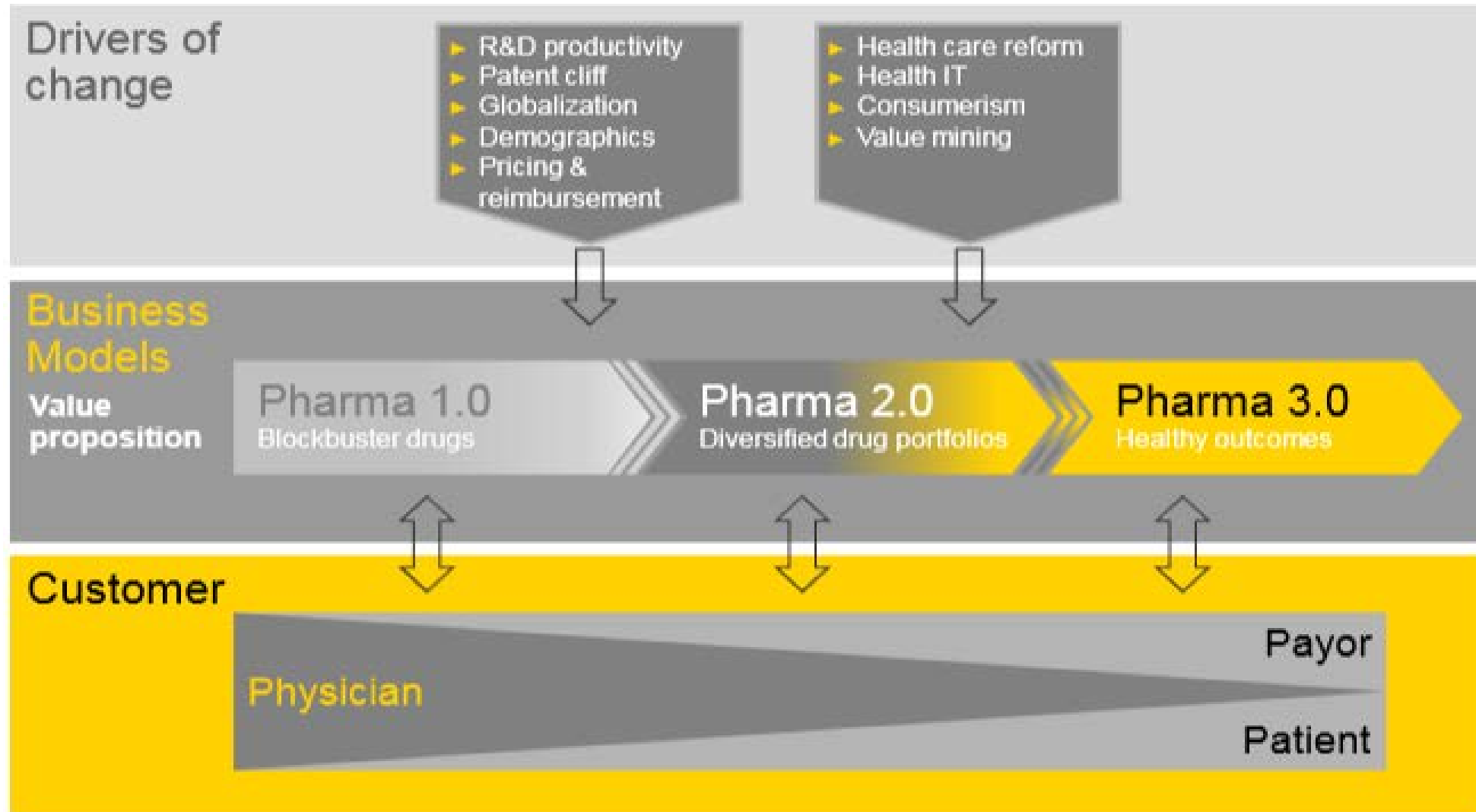


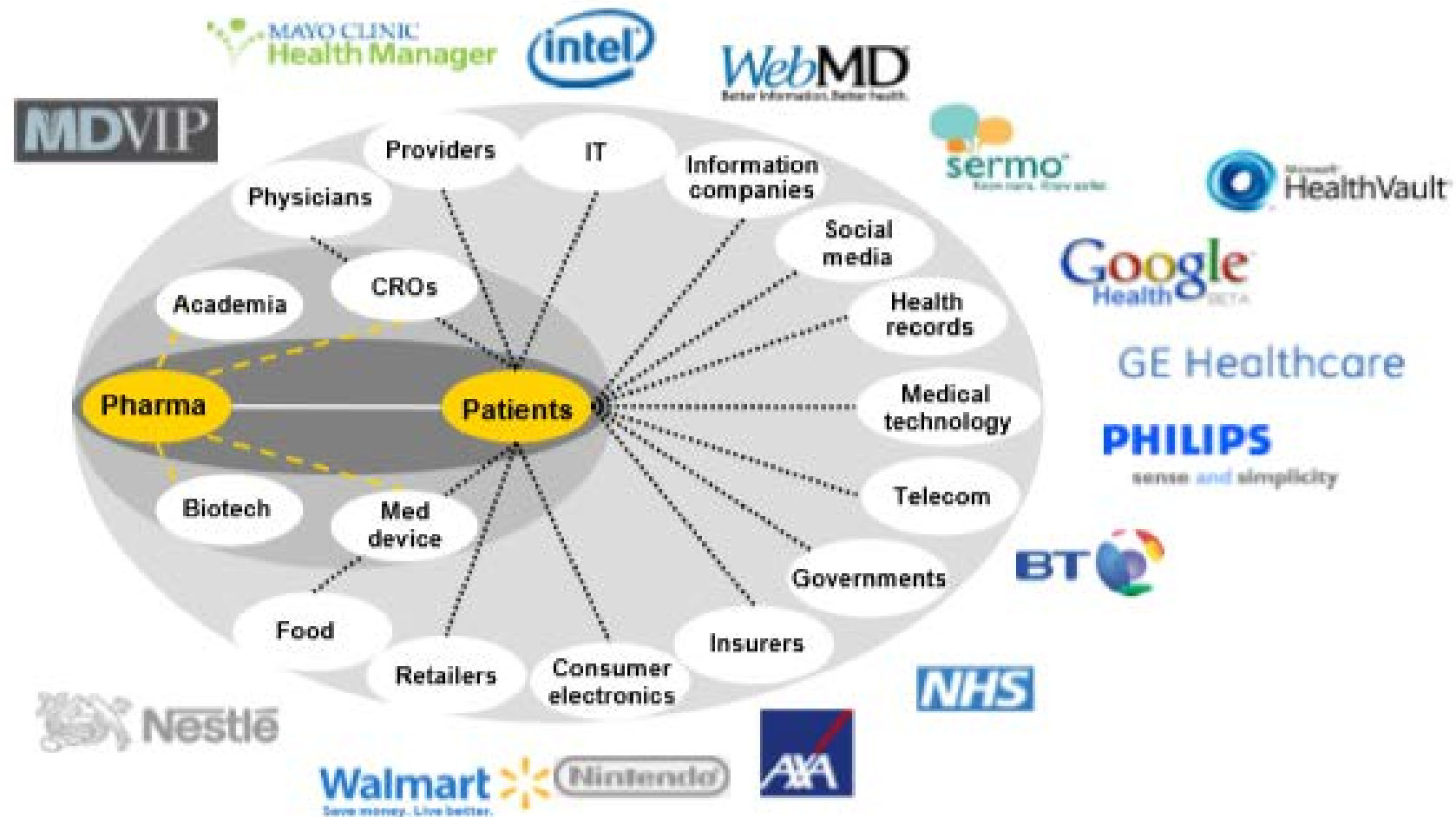
Pharma 3.0

From pharmas' perspective



Pharma 3.0

The health outcomes ecosystem



— Pharma 1.0 (drugs)

