMACY BUSINESS
CNBC

Amazon is hiring people to break into the multibillion-dollar pharmacy market

- Each year, Amazon holds an annual meeting to discuss whether it should break into the pharmacy market, said a source familiar.
- This year, it is getting more serious and Amazon is looking to hire a general manager.
- Industry experts say this could be a multibillion market opportunity for the e-commerce company.

Christina Farr | @chrissyfarr

Published 8:23 PM ET Tue, 16 May 2017 | Updated 10:19 AM ET Wed, 17 May 2017

CNBC

THE WALL STREET JOURNAL.

Amazon has been applying for pharmacy licenses in certain states over the past few months, which a company spokeswoman says is required for Amazon Business to sell such professional-use medical products.

BUSINESS

Amazon launches same-day delivery service for food and medicine

BY SHUSUKE MURAI
STAFF WRITER

Drug store > Pharmaceuticals / designated drugs

[Class 1 drugs] Loxonin S 12 tablets * Self-medication tax target items

Daiichi Sankyo Healthcare

Reference price: ~~¥ 700~~

price: ¥ 630 Shipping ¥ 2,000 or more order in the **Eligible for FREE Super Saver Shipping.** Details

OFF: ¥ 70 (10%)

In stock. Availability for

This item is sold and shipped by Amazon.co.jp .

- Contents amount: 12 tablets

This product is Class 1 drug. It will be shipped after confirmation of proper use by the pharmacist.

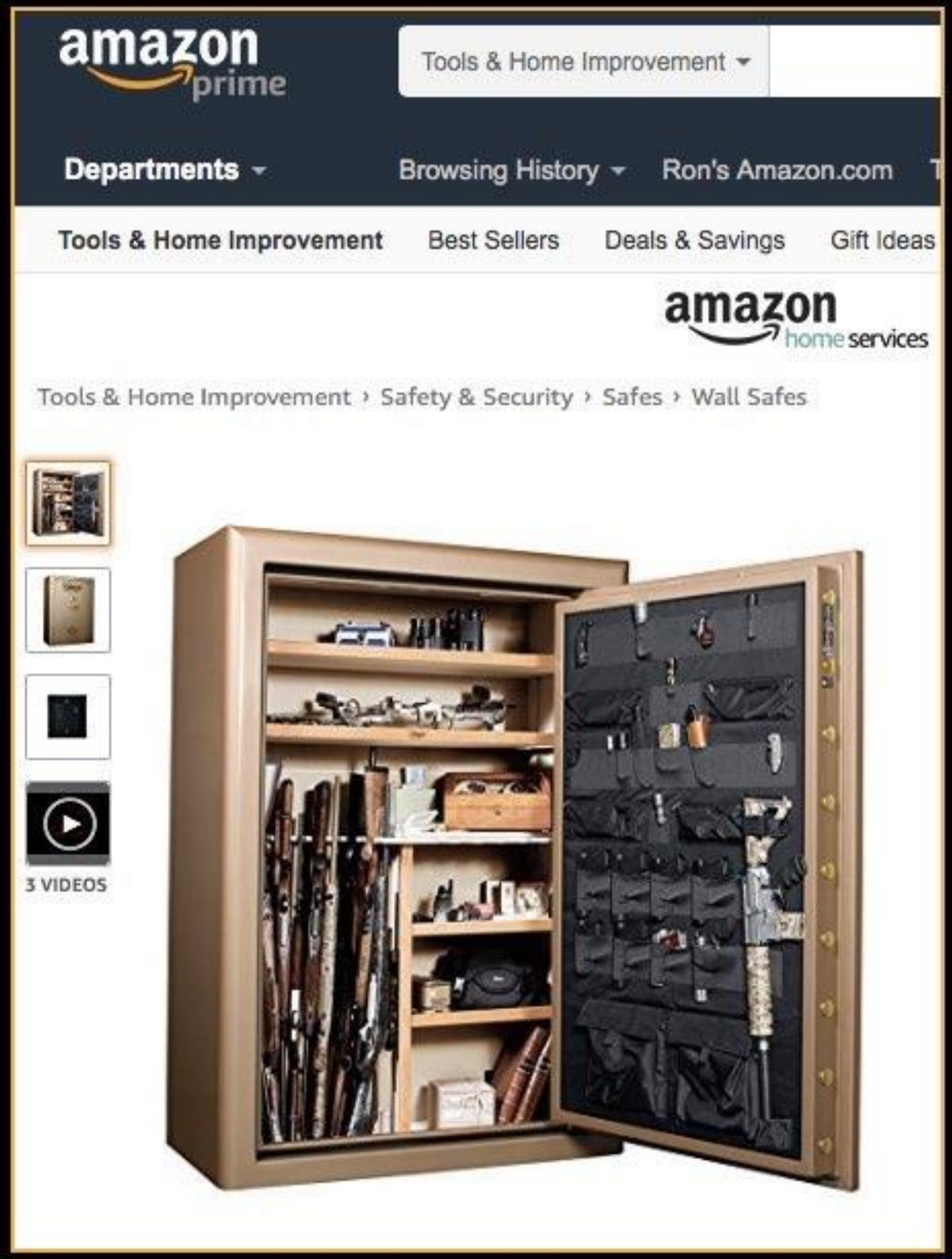
Before purchasing, you will need to answer questions for the status of your users. Since the order is not confirmed until confirmation of the pharmacist is completed, the delivery date displayed may change. Also, please note that if the pharmacist judges that it is not proper use order will be canceled. The detailed flow of up to shipment of the product here. Please check in.

Amazon.co.jp also started selling category No. 1 drugs, which require consultation with a pharmacist before purchase, at its website from Monday.

Before placing orders, customers need to report their symptoms and medical history via a form on Amazon's site. Items will only be delivered after approval by a pharmacist.

Compared with books, toys and other bulky items, the drugs market would appear to be a nirvana for Amazon.

Prescription medicines weigh almost nothing, take up little space and can cost hundreds or thousands of dollars per pill.



1,672 pounds. Free shipping.

Practical Information for Today's Pharmacist
Pharmacy Times

Amazon Is Out of the Game for Now: Back to Business as Usual?

MAY 01, 2018

Troy Trygstad, PharmD, PhD, MBA, Pharmacy Times Editor-in-Chief

Last month, CNBC reported that Amazon is backing off plans for large-scale drug distribution and had been struggling to do business with hospitals. Additionally, Amazon has run into some infrastructure and logistical issues around specialized products, such as requiring refrigeration across the distribution infrastructure and special handling requirements—ironic, considering that Amazon is one of the world's foremost logistics companies. Furthermore, most observers cited regulatory challenges and other barriers to entry that make disruption in the pharmacy sector difficult to achieve with minimal investment or over a short time. However, very few analysts think that Amazon's retreat is permanent. The lure of a health care sector that exceeds $1 trillion in annual output is just too alluring for a company such as Amazon.

THE WALL STREET JOURNAL.

U.S. Edition ▾ | July 8, 2018 | Today's Paper | Video

Amazon's PillPack Deal Gives It Access to Sensitive Health Data

Amazon, master of shopping behavior, will now know prescriptions

Sharon Terlep • July 1, 2018 7:00 a.m. ET

Amazon's purchase of PillPack gives it the ability to ship prescriptions to customers' homes in 49 states.

It paid roughly $1 billion in cash for the company and beat out Walmart Inc. in the process, according to people familiar with the matter.

Amazon just hired a top Seattle doctor who ran a network of health clinics

Christina Farr • 6:12 PM ET Wed, 26 July 2017 | 01:22

Getty Images

Amazon.com founder and CEO Jeff Bezos.

Amazon has hired a top Seattle doctor in its latest push into health care, according to two people familiar with the matter.

Martin Levine of Iora Health, which focuses on Medicare patients in six U.S. markets, is one of Amazon's most high-profile hires to date in health. It's not yet certain what Levine's role at the company will be, said the sources, who asked not to be named because no announcement has been made.

Martin Levine, MD • 3rd

Seattle Market Medical Director at Iora Health

Iora Health • University of Washington, Michael G. Foster School of Business

Greater Seattle Area • 500+

Experience

Seattle Market Medical Director

Iora Health

2015 – Present • 3 yrs

Greater Seattle Area

Supervise primary care clinics serving Medicare patients in value-based, capitated arrangements in Shoreline, Central District, Renton, and Federal Way. Staff of ~45 comprised of physicians, nurses, health coaches, clinic managers, business staff, marketing and recruitment personnel. Lead performance in cost, quality, service, sustainability and joy of practice. Engaged in utilization management, health plan design, growth strategies, access systems, 5 Star, HEDIS, risk adjustment, relationship-based care.

One potential role for Levine at Amazon might be to investigate whether the company should invest in new forms of primary care for its own employees.

Whole Foods, which Amazon acquired last year, once explored getting into the health clinic space.

