

When an intelligent ecosystem delivers personalized health experiences anytime and anywhere, how will you create value?

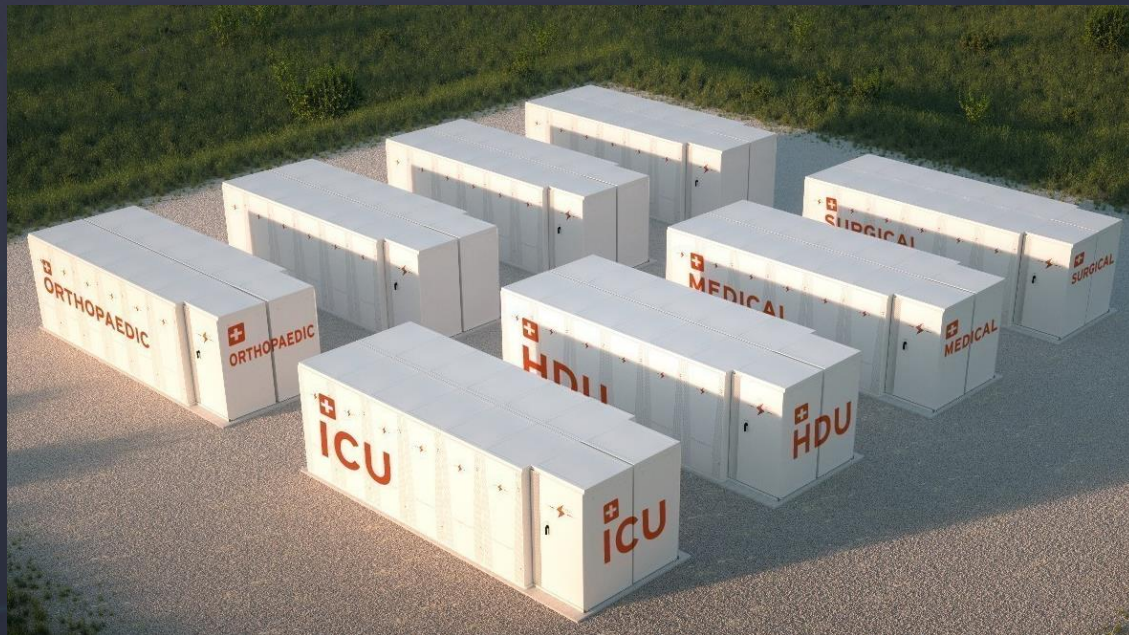
■ ■ ■  
The better the question. The better the answer.  
The better the world works.



# The future physician (or "medical engineer")?

Will physicians become 'medical engineers' overseeing nanobots augmented by smart technologies?

Will medical parks unlock remote care at (seemingly today) unimaginable scale?



Medical engineer hundreds of miles away from the actual patient and can monitor and treat >50 patients at a time.



Advanced nanobots performing medical intervention



# ...and the future Smart home



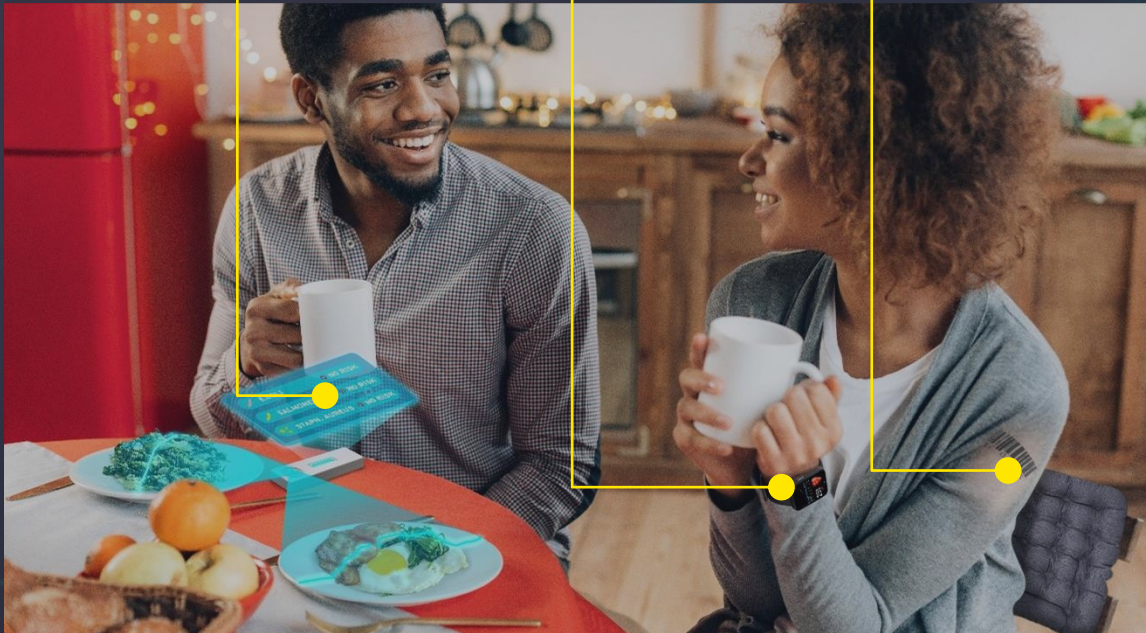
Genomic sequencer scans breakfast checking for signs of *E.coli*