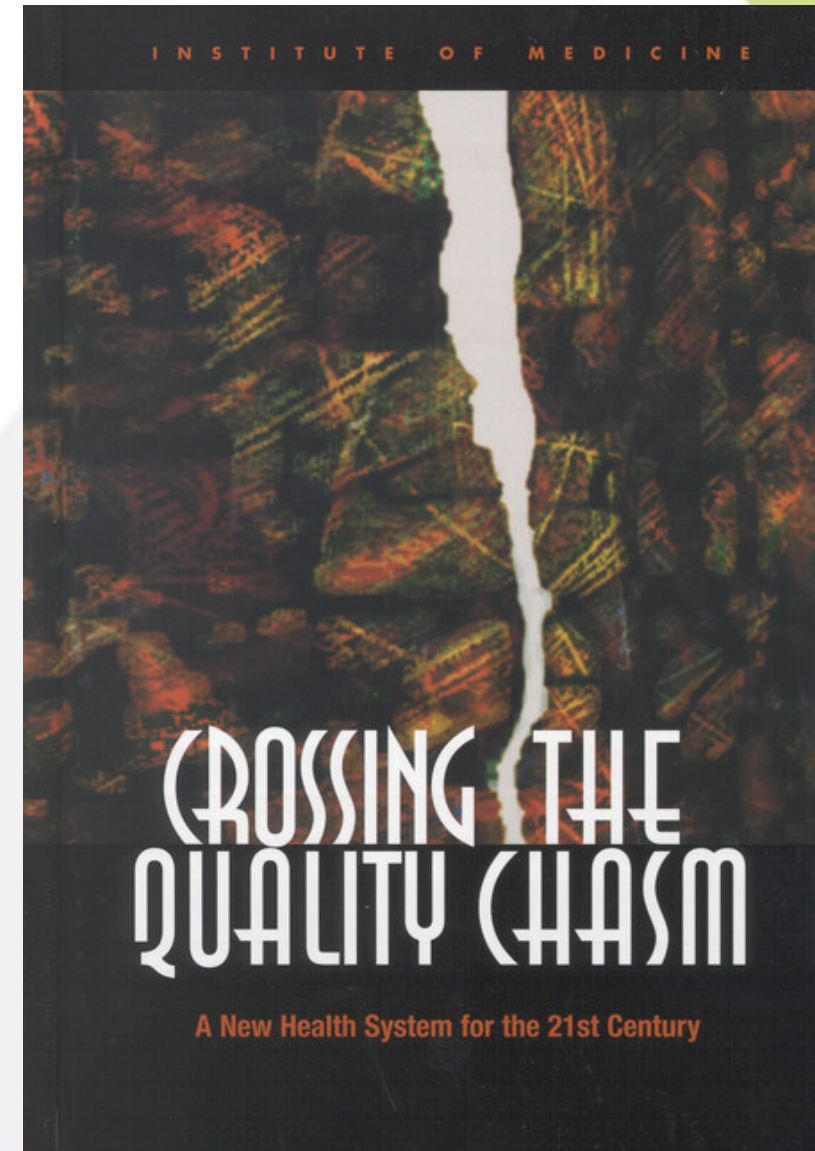
- - - - - Pharma 2.0 (diversified drug portfolios)

..... Pharma 3.0 (outcomes)



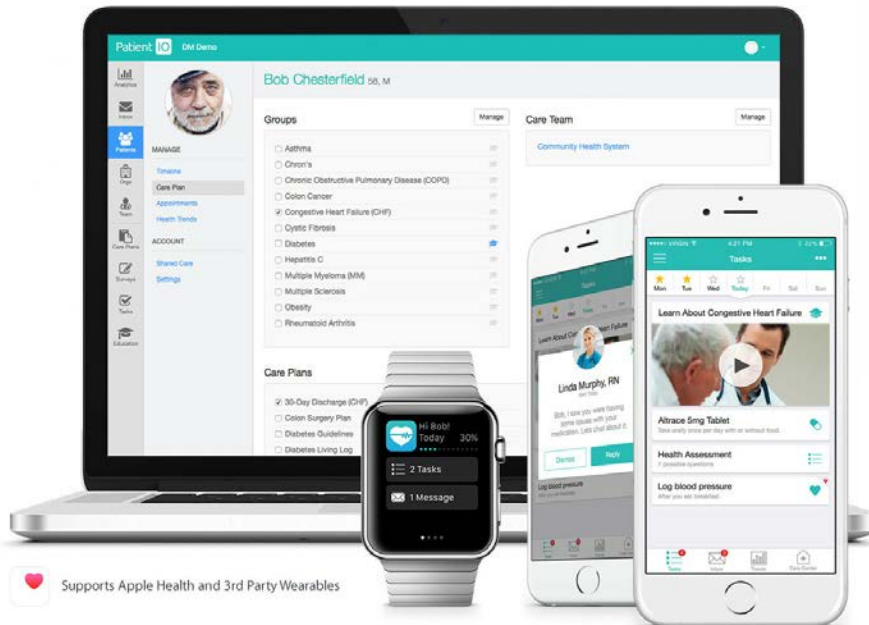
Fundamentals of Healthcare

1. Safe
2. Timely
3. Effective
4. Efficient
5. Equitable
6. Patient centered



ePatient

The Digital Patient is Empowered



Supports Apple Health and 3rd Party Wearables

The digital patient is...
EMPOWERED

52%
OF CONSUMERS ARE
INTERESTED IN BUYING
WEARABLE HEALTH
TRACKERS.⁶

mHEALTH TECHNOLOGY IS POSITIVELY INFLUENCING PEOPLE TO TAKE CHARGE OF THEIR OWN WELL-BEING.⁷



THE NUMBER OF
ADULTS USING
SMARTPHONES TO
MONITOR THEIR
HEALTH GREW TO
75 MILLION
IN 2012. IT'S PROJECTED
TO INCREASE MORE
THAN THREEFOLD BY
THE END OF 2014.



**70% OF THE
TOP-SELLING
WEARABLE
DEVICES**
ARE DEDICATED TO
FITNESS.



CONSUMERS WILL
SPORT ALMOST
**112 MILLION
WEARABLES**
BY 2018.



