

Internet of Clinical Things – Digital Disruption in Clinical Development



Presenter:

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Learning Objectives

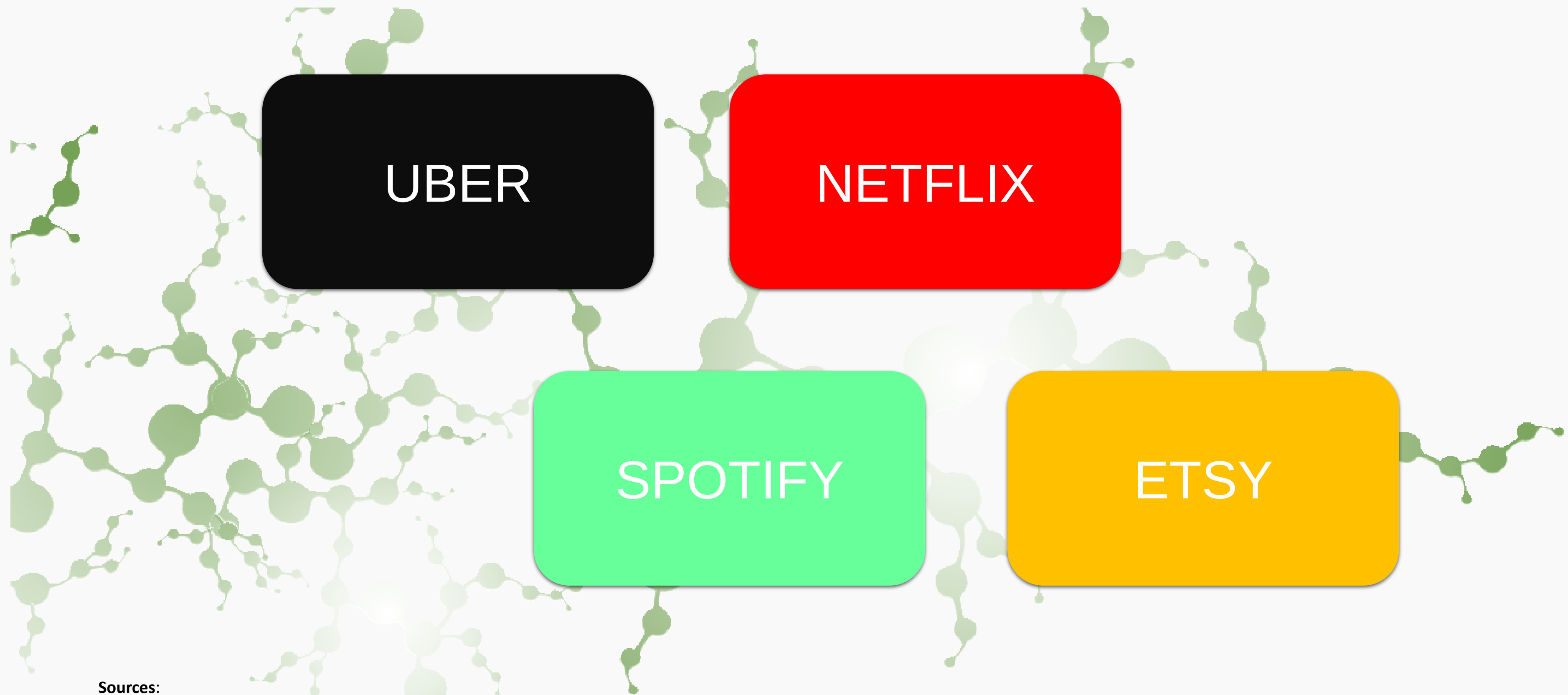
- What is Digital Disruption?
- Digital Disruption Examples!
- Challenges faced by Life Sciences & Healthcare Industry
- Digital Disruption in Life Sciences Industry

What is digital disruption?

- a Changes enabled by technologies that disrupt established ways of value creation
- b Disrupt social interactions and the way we do business
- c Disrupt our thinking
- d All of the above



Examples of Digital Disruption from Other Industries



Sources:

UBER: [https://en.wikipedia.org/wiki/Uber_\(company\)](https://en.wikipedia.org/wiki/Uber_(company))

Spotify: <https://en.wikipedia.org/wiki/Spotify>

Netflix: https://en.wikipedia.org/wiki/Reed_Hastings

Etsy: <https://en.wikipedia.org/wiki/Etsy>

Challenges that Life Sciences and Healthcare industry faces ...