CNBC 1/19/18

Hospital supplier shares dive as Amazon reportedly ramps up medical supply business

Tae Kim 3:32 PM ET Tue, 13 Feb 2018 | 01:09

Amazon's Advantages

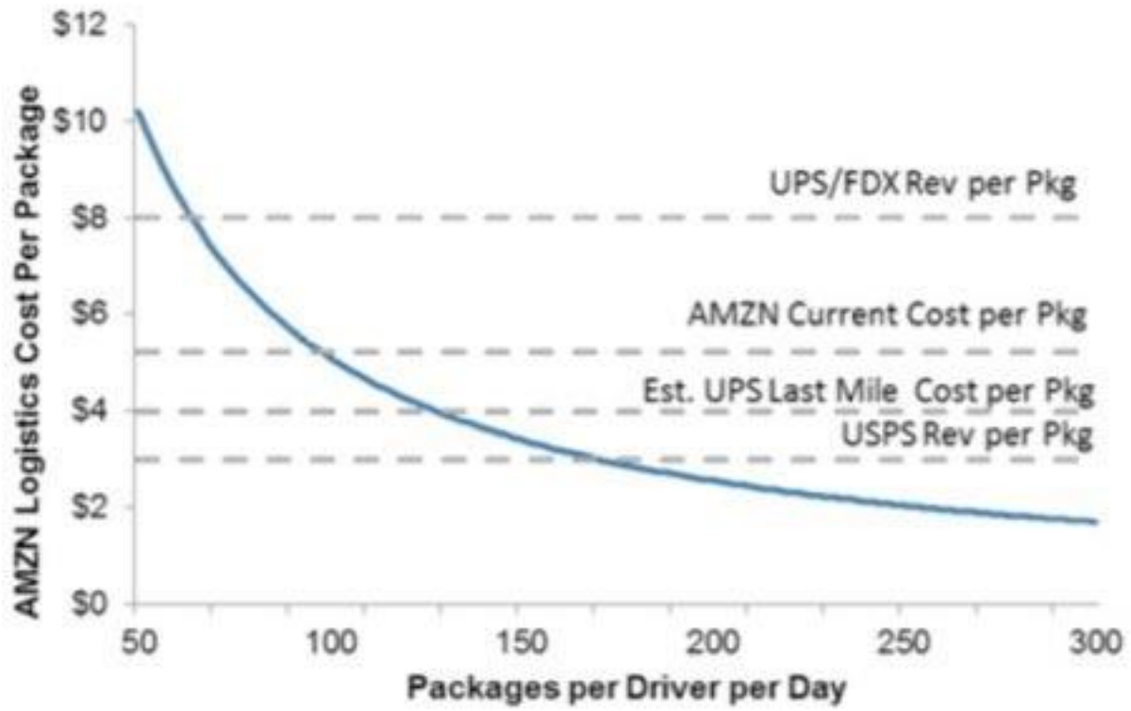
LOGISTICS

Morgan Stanley

Amazon's Impact on Transportation and Logistics

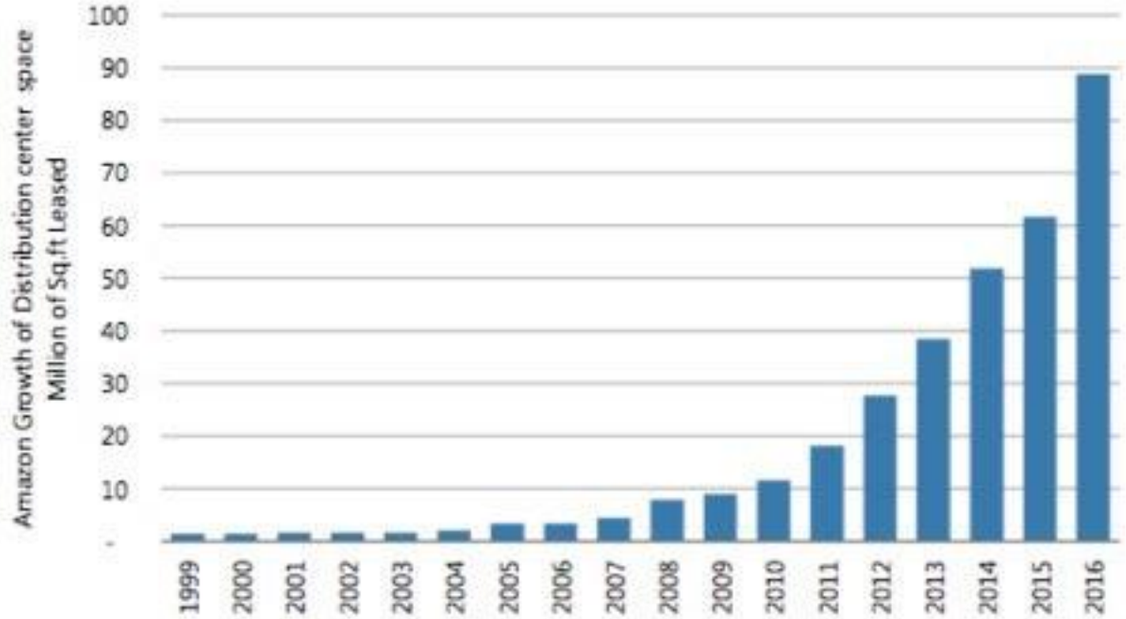
AMZN continues building its own logistics network past 2-3 years:

1) Deployed last-mile delivery in several US and European cities
2) Acquired 1000's of truck trailers/hundreds of trucks
3) Building $1.5B Kentucky air hub to house its aircraft
4) Leased 40 B767 air freighters with the option to pick up equity stakes air lessors
5) Acquired ocean freight forwarding license
6) Building in-house freight mgmt tech platform/app

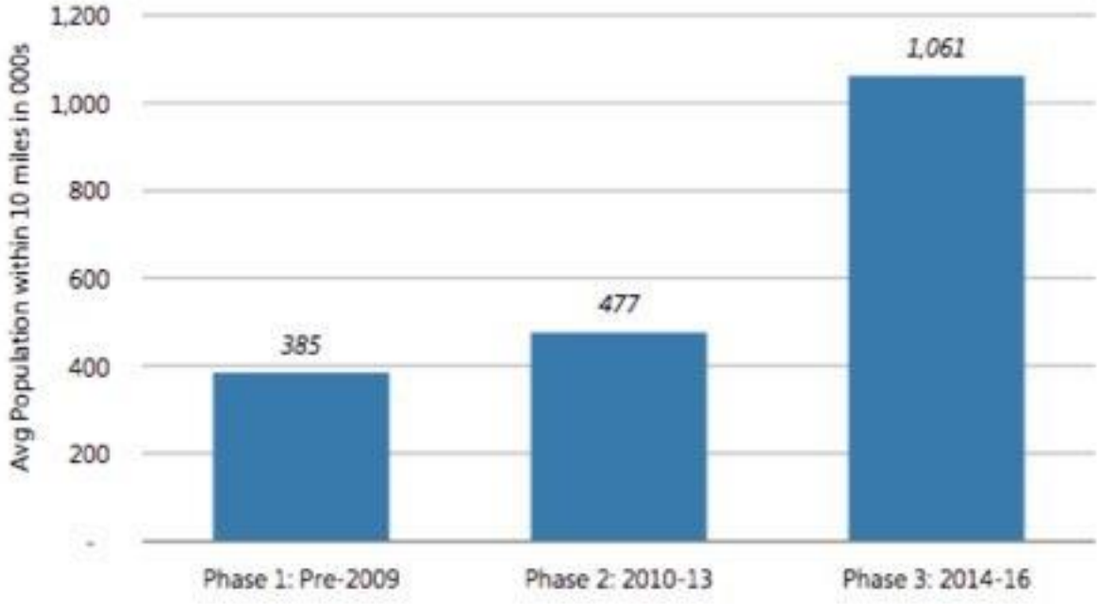


…Boosting Demand for Last Mile Warehouse Space that Increases Proximity to the Consumer

AMZN's warehouse expansion represents over 10% of US warehouse leasing since 2010



Amazon's leasing patterns have recently emphasized last-mile warehouses driving proximity to the consumer



Morgan Stanley

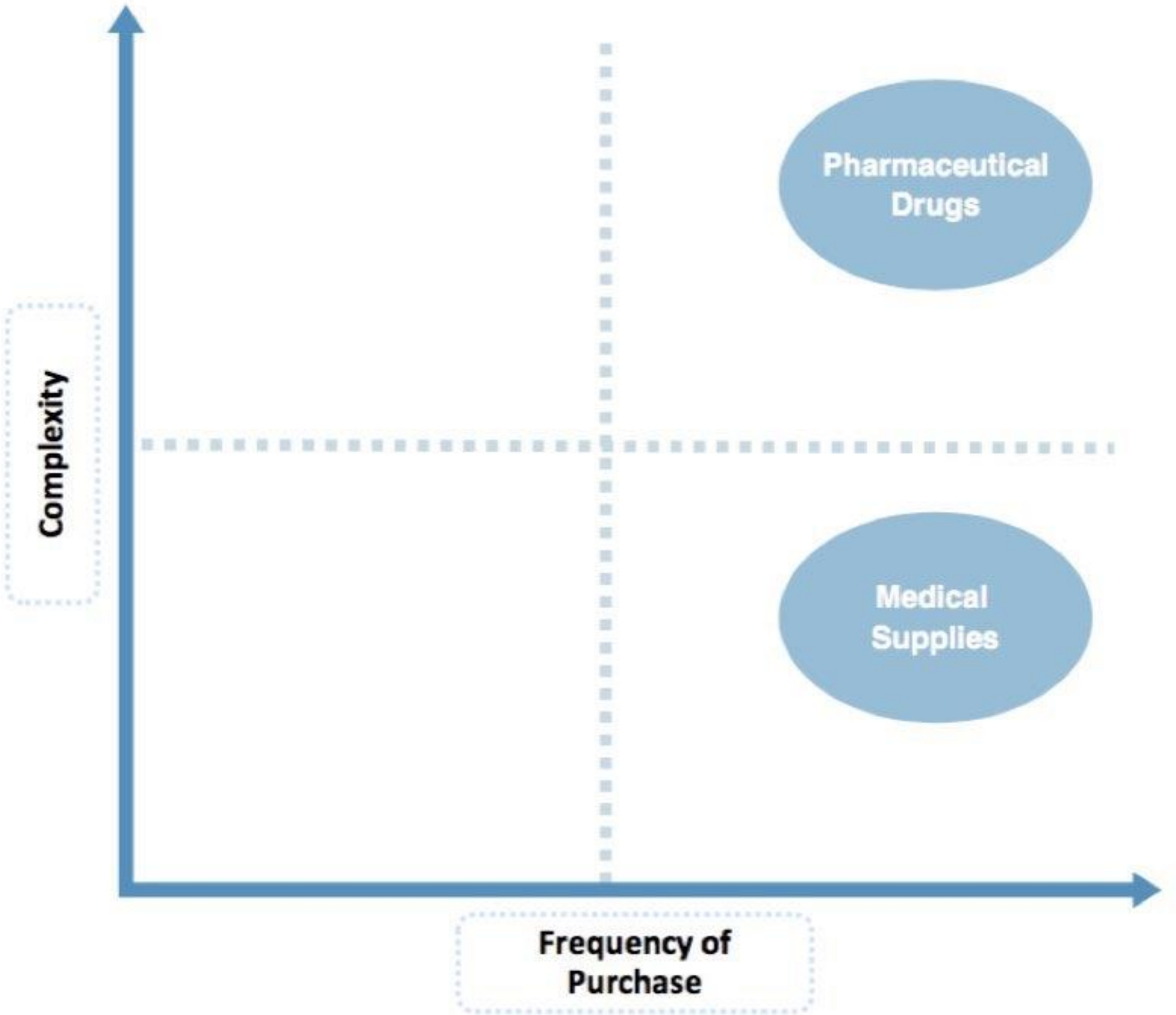
ALPHAWISE

Omnichannel Benefits from AMZN's Acquisition of WFM; Warehouse Leasing to Accelerate as AMZN & Peers Compete to Increase Market Penetration