247 MILLION AMERICANS
HAVE DOWNLOADED A HEALTHCARE APP FOR
THEIR PERSONAL USE.⁸

NOVEMBER 2017

The Growing Value of Digital Health

Evidence and Impact on Human Health and
the Healthcare System





Impact of Digital Health on the Pharmaceutical Industry

Will Business Models be Reshaped by Digital Health?



The study results indicate that by 2020 the business model of the Pharmaceutical industry will be reshaped by Digital Health:

- **84%** of study participants consider it crucial to have a **Digital Health strategy** in 2020
- **77%** believe Digital Health will **generate new business** by 2020
- **94%** believe it will invent a **new value proposition** for the Pharmaceutical industry (57%)
- All participants believe Digital Health will have a crucial impact (73%) for the **competitive advantage** of their Pharmaceutical companies

“

I think the biggest innovations of the 21st century will be at the intersection of biology and technology. A new era is beginning.



Digital Health 3.0

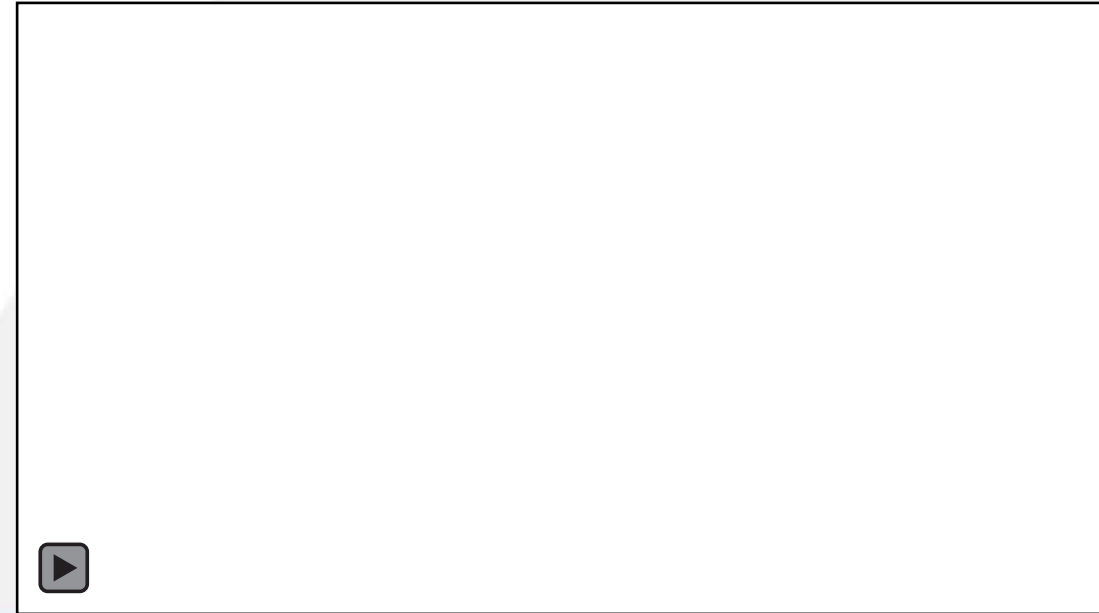
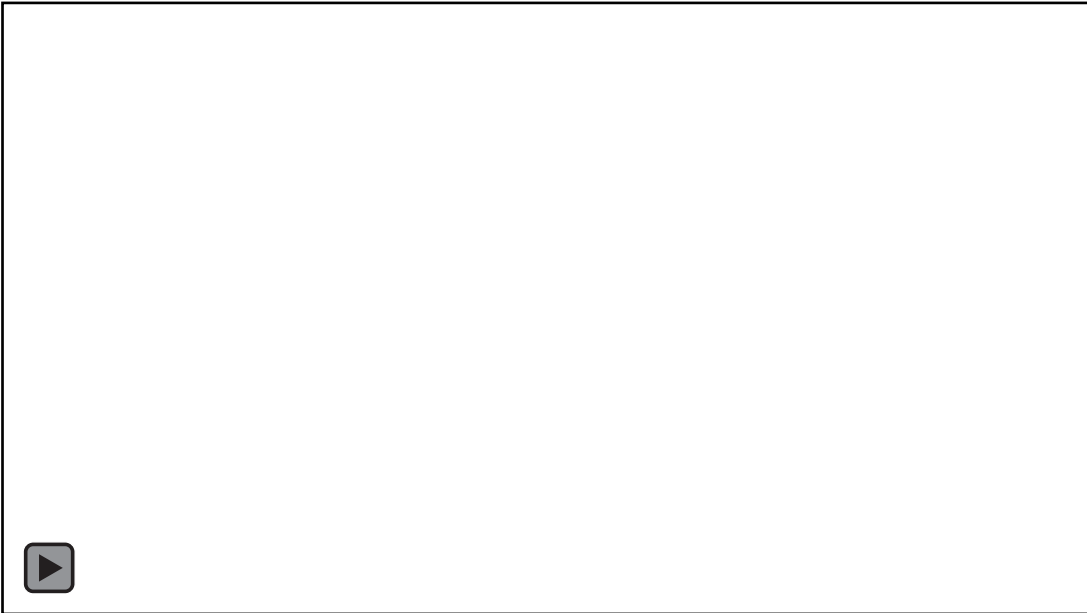
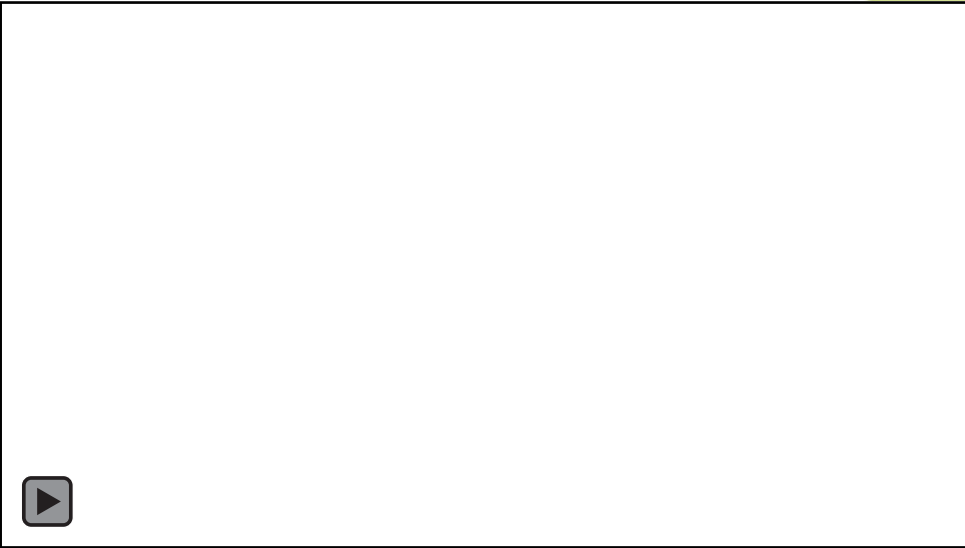
- **Web/mobile based Teleconsultation**
- **ePatient – ePhysician**
- **Smart Hospitals**
- **Wearable Sensors to “Insideable” Devices**
- **Mobile Apps**
- **Personalized / Precision medicine**
- **Health Portals & PHR (EMR)**
- **Big Data**
- **3D Printing**
- **Virtual Reality**
- **Genome Sequencing**
- **Artificial Intelligence (AI)**
- **Blockchain**