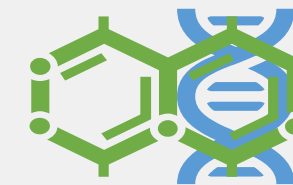
Aging Population



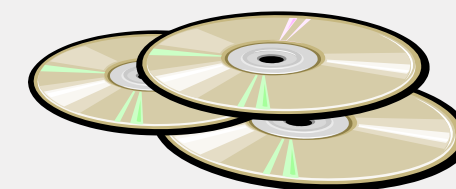
Rising Cost of Healthcare



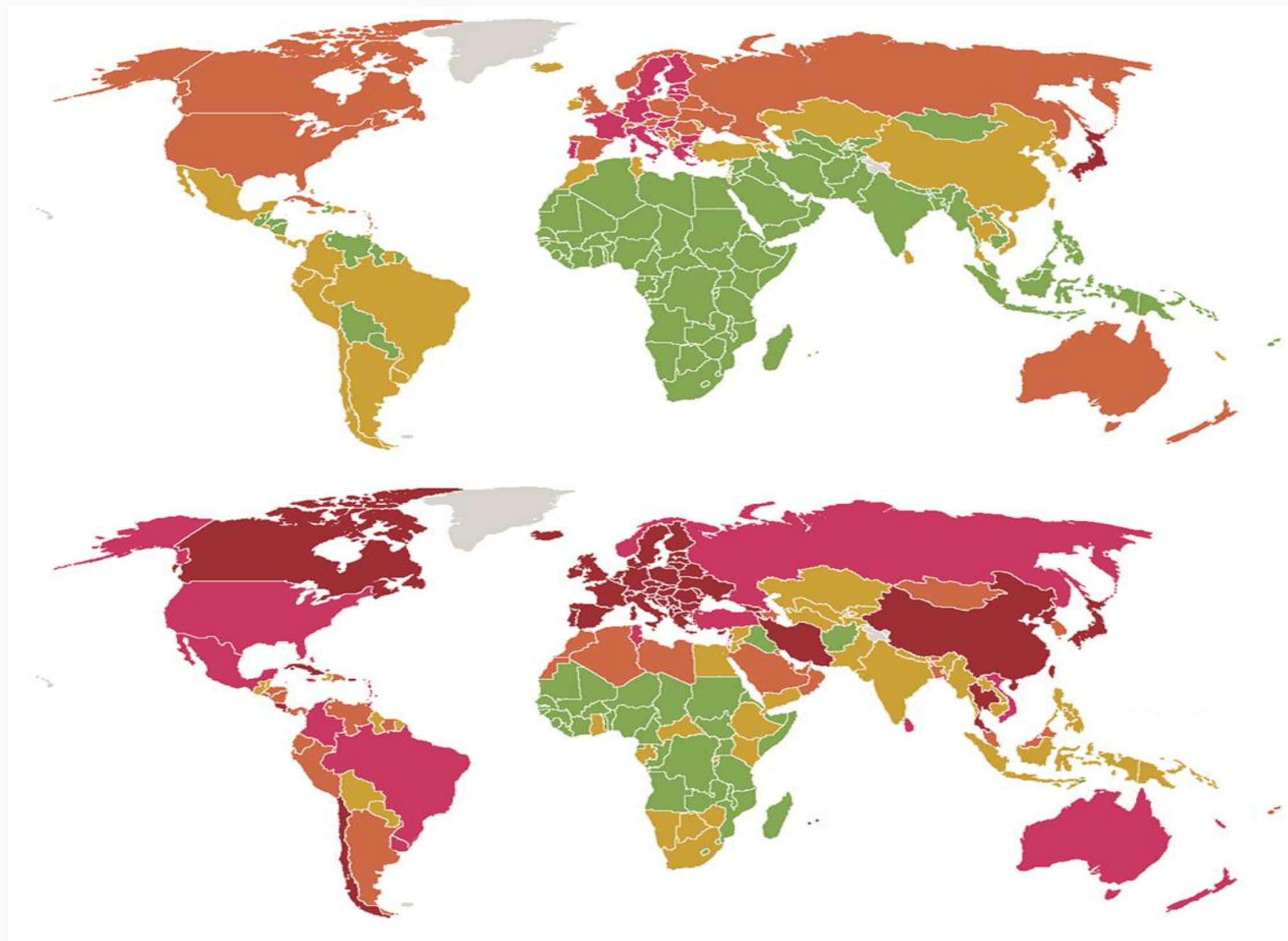
New, potentially deadly organisms / mutation of existing organisms



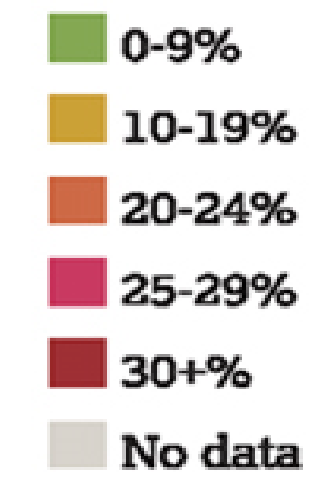
BIG Data Challenge!



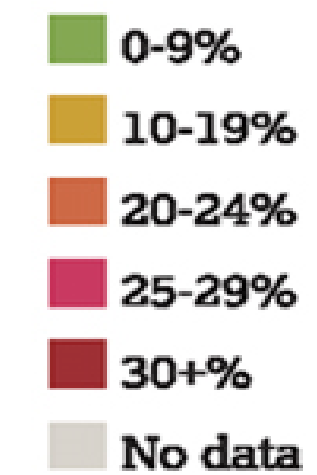
An Aging World ...