The race for space has likely escalated as AMZN will need to significantly increase their warehouse footprint if they want to increase market penetration

	WHOLE FOODS MARKET	a	WHOLE FOODS MARKET + a	Kroger	COSTCO WHOLESALE	Walmart
Population within 10 miles of store/warehouse (A)	147	85	164	151	172	290
Total US Census population in footprint in millions (B)	216	180	221	184	229	324
Market penetration (A divided by B)	68%	47%	74%	82%	75%	90%
Avg income within 10 miles	$103k	$91k	$100k	$85k	$97k	$82k
Millennial Penetration within 10 miles of store or warehouse in millions	35	21	40	36	41	68
Number of stores + distribution centers	~450+	~200+	~650+	~2800+	~500+	~3950+

Next on Amazon's List?



Digging Into Distribution

Bespoke Products

Regulatory Hurdles

Industry/Business Model

Attention Post Sale/ Service Element

Nuances/Complexities Behind Transaction

Most Protected → **Most Exposed**

Industrial Conglomerates

Electrical

WESCO

HVAC

watsco

Facility MRO

HD SUPPLY

Industrial MRO

GRAINGER

FASTENAL

Healthcare Services & Distribution

Pharmaceutical Supply Chain

McKESSON

CVS Health

EXPRESS SCRIPTS

Medical Supply Supply Chain

Owens & Minor

PERFORMANCE HEALTH

CardinalHealth

McKESSON

HENRY SCHEIN

NEW & INTERESTING FINDS ON AMAZON EXPLORE

amazon prime

All

5% Back at Whole Foods Market and Amazon.com

Departments | Browsing History | Ron's Amazon.com | Today's Deals | Gift Cards | Registry | Sell | EN | Hello, Ron Account & Lists | Orders | Prime | 3 Cart

ALLERGY/COUGH/COLD | DIGESTIVE | PAIN | STOP SMOKING | HAIR REGROWTH | CHILDREN'S | FEMININE HYGIENE

Basic Care medicines are anything but basic. In fact, they are basically everything you expect from name brands – except the branding.

allergy cough/cold

Amazon is already undercutting prices on over-the-counter pills

Bloomberg

Walgreens and other pharmacy chains are feeling more pressure as Amazon undercuts their prices for store-brand drugs. (Charles Krupa / Associated Press)

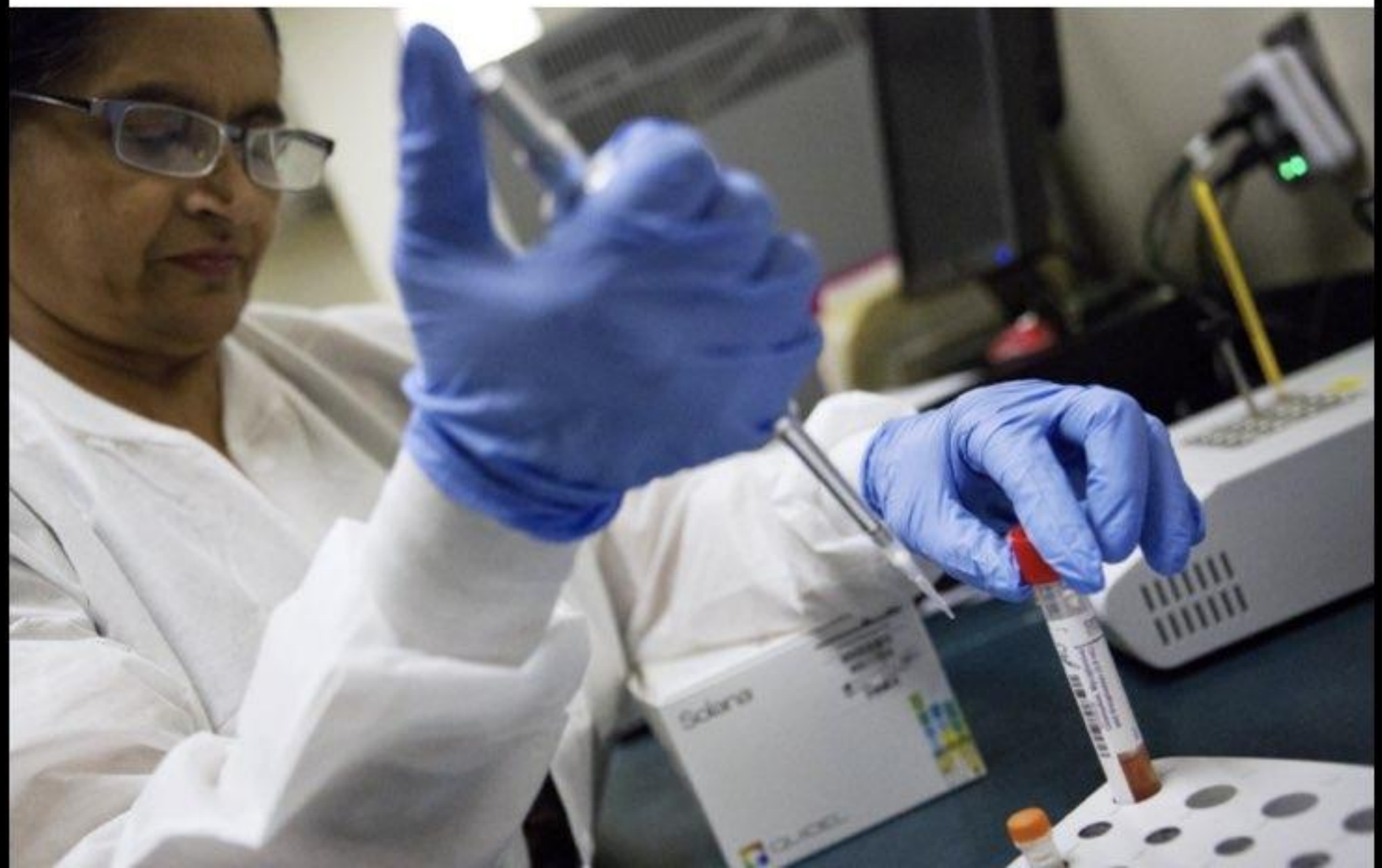
As pharmacy chains await Amazon.com Inc.'s entry into the prescription-drug market, the online retail giant is already undercutting them for nonprescription medicine for aches, colds and allergies.

Median prices for over-the-counter, private-brand medicine sold by Walgreens Boots Alliance Inc. and CVS Health Corp. were about 20% higher than Basic Care, the over-the-counter drug line sold exclusively by Amazon, according to a report Friday by Jefferies Group analysts.

Amazon's Latest Ambition: To Be a Major Hospital Supplier

The online retailer is pushing hard to expand its foothold in medical supplies, creating a marketplace where hospitals could shop to stock emergency rooms, operating suites and outpatient facilities

Laura Stevens • Updated Feb. 13, 2018 7:05 p.m. ET



THE WALL STREET JOURNAL.

Amazon has invited hospital executives to its Seattle headquarters on several occasions, most recently in late January, to sound out ideas for expanding its business-to-business marketplace, Amazon Business, into one where hospitals could shop to stock outpatient locations, operating suites and emergency rooms, according to hospital executives who attended the meetings.

THE WALL STREET JOURNAL.

Chris Holt, leader of global health care at Amazon Business, said Amazon won't look to imitate established models already used in the medical-distribution sector. "Our goal is to be something new," he said. "We've been actively building out new capabilities and features" to simplify purchasing, he said.

Health care is "opaque with respect to pricing and how much players are compensated along the supply chain, so entrance by an e-commerce giant like Amazon could be a game changer," S&P Global analysts wrote in a recent report titled "U.S. Healthcare is 'prime' for change by Amazon and others."

Amazon is betting that those who buy supplies for medical practices -- as well as for educational and government offices -- will be comfortable shopping online. Its business site offers additional functions, such as allowing multiple users on a single account, requiring approvals from supervisors and enforcing spending limits. But it also allows users to quickly compare prices for a variety of vendors.

"We want to create an experience similar to the way people shop at home," said Lori Torerson, an Amazon spokeswoman.

THE WALL STREET JOURNAL.

Amazon recently dispatched employees to a large Midwestern hospital system, where officials are testing whether they can use Amazon Business to order health supplies for the system's roughly 150 outpatient facilities, according to a hospital official overseeing the efforts.

The pilot is customized for the hospital system's catalog of supplies, the official said, allowing employees to compare prices the system negotiates with its distributors against those in the Amazon Business marketplace.

Which health care providers will Amazon target first and most aggressively? Acute care, long-term care, urgent/emergency, or primary care?