Smart watch - monitors lethargy



Smart tattoo- blood and tissue readings



Will hand-held genomic sequencers that check our food for antibiotic-resistant bacteria become common place?

Will biometric tattoos programmed to our personal health risks and needs and monitored by AI not only "manage and treat" but enable early detection to "prevent and cure"?

# Five irrefutable facts continue to force a shift in traditional industry models ...

## Socioeconomic forces

Care will continue to take an ever larger share of GDP as obesity, chronic disease, aging populations and health disparities increase ... will require a greater proof of value.

## Required capital efficiency

Pressure moves from productivity and efficiency challenges to innovation with intelligent modernized infrastructure ... will require constant productivity assessments.



## Technology integration

Conversion to virtual personalized and preventive models ... will require integration of new capabilities.

## Customer engagement

Consumer acceptance of smart devices to receive care will reshape care delivery ... will require change in business and clinical models.

## Workforce shortages

18m predicted shortfall in global health care workforce by 2030 ... will need a shift toward virtualization, automation and AI

# ... which drive eight key changes in the traditional health model



At the same time, the volume of health data - and the sources that generate these data - are growing exponentially

**36% CAGR** projected increase in Health data by 2025

**6.3%** Manufacturing

**6.0%** Financial services

Health data is growing at a much faster rate than data generated by other industries