2015



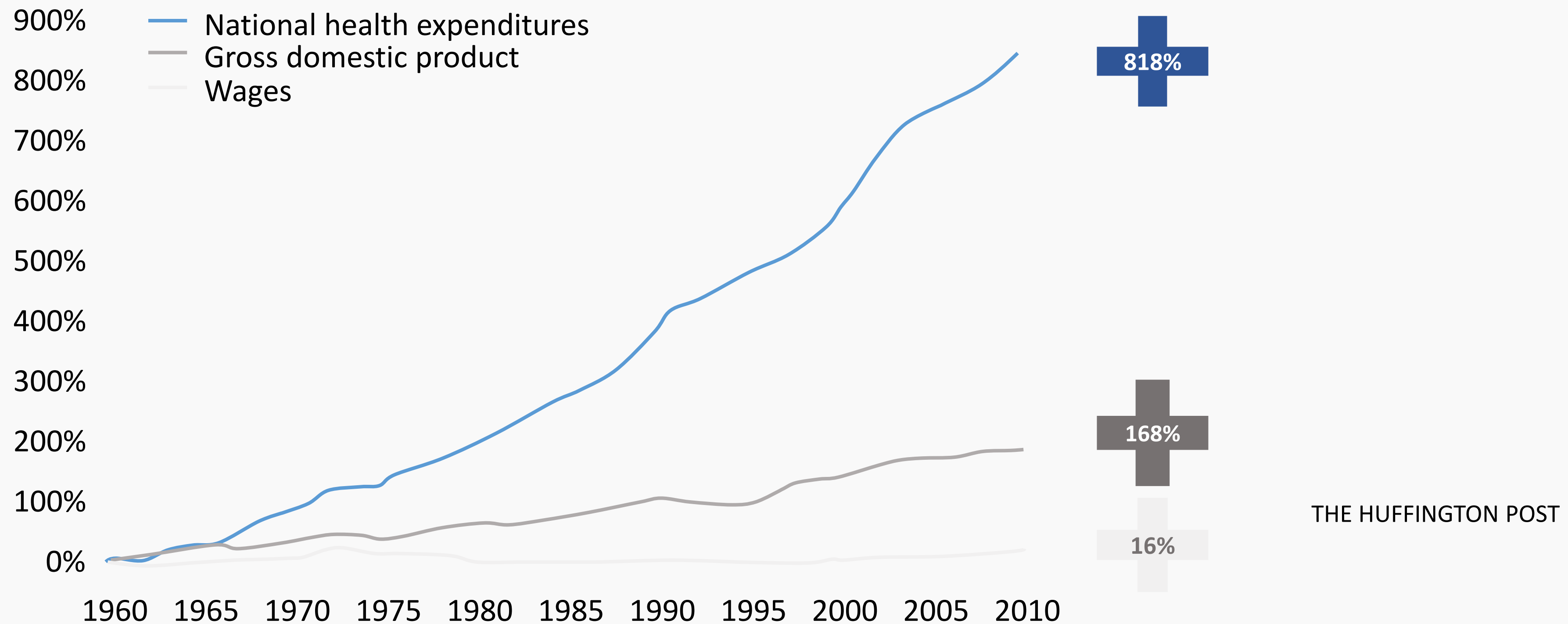
2050



Source: http://www.who.int/ageing/primary_health_care/en/

... leading to higher healthcare costs...

Health care spending has grown much faster than the rest of the economy in recent decades



Source: McKinsey, "Accounting for the Cost of U.S. Health Care" (2011). Center for American Progress

BIG data is growing big anyways!

40 ZETTABYTES

[43 TRILLION GIGABYTES]

of data will be created by 2020, an increase of 300 times from 2005

6 BILLION PEOPLE
have cell phones



WORLD POPULATION: 7 BILLION

Volume SCALE OF DATA

It's estimated that

2.5 QUINTILLION BYTES

[2.3 TRILLION GIGABYTES]

of data are created each day



Most companies in the U.S. have at least

100 TERABYTES

[100,000 GIGABYTES]

of data stored

The FOUR V's of Big Data

From traffic patterns and music downloads to web history and medical records, data is recorded, stored, and analyzed to enable the technology and services that the world relies on every day. But what exactly is big data, and how can these massive amounts of data be used?

As a leader in the sector, IBM data scientists break big data into four dimensions: **Volume, Velocity, Variety and Veracity**

Depending on the industry and organization, big data encompasses information from multiple internal and external sources such as transactions, social media, enterprise content, sensors and mobile devices. Companies can leverage data to adapt their products and services to better meet customer needs, optimize operations and infrastructure, and find new sources of revenue.

By 2015

4.4 MILLION IT JOBS

will be created globally to support big data, with 1.9 million in the United States



As of 2011, the global size of data in healthcare was estimated to be

150 EXABYTES

[161 BILLION GIGABYTES]



**30 BILLION
PIECES OF CONTENT**

are shared on Facebook every month



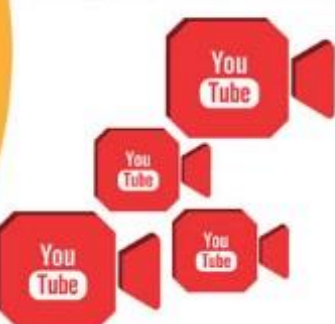
Variety DIFFERENT FORMS OF DATA

By 2014, it's anticipated there will be

**420 MILLION
WEARABLE, WIRELESS
HEALTH MONITORS**

**4 BILLION+
HOURS OF VIDEO**

are watched on YouTube each month



400 MILLION TWEETS

are sent per day by about 200 million monthly active users



The New York Stock Exchange captures

**1 TB OF TRADE
INFORMATION**

during each trading session



Velocity ANALYSIS OF STREAMING DATA

Modern cars have close to

100 SENSORS

that monitor items such as fuel level and tire pressure



By 2016, it is projected there will be

**18.9 BILLION
NETWORK
CONNECTIONS**

— almost 2.5 connections per person on earth



**1 IN 3 BUSINESS
LEADERS**

don't trust the information they use to make decisions



Poor data quality costs the US economy around

\$3.1 TRILLION A YEAR



**27% OF
RESPONDENTS**

in one survey were unsure of how much of their data was inaccurate

Veracity UNCERTAINTY OF DATA

Disrupters Are Changing The Rules...in Order to Find Solutions to these Challenges