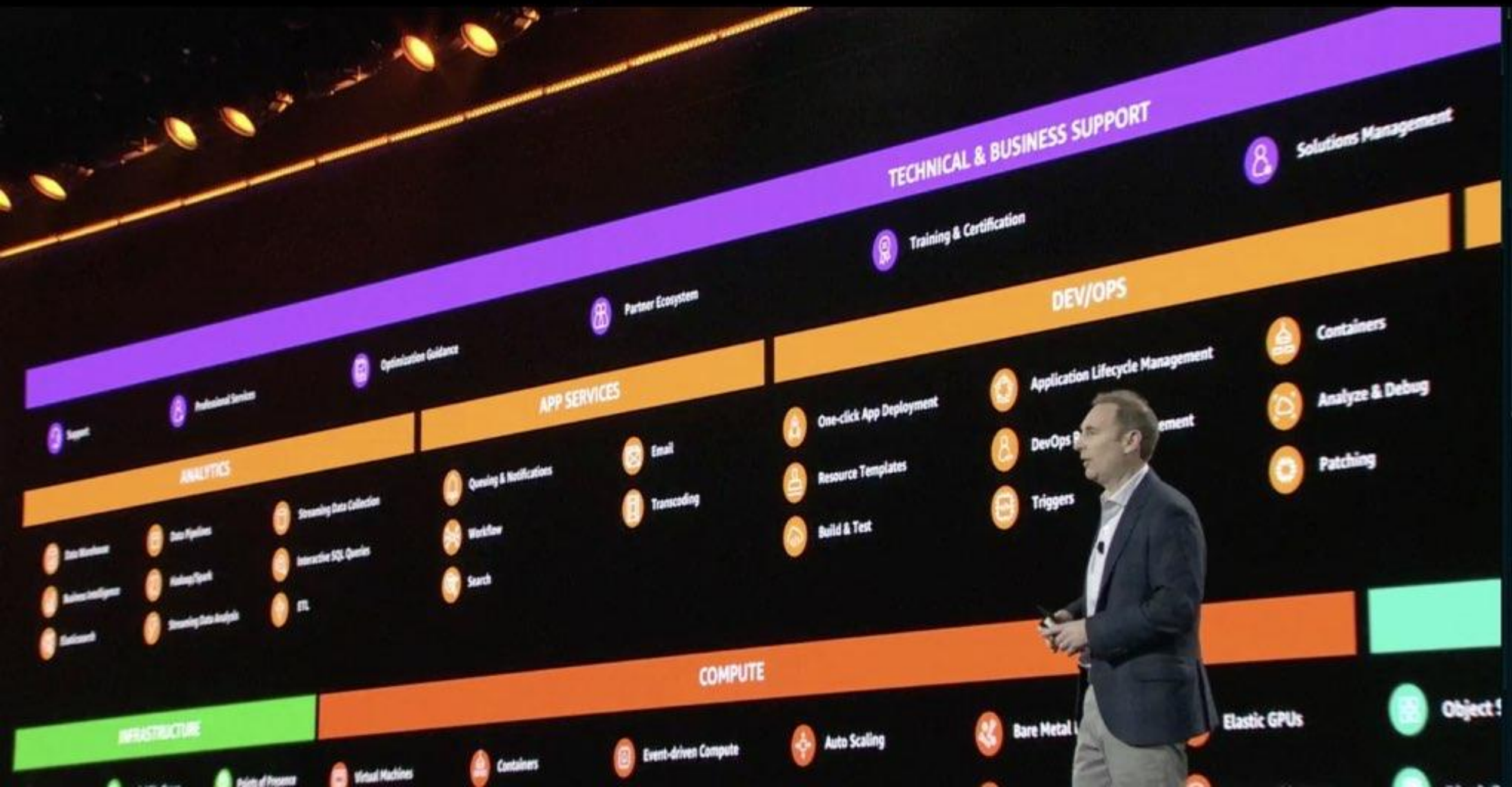
Will Amazon try to be in the just in time business or in the keep the shelves full business? Will Amazon deliver several times a day and on demand or on a schedule dictated by FedEx, UPS or its Uber-style in-house delivery service?

What roles, if any, will group purchasing organizations play?

How will Amazon's deals with small chains and individual providers differ with how it serves HCA, etc.?

Amazon's Advantages

BIG, BIG DATA



Store, Protect, Optimize Your Healthcare Data in AWS

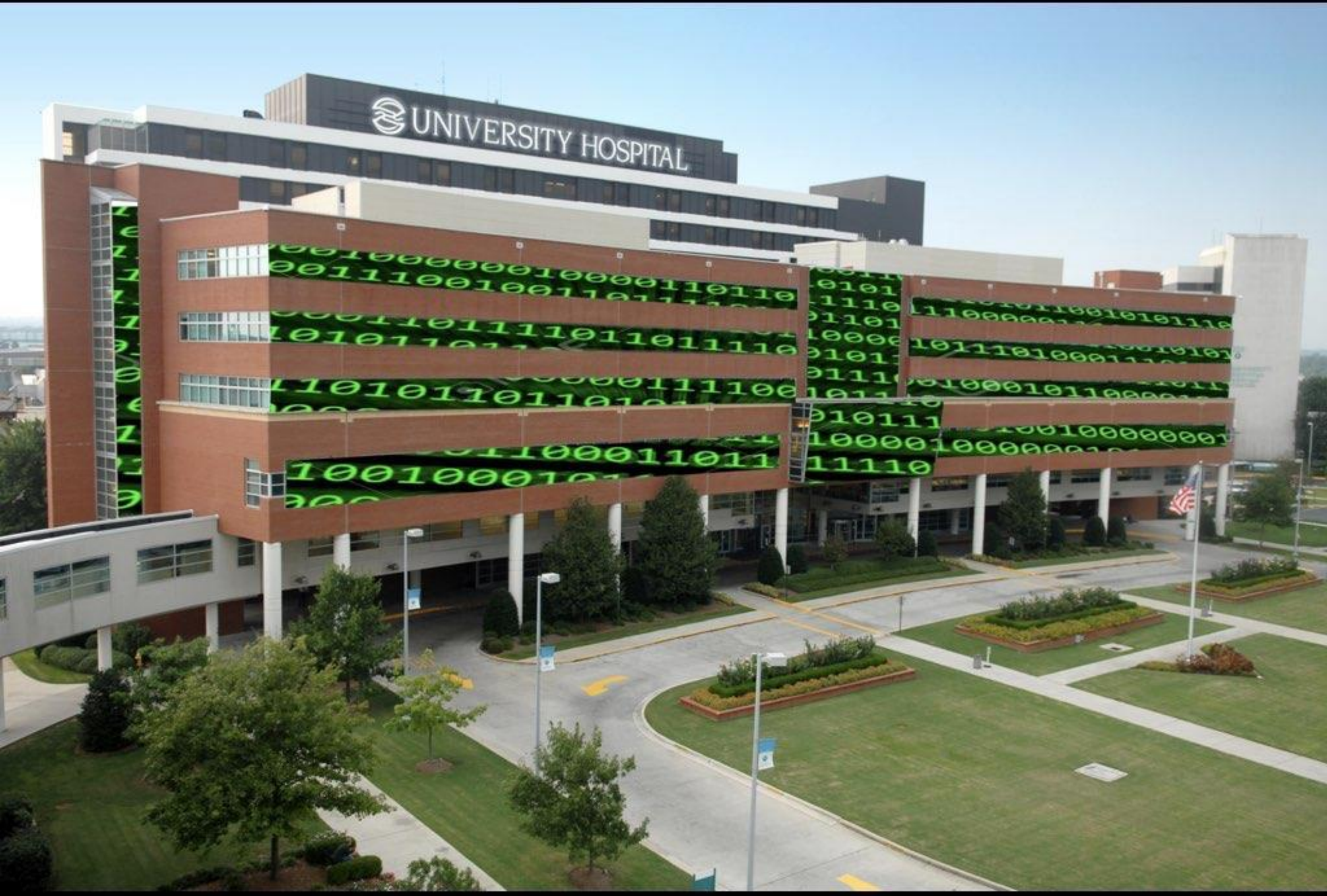
Healthcare reform, increasing patient expectations, exponential data growth, and the threat of cyberattacks are forcing healthcare providers to re-evaluate their data management strategies.

Healthcare providers are responding to these demands by leveraging AWS to enforce lifecycle management, employ cost effective, scalable storage and un-trap data for operational and quality insights.

Key design criteria for managing healthcare data should include:

- Flexible ingestion of data
- Storage for a variety of data types
- Data resiliency including backup and DR
- Ability to protect and secure critical data
- Provide and maintain HIPAA required audit controls
- Secure networking environment

In order to help customers, the following diagrams are reference architectures for managing healthcare data on AWS, including data ingestion and storage management using AWS services.


UNIVERSITY HOSPITAL

Hospitals are looking for the killer Amazon Alexa app

- Hospitals are tinkering with Alexa apps for things like safety checklists.
- They'd love to use it for documentation and transcription, but are currently hindered by the lack of HIPAA compliance.
- Investors are looking to fund the next hot Alexa app.

Christina Farr | @chrissyfarr

Published 8:28 AM ET Sun, 18 June 2017 | Updated 2:13 PM ET Mon, 26 June 2017

CNBC

aws Services Resource Groups Ron Galloway N. Virginia

ARTIFICIAL INTELLIGENCE

Amazon Transcribe

Automatic Speech Recognition powered by deep learning

Amazon Transcribe provides high-quality and affordable speech-to-text transcription for a wide range of use cases.

Launch the demo

We know you're curious. Jump in and test our Automatic Speech Recognition API.

Try Amazon Transcribe

Amazon has a secret health tech team called 1492 working on medical records, virtual doc visits

- Amazon has a secret skunkworks lab called 1492, dedicated to health care tech.
- Areas of exploration include a platform for electronic medical record data, telemedicine and health apps for existing devices like the Amazon Echo.