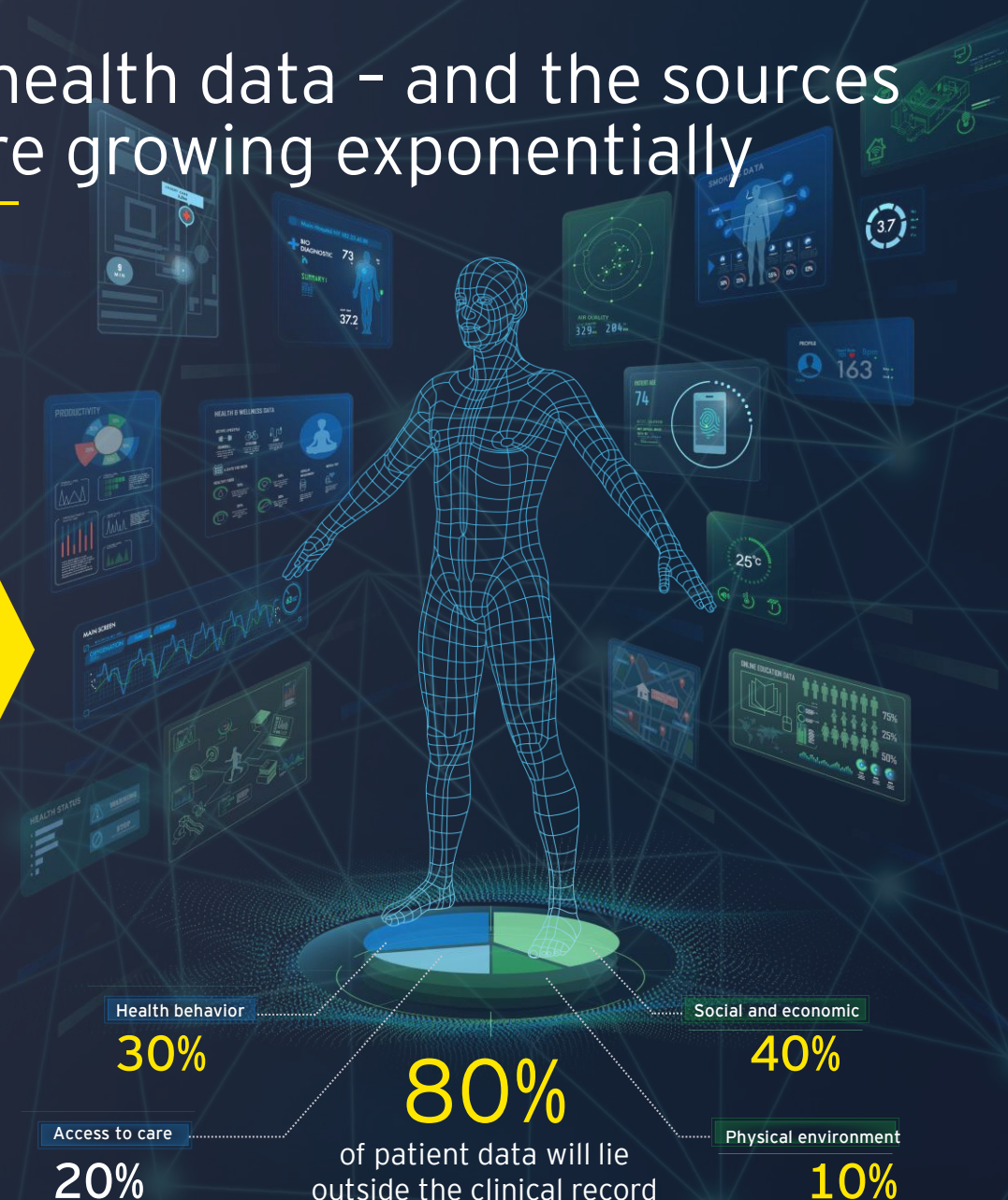
*In 2021, every person on the planet generated 50 terabytes of data*