1

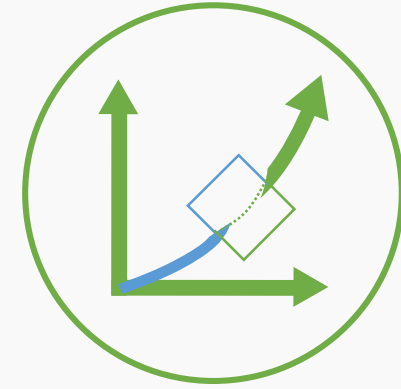
Remote monitoring of health condition

2

Digital Doctor

3

Faster, cheaper clinical 'simulated' trials



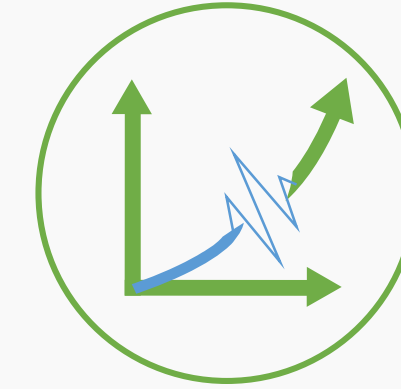
4

Digital CRO



5

Customized, Personalized Medication



6

Outcome based payment

Remote monitoring of health conditions

Remote monitoring of health condition

Digital Doctor

Faster, cheaper clinical 'simulated' trials

Digital CRO

Customized, Personalized Medication

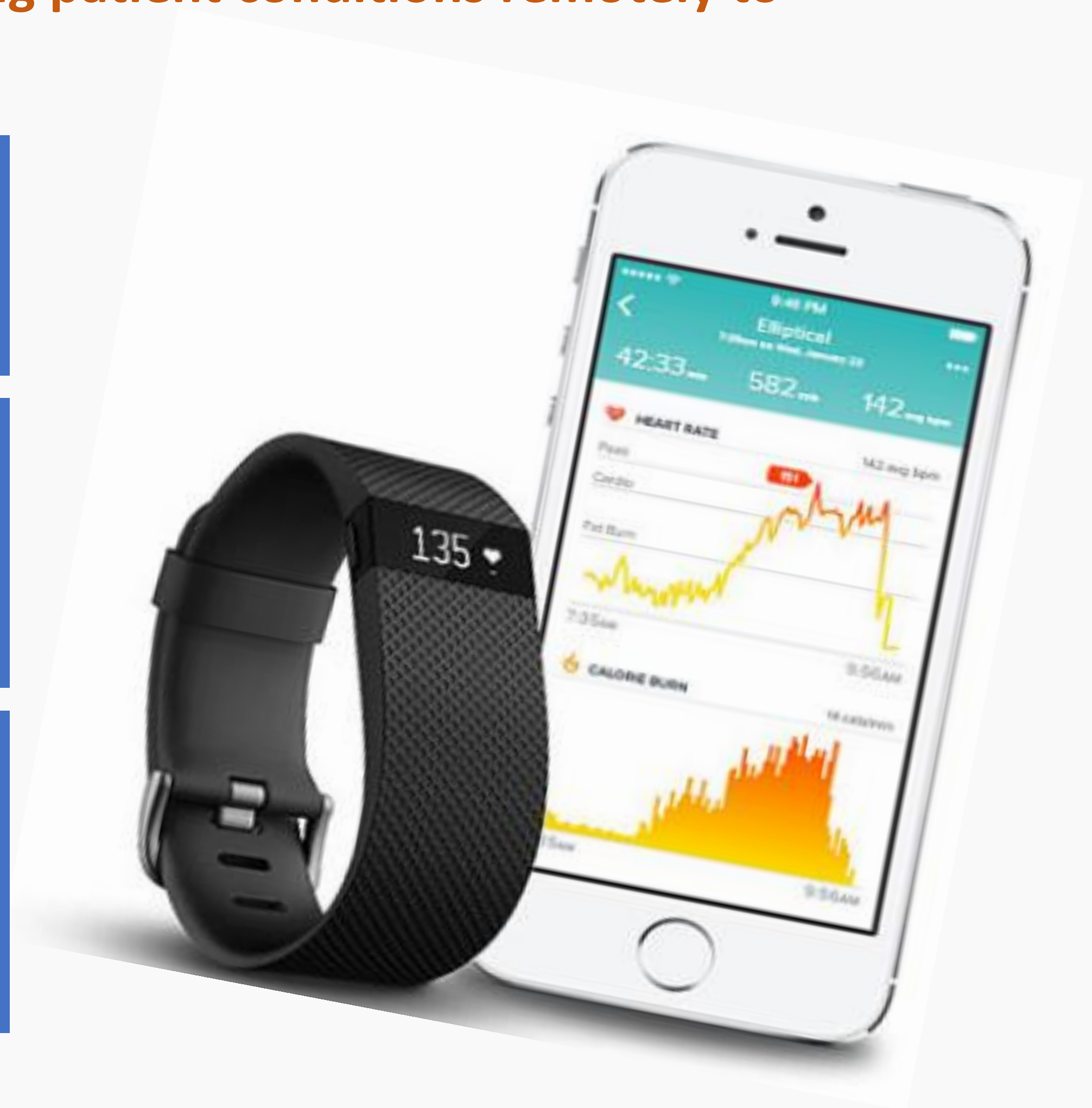
Outcome based payment

Hospitals going high tech and are monitoring patient conditions remotely to free up doctors appointments

Patients with long term illness monitor their conditions remotely through high tech clothing and wearable gadgets

Within 5 years patients will be able to go online and speak to their physician via videolink , order prescriptions or see their entire health record