Eugene Kim | Christina Farr

Published 5:30 PM ET Wed, 26 July 2017 | Updated 2:30 PM ET Thu, 27 July 2017

CNBC

"Once news of 1492's existence became known, Amazon took steps to erase all information confirming its existence..."

Team 1492 aims to perform following tasks:

Extracting and using data from Electronic Medical Records system and improve the algorithm to make it more efficient and useful.

To make the data available to the patients and doctors.

To build a platform for telemedicine so that patients can interact virtually with the physicians and specialists regarding their problems.

Exploring various medical applications of hardware like Echo and Dash Wand.

Developing skills for Amazon’s Alexa that can be used for healthcare as well.

Also, there is a possibility about the development of medical devices as well.

AWS Direct Connect joins growing list of HIPAA-eligible services from AWS!

Posted On: Mar 10, 2017

AWS has expanded its HIPAA compliance program to include AWS Direct Connect as a HIPAA Eligible Service. With the addition of Direct Connect, if you have an executed Business Associate Agreement (BAA) with AWS you can now transfer large amounts of data, including Protected Health Information (PHI), into and out of AWS in a cost-effective manner designed for your security. AWS Direct Connect offers several benefits for customers: it lowers bandwidth costs out of AWS (which is valuable for applications that have bulk data transfer requirements), it offers more consistent network performance over Internet-based connections for applications that require real-time data feeds, and it provides an alternative means to connect to the AWS cloud for customers who may have security or compliance policies that prevent VPN connectivity to the cloud.

Using Direct Connect to migrate data to AWS is a simple first step towards leveraging a full suite of cloud-based HIPAA Eligible Services for data life cycle management, such as Amazon S3 (excluding the use of S3 Transfer Acceleration), Amazon Glacier, and AWS database services. Read our whitepaper to learn more on how to configure AWS services to support your HIPAA applications.

If you already have an executed BAA with AWS and a Direct Connect connection into AWS, no action is necessary to begin using Direct Connect in the account(s) covered by your BAA. If you do not have an executed BAA with AWS or have any other questions about running applications on AWS that might be subject to HIPAA, please contact us and we will put you in touch with a representative from our team.

Architecting for HIPAA Security and Compliance on Amazon Web Services

January 2018

Contents

Introduction 1

Encryption and Protection of PHI in AWS 2

- Amazon EC2 2
- Amazon Systems Manager 3
- Amazon Virtual Private Cloud 4
- Amazon Elastic Block Store 4
- Amazon Redshift 4
- Amazon S3 5
- Amazon S3 Transfer Acceleration 5
- Amazon SNS 6
- Amazon SQS 6
- Amazon Glacier 7
- Amazon RDS for MySQL 8
- Amazon RDS for Oracle 8
- Amazon RDS for PostgreSQL 9
- Amazon RDS for SQL Server 10
- Amazon RDS for MariaDB 11
- Amazon Aurora 12
- Amazon CloudFront 12
- Elastic Load Balancing 13
- Amazon ECS 14
- Amazon EMR 14
- Amazon DynamoDB 15
- Amazon API Gateway 15
- AWS Storage Gateway 16
- Using AWS KMS for Encryption of PHI 17

Amazon Web Services exec: We're interested in longitudinal health records for analytics and pop health

The tech giant said the cloud can serve as a home for patient records and enable a broader view at medical data to fuel value-based care.

Amazon working with Cerner on pop health cloud platform

AWS will be working with the healthcare tech giant on its HealtheIntent platform to analyze clinical data and predict available treatment.

The cloud business arm of Amazon is expected to team with healthcare tech giant Cerner to help analyze clinical data and predict available treatments, according to reports.

Cerner reportedly finalizing a new partnership with Amazon's cloud service

by *Evan Sweeney* | Nov 27, 2017 11:57am

Triple Threat: Amazon, Berkshire, JPMorgan Rattle Health-Care Firms

The three giants' envision using technology to cut costs and at one point discussed replacing their insurers and drug-benefit managers

Laura Stevens Jan. 30, 2018 7:45 p.m. ET

Amazon's Advantages

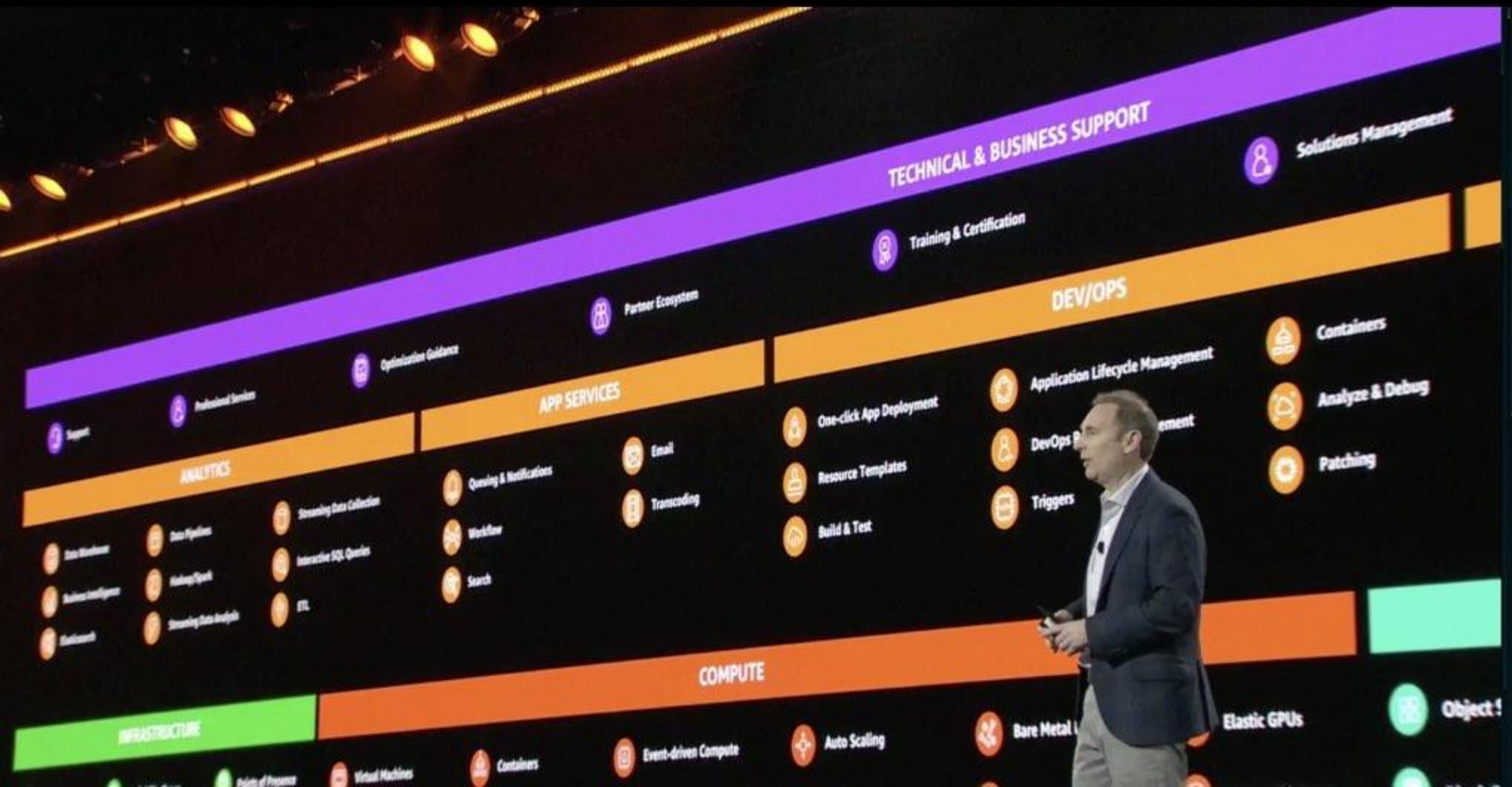
LOGISTICS

Amazon's Advantages

CUSTOMERS

Amazon's Advantages

BIG, BIG DATA



Amazon Letter to shareholders - 1997

amazon.com

To our shareholders:

Amazon.com passed many milestones in 1997: by year-end, we had served more than 1.5 million customers, yielding 838% revenue growth to $147.8 million, and extended our market leadership despite aggressive competitive entry.

But this is Day 1 for the Internet and, if we execute well, for Amazon.com. Today, online commerce saves customers money and precious time. Tomorrow, through personalization, online commerce will accelerate the very process of discovery. Amazon.com uses the Internet to create real value for its customers and, by doing so, hopes to create an enduring franchise, even in established and large markets.

We have a window of opportunity as larger players marshal the resources to pursue the online opportunity and as customers, new to purchasing online, are receptive to forming new relationships. The competitive landscape has continued to evolve at a fast pace. Many large players have moved online with credible offerings and have devoted substantial energy and resources to building awareness, traffic, and sales. Our goal is to move quickly to solidify and extend our current position while we begin to pursue the online commerce opportunities in other areas. We see substantial opportunity in the large markets we are targeting. This strategy is not without risk: it requires serious investment and crisp execution against established franchise leaders.

It's All About the Long Term

We believe that a fundamental measure of our success will be the shareholder value we create over the *long term*. This value will be a direct result of our ability to extend and solidify our current market leadership position. The stronger our market leadership, the more powerful our economic model. Market leadership can translate directly to higher revenue, higher profitability, greater capital velocity, and correspondingly stronger returns on invested capital.

Our decisions have consistently reflected this focus. We first measure ourselves in terms of the metrics most indicative of our market leadership: customer and revenue growth, the degree to which our customers continue to purchase from us on a repeat basis, and the strength of our brand. We have invested and will continue to invest aggressively to expand and leverage our customer base, brand, and infrastructure as we move to establish an enduring franchise.