Uberization of Healthcare

**patients are now connected
directly with providers through
technology**



Connected Health

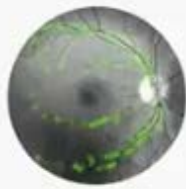


Google & AI in Health

Predicting cardiovascular risk



Image of retina



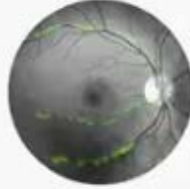
Age

Predicted: 59.1 years
Actual: 57.5 years



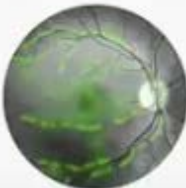
Biological sex

Predicted: Female
Actual: Female



Smoking

Predicted: Non-smoker
Actual: Non-smoker



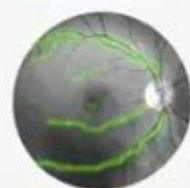
A1C

Predicted: Non-diabetic



BMI

Predicted: 24.1 kg/m



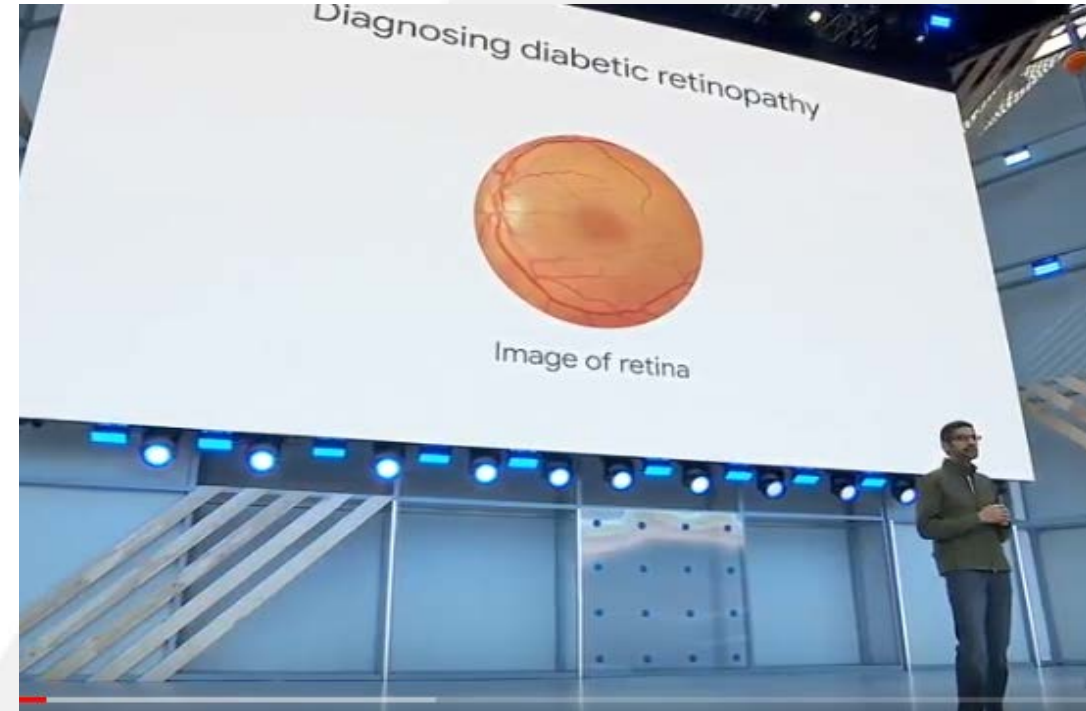
Systolic blood pressure

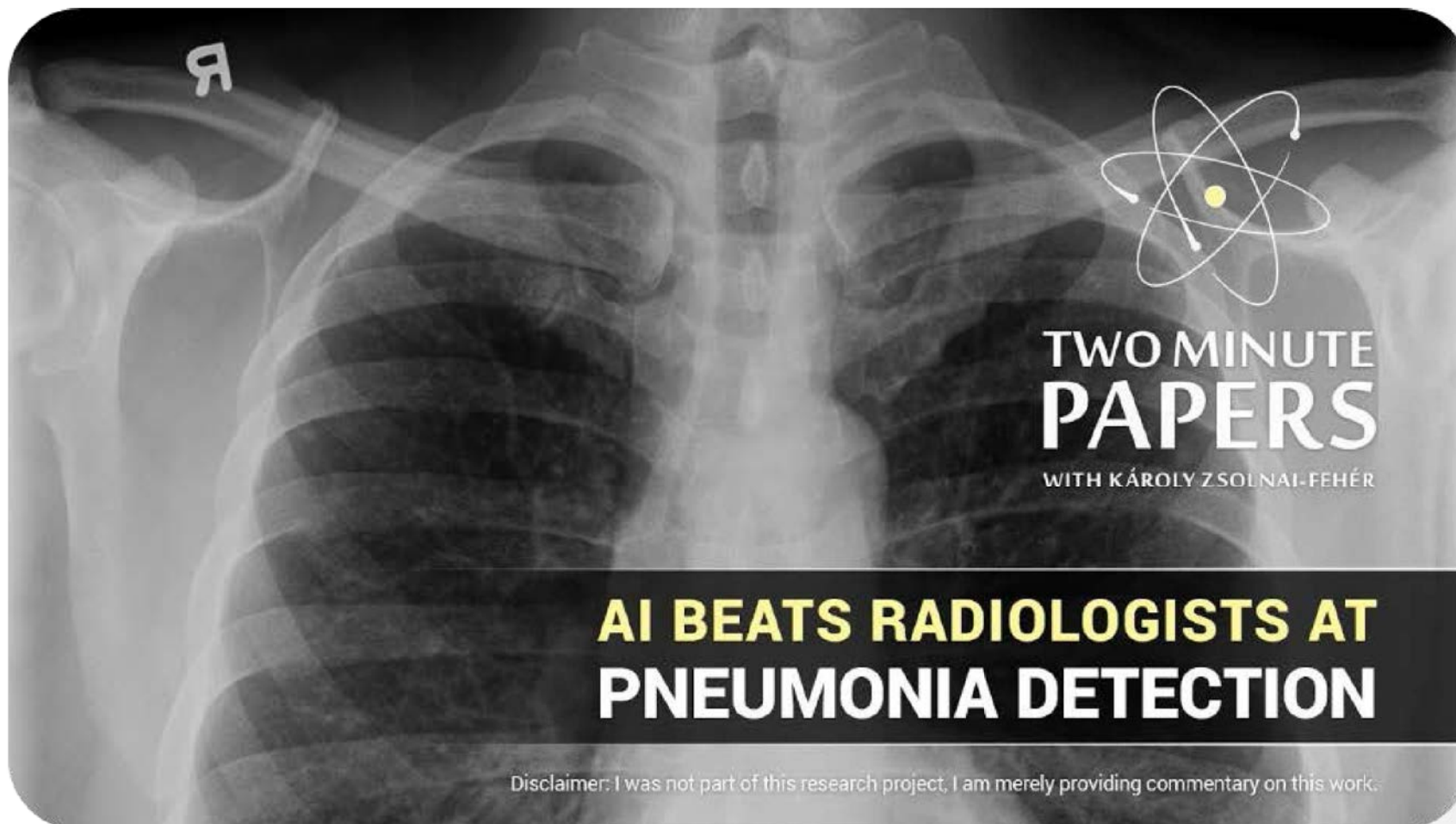
Predicted: 148.0 mmHg

Diagnosing diabetic retinopathy



Image of retina





TWO MINUTE PAPERS

WITH KÁROLY ZSOLNAI-FEHÉR

AI BEATS RADIOLOGISTS AT PNEUMONIA DETECTION