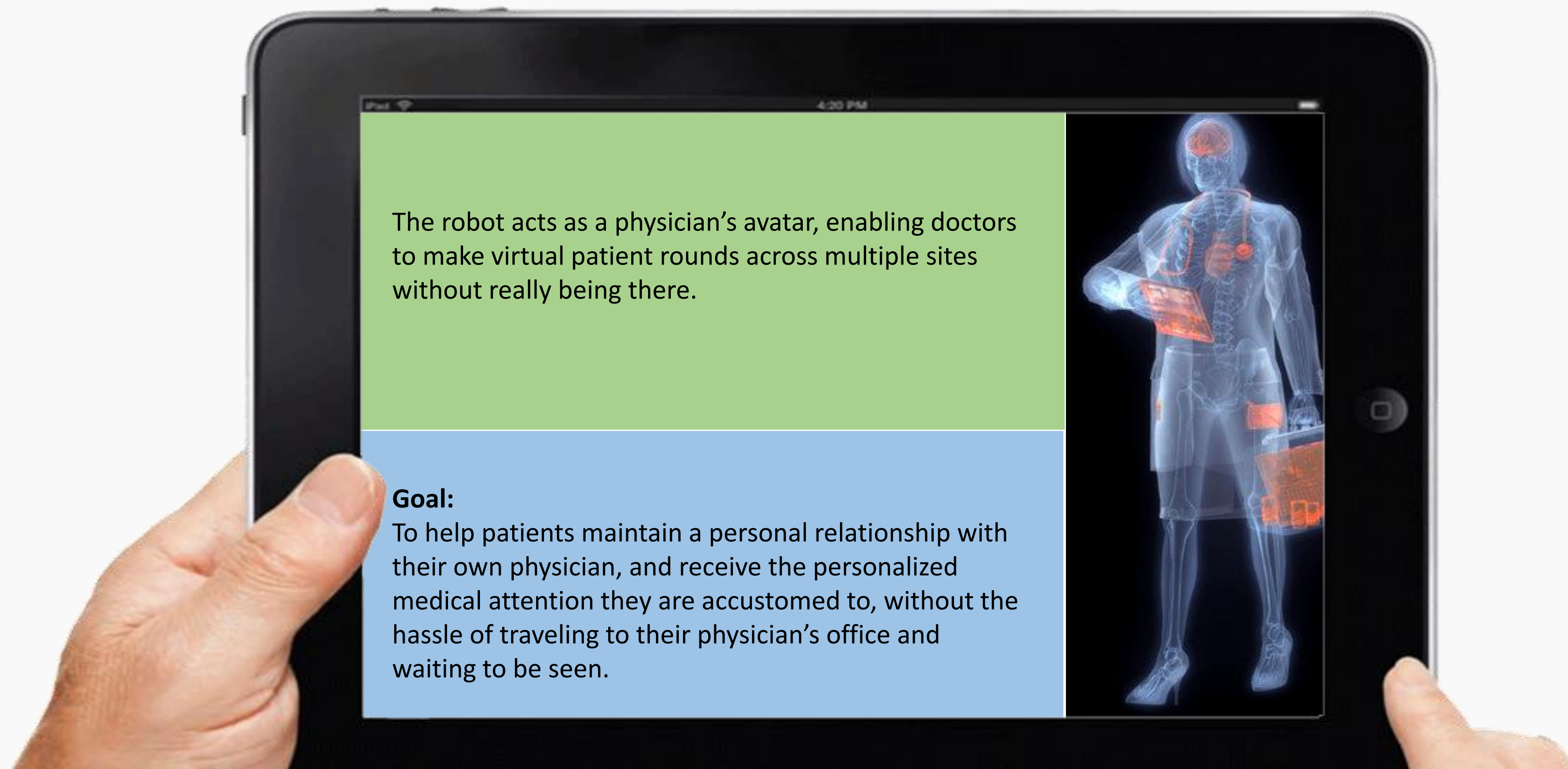
Per NHS, By 2018 nearly three million people are expected to have at least three long-term medical conditions like diabetes and dementia, resulting in growing demand and pressure on health and care services



Digital Doctor

Remote monitoring of health condition	Digital Doctor	Faster, cheaper clinical 'simulated' trials
Digital CRO	Customized, Personalized Medication	Outcome based payment

In today's digitally focused world, there are some cases where a trip to the doctor can be easily replaced with the download of an app or the power of a text message