Amazon Letter to shareholders - 1997

- We will continue to make investment decisions in light of long-term market leadership considerations rather than short-term profitability considerations or short-term Wall Street reactions.

- We will make bold rather than timid investment decisions where we see a sufficient probability of gaining market leadership advantages. Some of these investments will pay off, others will not, and we will have learned another valuable lesson in either case.

Amazon Letter to shareholders - 1997

- We will continue to make investment decisions in light of long-term market leadership considerations rather than short-term profitability considerations or short-term Wall Street reactions.

- We will make bold rather than timid investment decisions where we see a sufficient probability of gaining market leadership advantages. Some of these investments will pay off, others will not, and we will have learned another valuable lesson in either case.

1

Amazon builds out "interfaces" for its employees (as well as those of Berkshire Hathaway and J.P. Morgan Chase, both digital and physical, to access basic healthcare needs; these sit in front of pharmacy benefit managers (PBMs), insurance administrators, wholesale distributors and pharmacies.

2

Amazon starts building out infrastructure for those healthcare suppliers, requiring them to serve Amazon's employees using a standard interface.

3

Amazon converts the latter into a marketplace where PBMs, insurance administrators, distributors, and pharmacies have to compete to serve employees. And then, once that marketplace is functioning, Amazon will open the floodgates on the demand side, offering that standard interface to every large employer in America.

Once an aggregator has gained some number of end users, suppliers will come onto the aggregator's platform on the aggregator's terms, effectively commoditizing and modularizing themselves. Those additional suppliers then make the aggregator more attractive to more users, which in turn draws more suppliers, in a virtuous cycle.

Aggregation Theory

This means that for aggregators, customer acquisition costs decrease over time; marginal customers are attracted to the platform by virtue of the increasing number of suppliers. This further means that aggregators enjoy winner-take-all effects: since the value of an aggregator to end users is continually increasing it is exceedingly difficult for competitors to take away users or win new ones.

Aggregation Theory

Amazon Kindle interface enabling thousands of authors

amazon

INTERFACE

PHARMA ⟷ SUPPLIES ⟷ EHR

Apple has to get into healthcare

Slowly moving from hardware to services

Healthcare is only business with enough scale to move the needle

AC Wellness

Coming Spring 2018

AC Wellness is an independent medical practice dedicated to delivering compassionate, effective healthcare to the Apple employee population.

Contact | About | Careers

An Employee Benefit Your Team Will Love

Lower your health costs by giving your team VIP access to One Medical, a modern primary care practice that is in-network with major health plans.

LEARN MORE

Near Site Primary Care

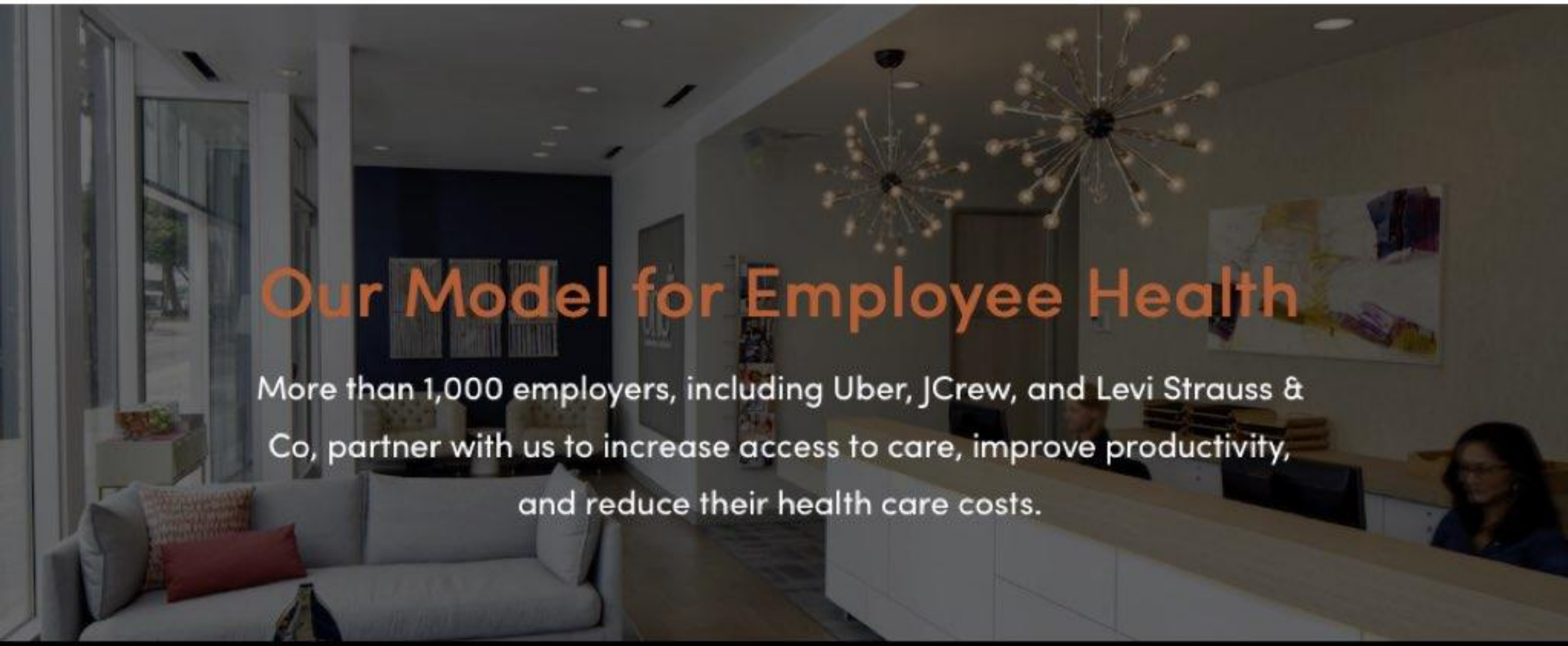
One Medical offers same-day, on-time appointments with top physicians in 60+ metro locations, so there's always an amazing provider nearby.

24/7 Telemedicine

Our Virtual Care team is on call 24/7 & our mobile app makes it easy to treat common medical issues & renew prescriptions without an appointment.

Onsite Care

From flu clinics to exclusive full-time centers, One Medical can create an onsite experience that's right for your business.



Our Model for Employee Health

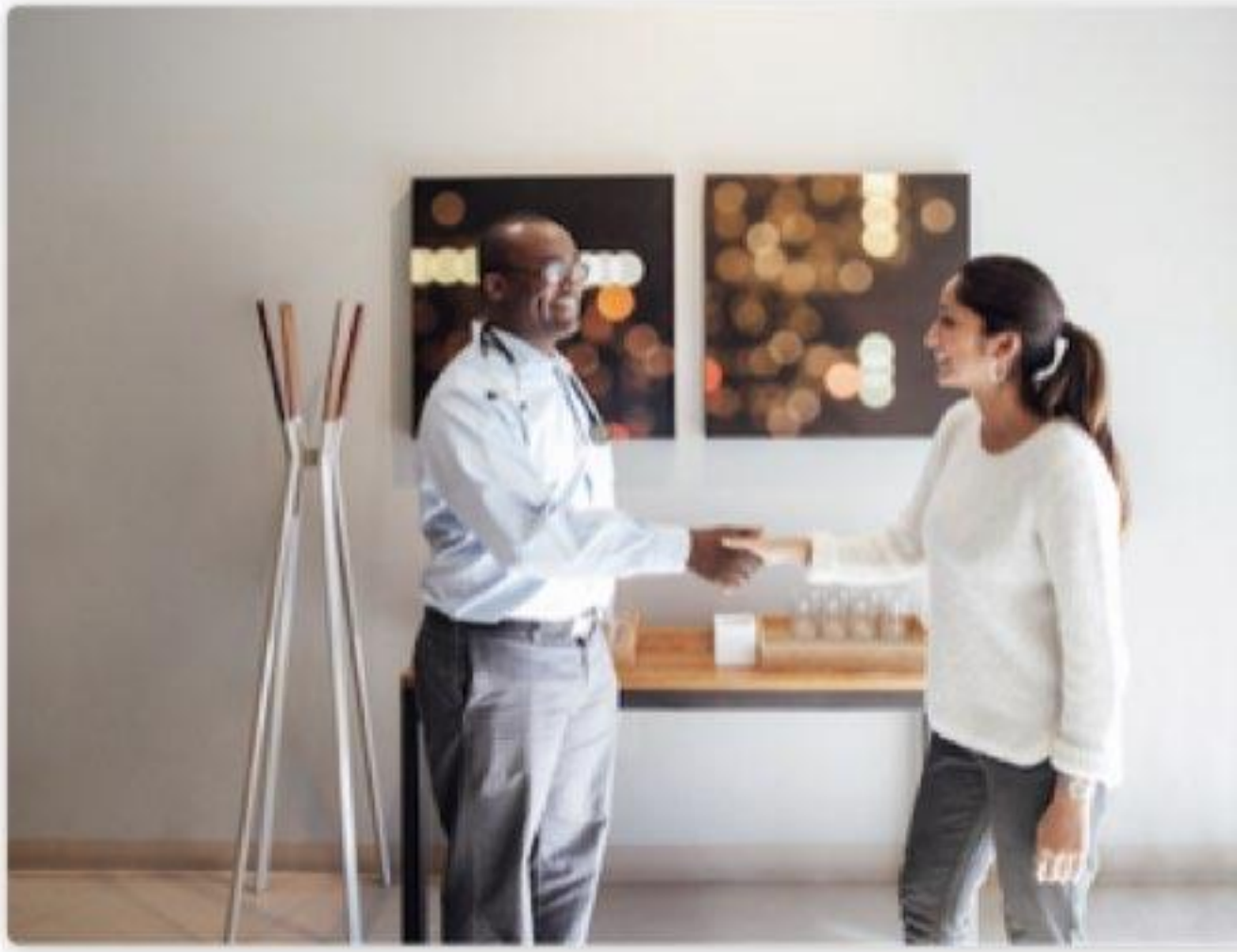
More than 1,000 employers, including Uber, JCrew, and Levi Strauss & Co, partner with us to increase access to care, improve productivity, and reduce their health care costs.