Disclaimer: I was not part of this research project, I am merely providing commentary on this work.

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PNEUMONIA DETECTION

This free AI reads X-rays as well as doctors

What happens when free, open-source software can diagnose us as well as doctors?



Chester the AI Radiology Assistant

<https://mimed.org/tools/xray/>

Intro to Chester the AI Radiology Assistant

by Paul Cohen, Paul Bertin, and Vincent Frappier 2019


Done in 14226ms

Made by **Mila Medical**

Upload an image locally:
side-cardiomegaly1.jpg or
or sample files

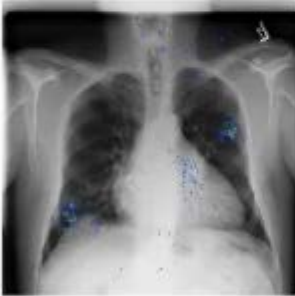
Example Image (00000001_001-Cardiomegaly-Emphysema.png)

Input Image



Score: 0.27, sslm: 0.39
[Show OOD heatmap](#)

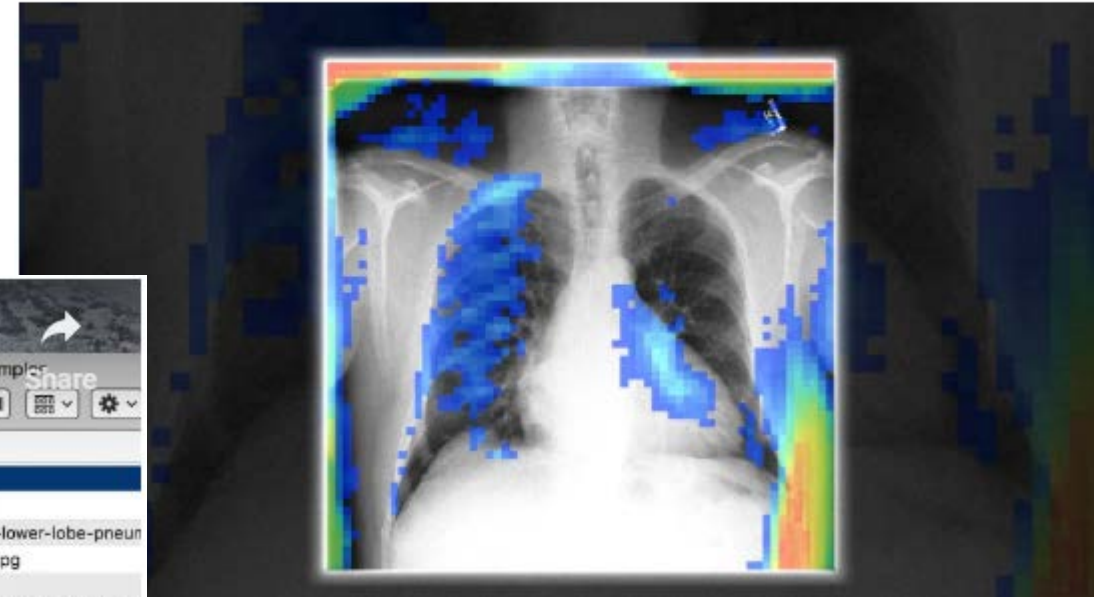
Predictive image regions
Heatmap of image regions which influence the prediction.



Disease Predictions
Risk of a disease.