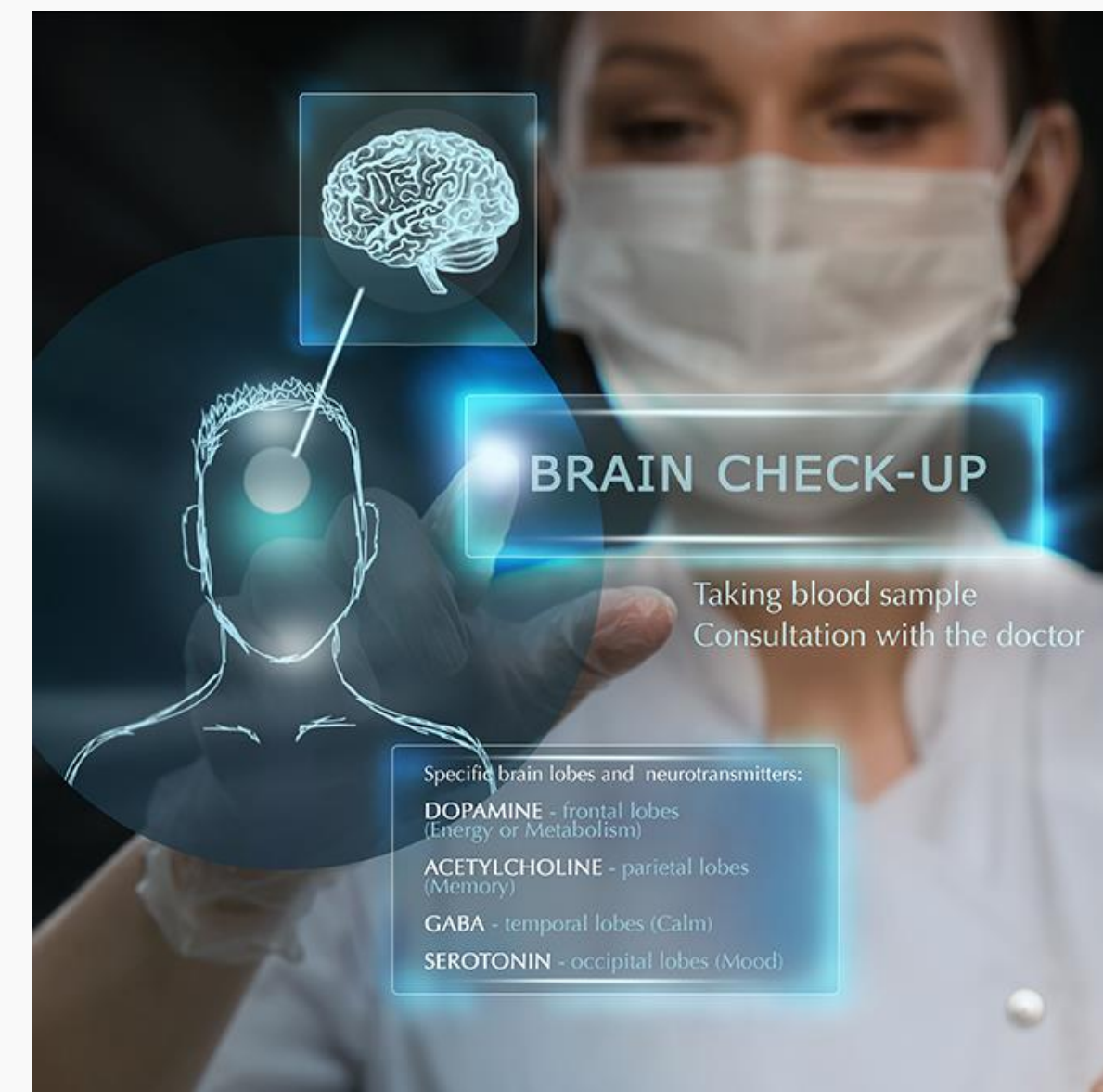
Digital Doctor

Today's Amelia

IPsoft's 'Amelia' virtual assistant just got a whole lot more human



Tomorrow will we see Dr. Amelia?



Remote monitoring of health condition	Digital Doctor	Faster, cheaper clinical 'simulated' trials
Digital CRO	Customized, Personalized Medication	Outcome based payment

Source: <http://www.pcworld.com/article/2989747/ipsofts-amelia-virtual-assistant-just-got-a-whole-lot-more-human.html>

Simulated Clinical Trials

Remote monitoring of
health condition

Digital Doctor

Faster, cheaper clinical
'simulated' trials

Digital CRO

Customized,
Personalized Medication

Outcome based payment

Today, average cost of developing and bringing a novel pharmaceutical agent to market is approximately \$2.6 billion, and the time invested into a signal project can total up to 12 years. The maximum cost (and time) incurred during clinical trials is on

- Recruiting patients
- Conducting trials

What is a “simulated clinical trial”?

- No real sites!!!
- No real patients!!!
- All ‘virtual’!!!

Cost and time for a trial are
minimized, leading to cheaper,
faster drugs from concept to
market!

Source: <http://xtalks.com/Virtual-Clinical-Trials-1.ashx>

Simulated Clinical Trials

Remote monitoring of
health condition

Digital Doctor

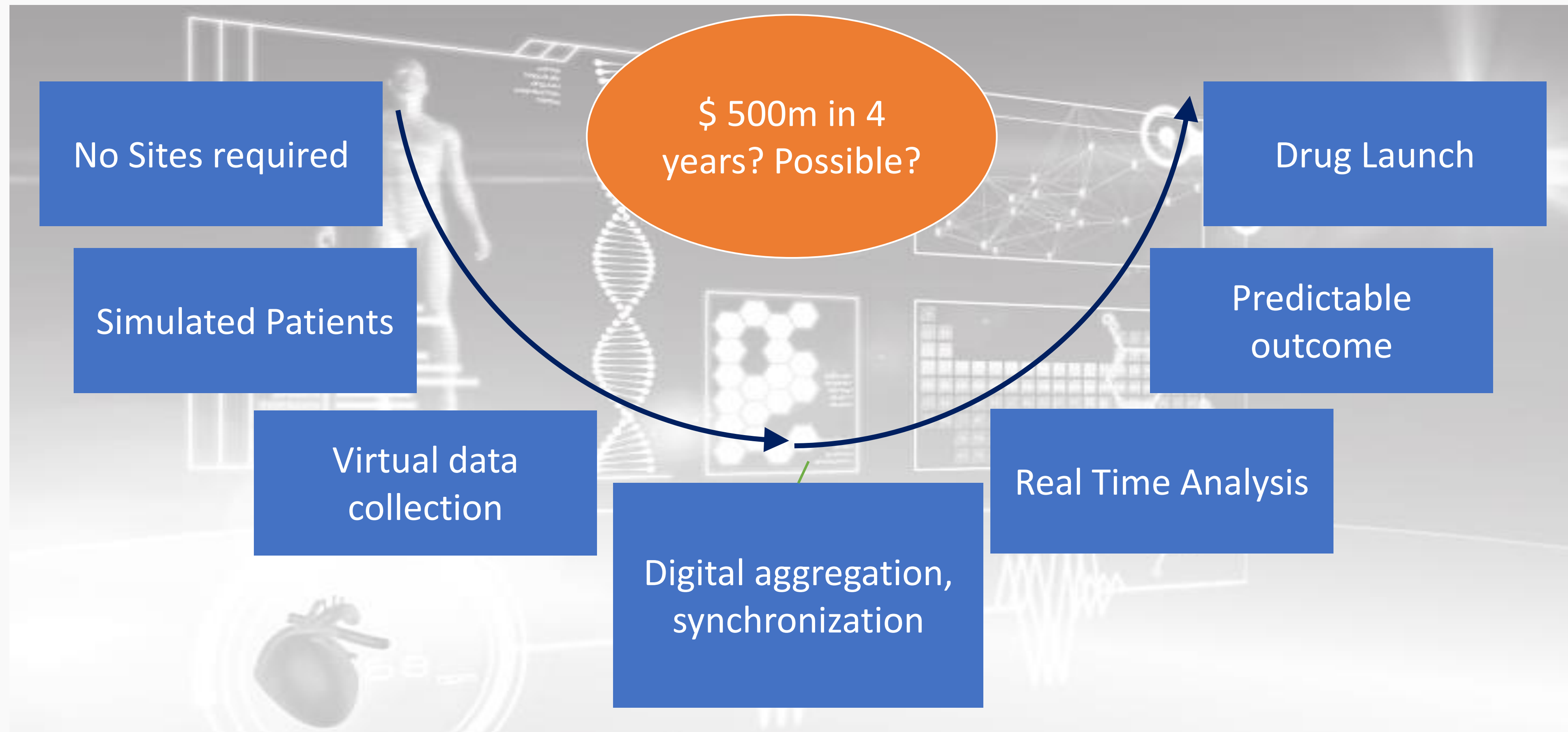
Faster, cheaper clinical
'simulated' trials