Reasons to Partner With Us

Our Providers Are In-Network

We are in-network with all major PPO and HMO health plans. Employees cover the applicable co-pay, coinsurance, or deductible just like they would with any doctor visit.

- ✔ Aetna
- ✔ Anthem
- ✔ Blue Cross Blue Shield
- ✔ Cigna
- ✔ Health Net
- ✔ UnitedHealthCare
- ✔ Regional carriers including Blue Shield of CA, Oscar, Arizona Care Network, PacifiCare, Empire, Tufts, and Harvard Pilgrim



TECH • ONE MEDICAL

One Medical Raises $65 Million for Its Affordable High-End Doctor's Offices

Apple explored buying a medical-clinic start-up as part of a bigger push into health care

- Apple's health team was until recently deep in talks to buy Crossover Health, the venture-backed start-up that runs its on-site medical clinic.
- It's not clear if Apple wanted to own and operate a network of health clinics, like its retail stores, or simply partner to sell products with a health-related angle, like the Apple Watch

Christina Farr | @chrissyfarr

Published 6:10 PM ET Mon, 16 Oct 2017 | Updated 10:03 AM ET Sat, 21 Oct 2017

CNBC

crossover HEALTH

Activate Account | Sign In

For Employers | For Employees

Next-Generation Workplace Health

We partner with health activist employers who understand the value of growing their human capital.

crossover HEALTH

For Employers | For Employees

Onsite

A dedicated Health Center for larger employers,
located on the client campus

Nearsite

A shared resource for 4-6 employers,
located near the offices of participating clients

Which model is right for you?

One consistent approach

Onsite? Nearsite? Whichever model is right for you and your employees, each shares our focus on a remarkable care experience, and each offers your way out of the healthcare vice grip, promising to lower costs, increase quality, and radically improve the member experience.

Brand strategy

We uniquely create distinctive health brands and compelling communication programs that engage our members.

Facility design

Each of our Health Centers integrates practical, effective layouts with environments that delight.

Care delivery

Crossover Health Medical Group's approach to care begins with our members at the center of all that we do.

Health management

We are positioned at the nexus of patients, providers and employers, and bring deep abilities to aggregate and report on a vast array of data.

Enabling technology

We embrace technology and build it from the start into everything we do, from member communication to clinical and administrative documentation.

Membership focus

When patients are members, engagement and accountability are taken to new levels.

We're proud of our client list, not simply because they are innovative leaders in their fields but also because they share our commitment to primary health and next-generation care.

APPLIED MATERIALS

NetApp

Frost

H-E-B

INTUIT

Microsoft

NVIDIA

Square

Symantec

SYNOPSYS

VERITAS

VISA

BROADCOM

LinkedIn

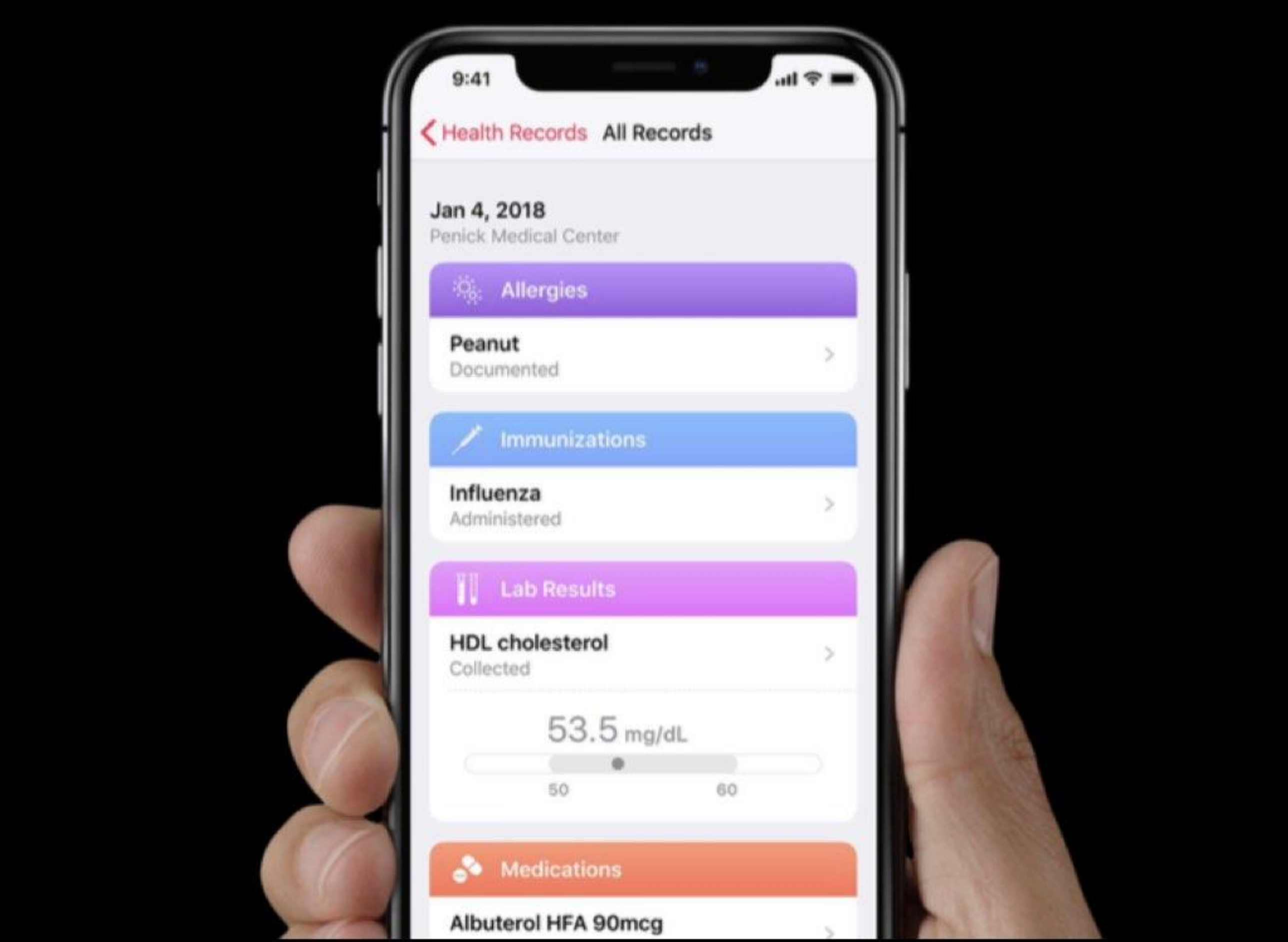
Dimensional

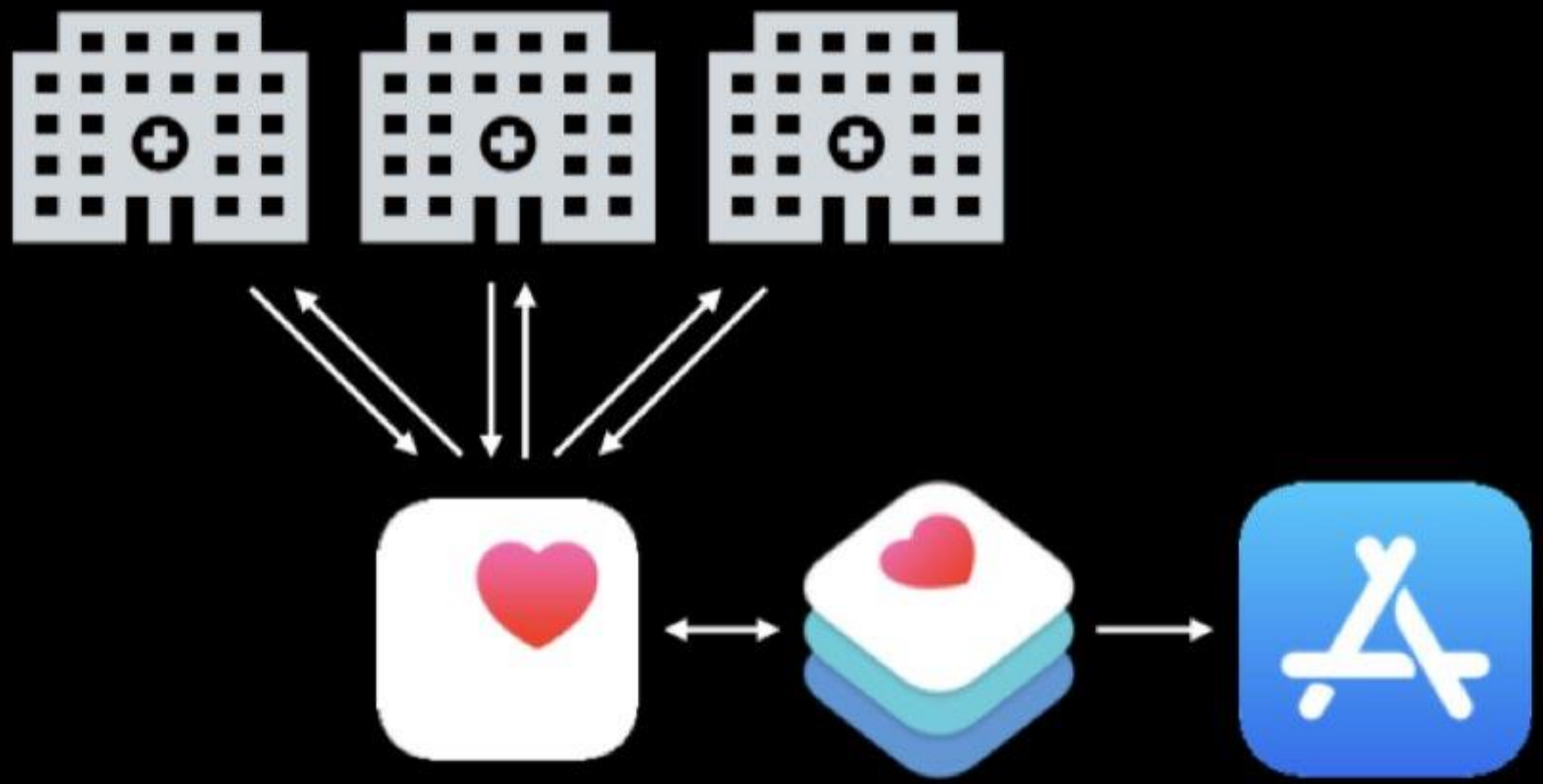
maxim integrated

A red-hot healthcare startup that got a boost when Apple took a chance on it is ramping up big time