Disease	Healthy	Risk
Cardiomegaly	●	●
Effusion	●	●
Infiltration	●	●
Mass	●	●
Nodule	●	●
Pneumonia	●	●
Pneumothorax	●	●
Consolidation	●	●
Edema	●	●
Emphysema	●	●
Fibrosis	●	●
Pleural Thickening	●	●
Hernia	●	●

[Send Feedback](#)



Novartis uses AI to get insights from clinical trial data



Bayer and Merck AI Partnership helps radiologists identify patients with chronic pulmonary hypertension faster





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COMPUTER SCIENCE



ARTIFICIAL IMAGINATION

How machines could learn creativity and common sense, among other human qualities

By George Musser

IF YOU EVER FEEL CYNICAL ABOUT HUMAN BEINGS, A GOOD ANTIDOTE IS TO TALK to artificial-intelligence researchers. You might expect them to be triumphalist now that AI systems match or beat humans at recognizing faces, translating languages, playing board and arcade games, and remembering to use the turn signal. To the contrary, they're always talking about how marvelous the human brain is, how adaptable, how efficient, how infinite in faculty. Machines still lack these qualities. They're inflexible, they're opaque and they're slow learners, requiring extensive training. Even their well-publicized successes are very narrow.

IN BRIEF

Several emerging methods on-draw artificial-intelligence systems, such as neural networks, with features that were once consid-

ered to be quintessentially human. Meta-learning primes a network to adapt quickly so that it can pick up new tasks without requiring reams of data.

So-called generative adversarial networks provide a form of imagination, letting machines reproduce the statistical features of data sets.

Disentanglement sensitizes neural networks to the underlying structure of data, making their inner workings more understandable in human terms.

Illustration by Gabriel Silveira

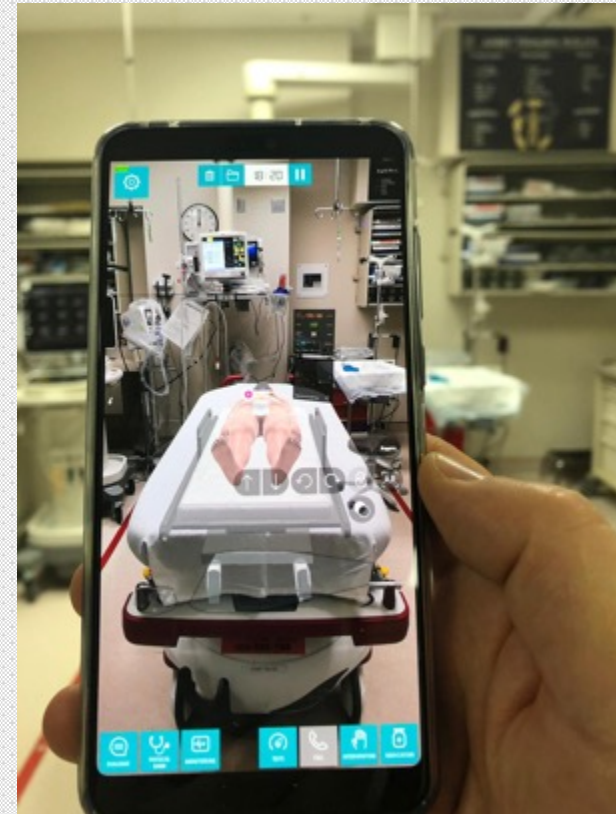
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May 2019, ScientificAmerican.com 59

How does that **WORKS?**

Play your scenario anywhere

Create an
immersive scenario
immediately,
wherever you are
combining the real
world with virtual
patients



She's One Smart Mom, She's Got **text4baby**

Text **BABY** to 511411

Envia **BEBE** al 511411 para Español

Get **FREE** messages each week on your cell phone to help you through your pregnancy and your baby's first year.

Text4baby is an educational program of the National Healthy Mothers, Healthy Babies Coalition.

[Click 2 Register](#)

[How it Works](#)

[FAQs](#)



MSD sponsors Text to Change, an initiative focused on helping people in countries affected by poverty and conflict to access healthcare information via SMS, and the US government, along with several pharmaceutical companies (including **Johnson & Johnson & Pfizer**) support **Text4Baby**, a program that provides information via SMS to improve health during pregnancy and early life

First Digital Pill ?

FDA has approved the first digital pill for the US which **tracks if patients have taken their medication.**

The pill called **Abilify MyCite**, is fitted with a tiny **ingestible sensor** that **communicates with a patch worn by the patient** — the patch then transmits medication data to a **smartphone app** which the patient can voluntarily upload to a **database for their doctor and other authorized persons** to see.

Abilify is a drug that treats schizophrenia, bipolar disorder, and is an add-on treatment for depression.