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So what are Simulated Clinical Trials?



Digital CRO

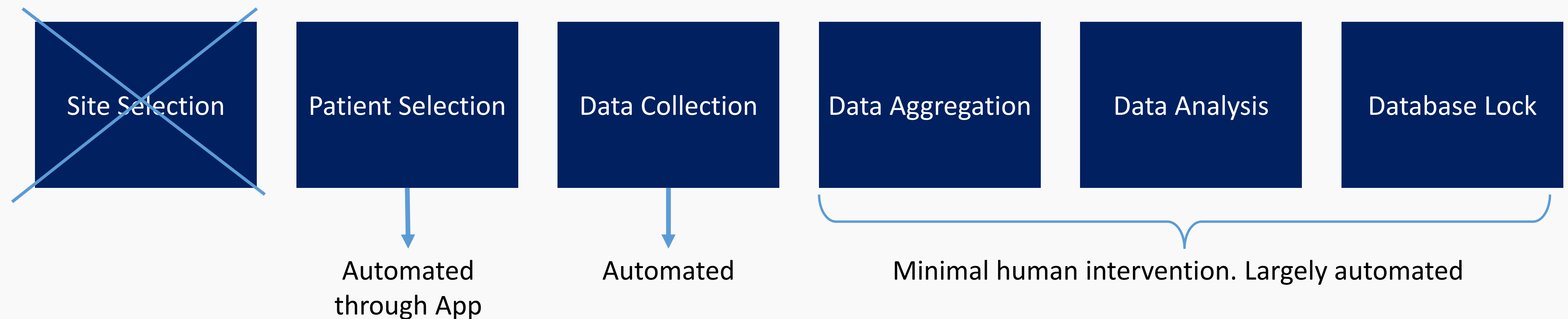
Remote monitoring of health condition	Digital Doctor	Faster, cheaper clinical 'simulated' trials
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In the world of a “Digital CRO” human intervention for clinical trials will be minimized

Current Process



Digital CRO Process



Personalized Medicine

Remote monitoring of
health condition

Digital Doctor

Faster, cheaper clinical
'simulated' trials

Digital CRO

Customized,
Personalized Medication

Outcome based payment

“Personalized medicine” is an innovative approach to disease prevention and treatment that takes into account differences in people’s genes, environments and lifestyles.

By performing more genetic tests, doctors may customize treatment to each patient’s needs.

Genetic Screening \$25B market by 2025



Source: <http://www.fiercehealthcare.com/it/genetic-testing-market-to-hit-25b-by-2021>

Use of Personalized medicine

Remote monitoring of
health condition

Digital Doctor

Faster, cheaper clinical
'simulated' trials

Digital CRO

Customized,
Personalized Medication

Outcome based payment

6 times faster genomic analyses helps

Determine un-common drug allergy prior surgery

If you are scheduled for a minor surgery tomorrow, a genomic analysis can be completed today to rule out any uncommon drug allergies, especially those which can prove to be lethal under general anesthesia.



Examples

Roche's personalized medicine **Zelboraf** receives positive opinion from European authority for the treatment of people with metastatic melanoma.



Myriad genetics are designing diagnostics to be paired with a specific drug, to help healthcare professionals determine which patients could be helped by that drug and which patients would not benefit, or could even be harmed.