Lydia Ramsey

One of Crossover Health's exam rooms at its Midtown, Manhattan location.
Courtesy Crossover Health

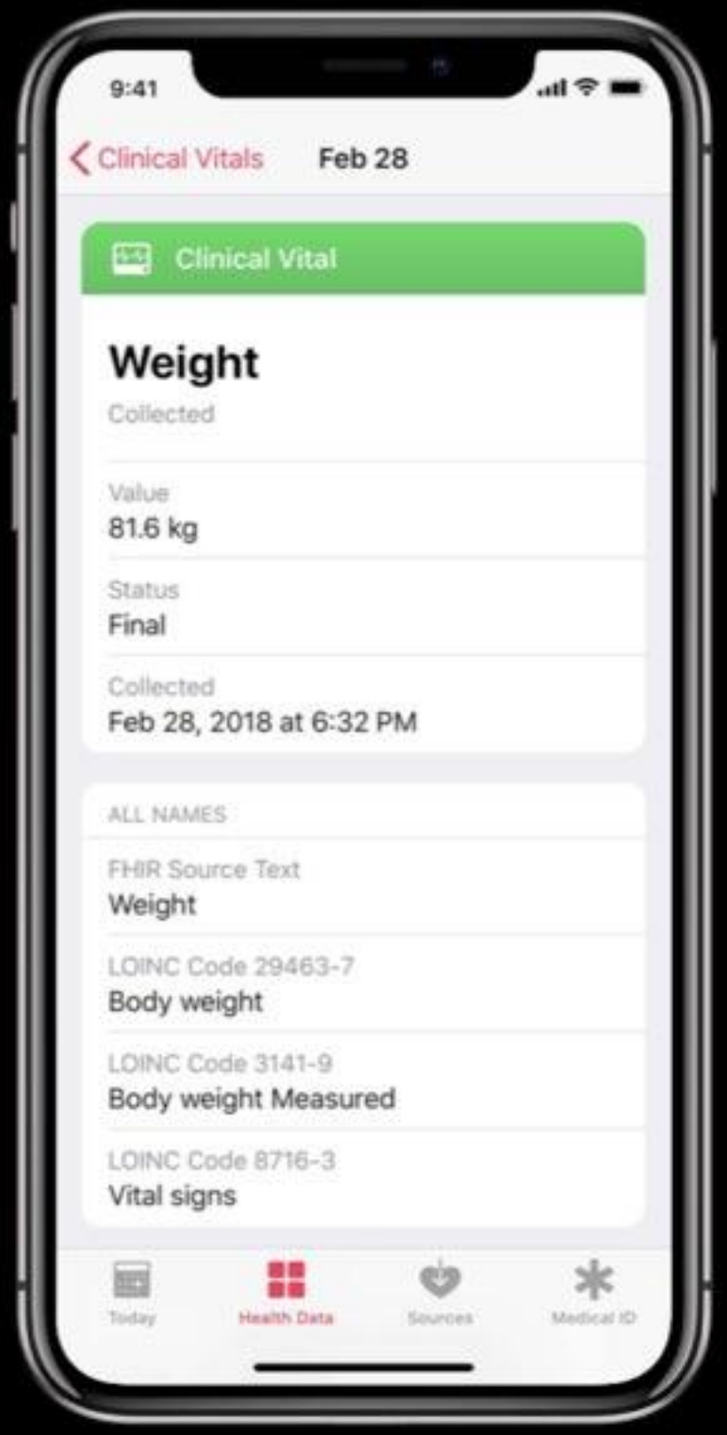

9:41
Health Records
All Records
Jan 4, 2018
Penick Medical Center
Allergies
Peanut
Documented
Immunizations
Influenza
Administered
Lab Results
HDL cholesterol
Collected
53.5 mg/dL
50
60
Medications
Albuterol HFA 90mcg



New Sample Types

HKClinicalTypeIdentifier

Allergies	`.allergyRecord`
Conditions	`.conditionRecord`
Immunizations	`.immunizationRecord`
Lab Results	`.labResultRecord`
Medications	`.medicationRecord`
Procedures	`.procedureRecord`
Vital Signs	`.vitalSignRecord`



NEW

#WWDC18

Accessing Health Records with HealthKit

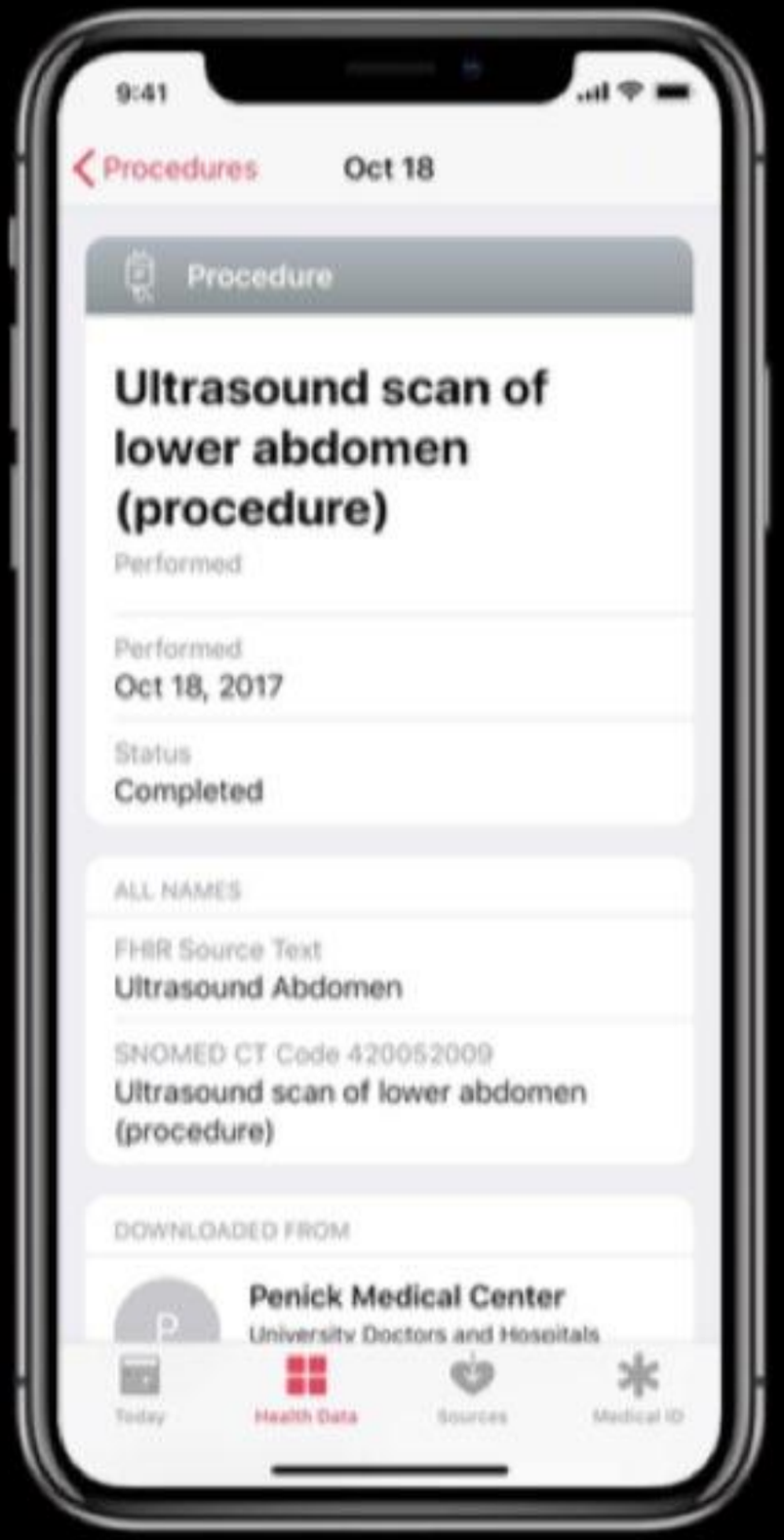
Session 706

Jason Morley, Health Software
Peyton Randolph, Health Software

New Sample Types

HKClinicalTypeIdentifier

Allergies	`.allergyRecord`
Conditions	`.conditionRecord`
Immunizations	`.immunizationRecord`
Lab Results	`.labResultRecord`
Medications	`.medicationRecord`
Procedures	`.procedureRecord`



ResearchKit

CareKit

API Features

All-day monitoring

Relevant to Parkinson's Disease

Code signing entitlement

Compete or Augment?

Move 78

IN TWO MOVES, ALPHAGO AND LEE SEDOL REDEFINED THE FUTURE

This isn't human versus machine. It's human *and* machine. Move 37 was beyond what any of us could fathom. But then came Move 78. And we have to ask:

If Lee Sedol hadn't played those first three games against AlphaGo, would he have found God's Touch? The machine that defeated him had also helped him find the way.

The Disruptors

amazon

CVS Health

Google