Sources:

<http://www.roche.com/media/store/releases/med-cor-2011-12-16.htm>

<https://www.myriad.com/healthcare-professionals/improving-patient-care/guiding-personalized-treatment/>

Outcome based Payments

Remote monitoring of
health condition

Digital Doctor

Faster, cheaper clinical
'simulated' trials

Digital CRO

Customized,
Personalized Medication

Outcome based payment

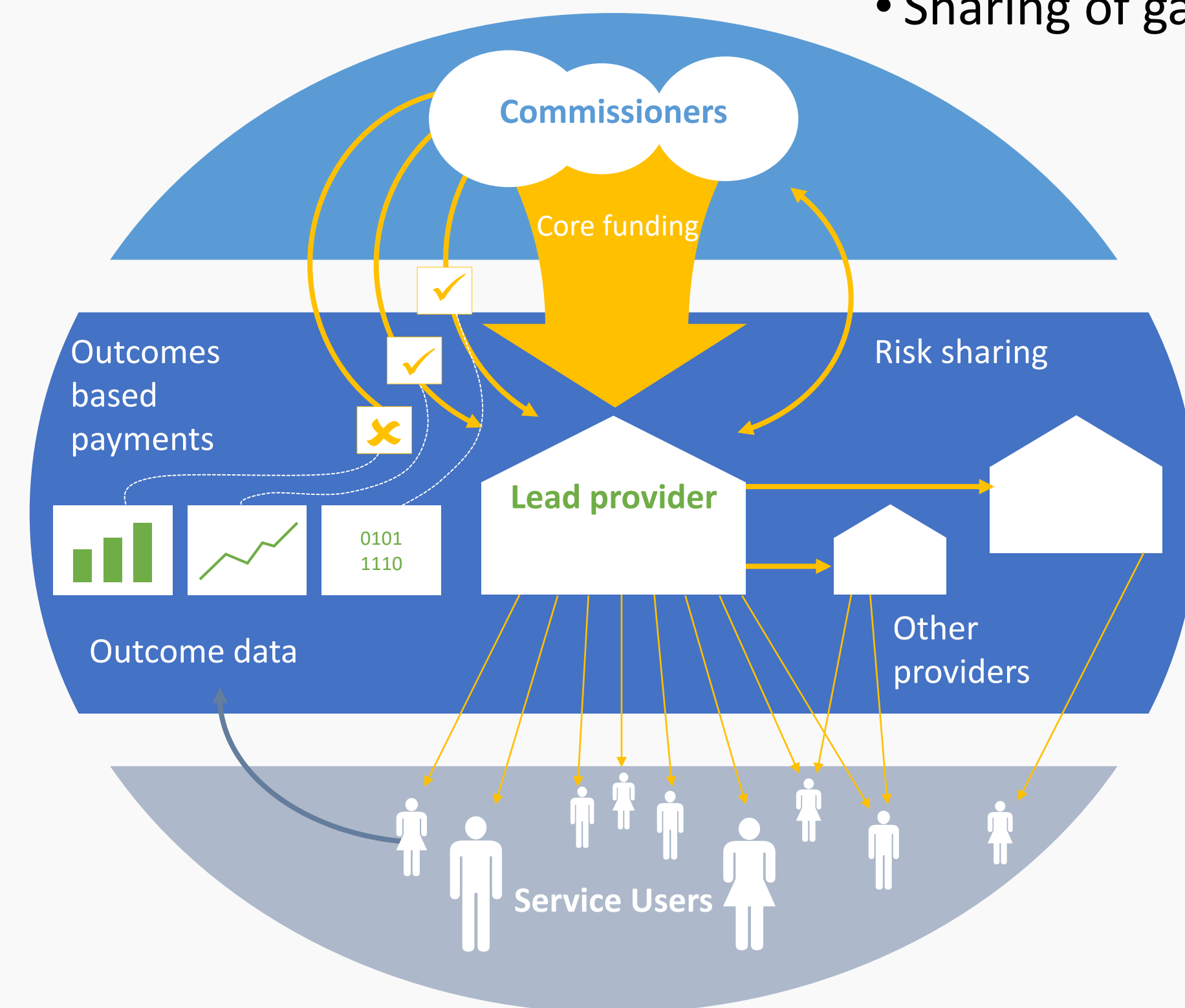
Also known as "**P4P**" or “value-based purchasing,” this payment model **rewards** physicians, hospitals, medical groups, and other healthcare providers for meeting certain performance measures for quality and efficiency.

It **penalizes** caregivers for poor outcomes, Medical errors, or increased costs.

How the model works

Blue arrow represent flows of money

- Funding for providers
- Spending on care for service users
- Sharing of gains/losses



Pharma companies offering outcome based payments

Remote monitoring of health condition

Digital Doctor

Faster, cheaper clinical 'simulated' trials

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Outcome based payment

Merck and Cigna deal



Merck & Co. will give discounts on its anti-diabetes medications – **Januvia** and **Janumet** – to Cigna if patients take the drugs as prescribed by their doctor. Merck will extend further discounts and rebates to Cigna if patients are able to lower their blood sugar levels.



Source: <http://www.hartfordbusiness.com/article/20090525/PRINTEDITION/305259968/cigna-merck-ink-pay-for-performance-deal>



Novartis plans to offer an outcomes-based plan for its newly approved drug **Entresto** for **chronic heart failure**.

Insurers would initially pay a lower price, followed by an additional payment if Entresto succeeds in keeping patients out of the hospital and reducing associated costs.



Source: <http://www.fiercepharma.com/sales-and-marketing/novartis-defies-naysayers-newfangled-pay-for-performance-deals-on-entresto>

Implications of Digital Disruption in Life Sciences

A combination of all the things we talked about could be what the future looks like:

- ✓ Pharmaceutical firms partner with **'dCROs'** to bring drugs to market faster
- ✓ Pharmaceutical firms partner with insurance companies to provide outcome based medication which in turn will spawn
 - **Device manufacturers** that will track wellness as well as compliance to prescribed medication
 - Firms with domain and technology skills that will drive **genetic analysis** of individuals

The pharmaceutical industry will start looking increasingly 'digital' and the firms that will be successful will need to have deep pharmaceutical domain skills as well as technology expertise