*1 terabyte (TB) = 1,000 gigabytes (about 500 hours of HD video)*

**1 trillion**

sensors in the world in 2020

*(CAGR of 195% since 2010)*



Health behavior

**30%**

Social and economic

**40%**

Access to care

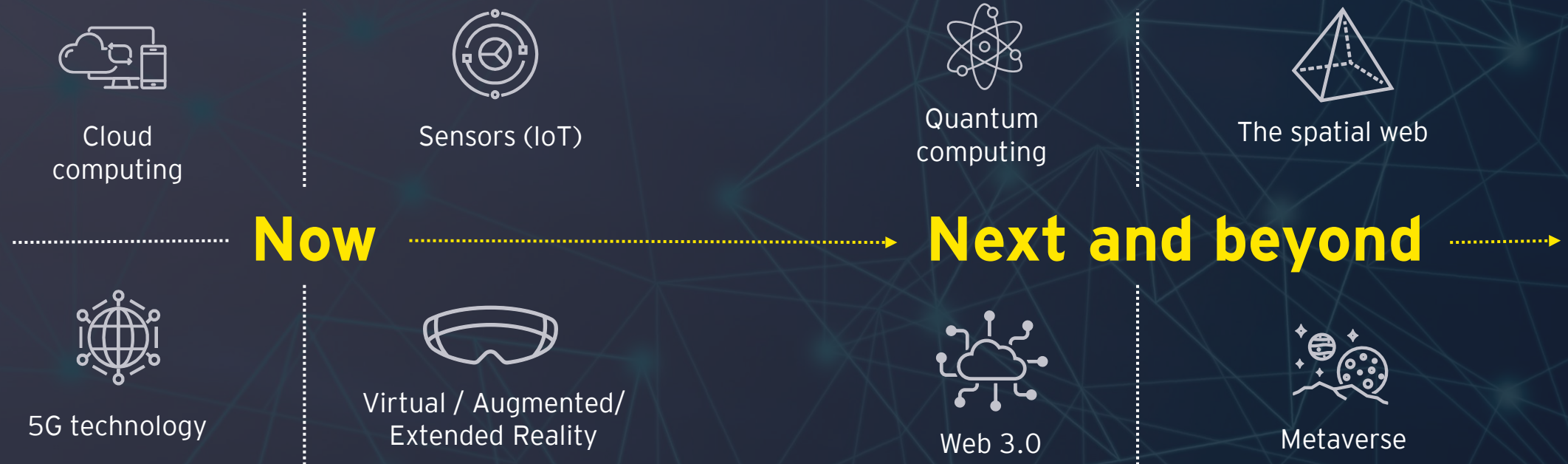
**20%**

**80%** of patient data will lie outside the clinical record

Physical environment

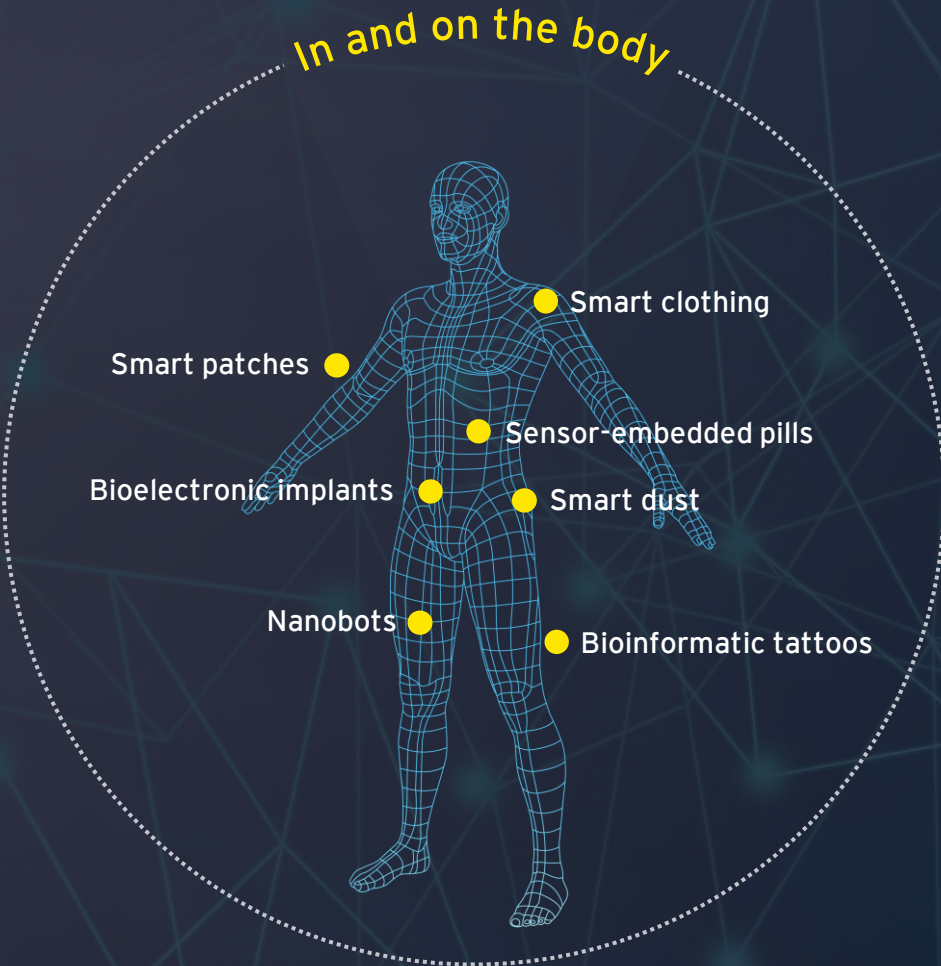
**10%**

... this trend is only set to continue. The future will be data-rich,  
and we will continue to see new technology drivers




Medicine will no longer be a clinical science supported by data; it is already moving to a data science supported by clinicians.

# Advancements in sensors are rapidly creating a new Internet of Medical Things (IoMT) ... “inside” us and “on” us

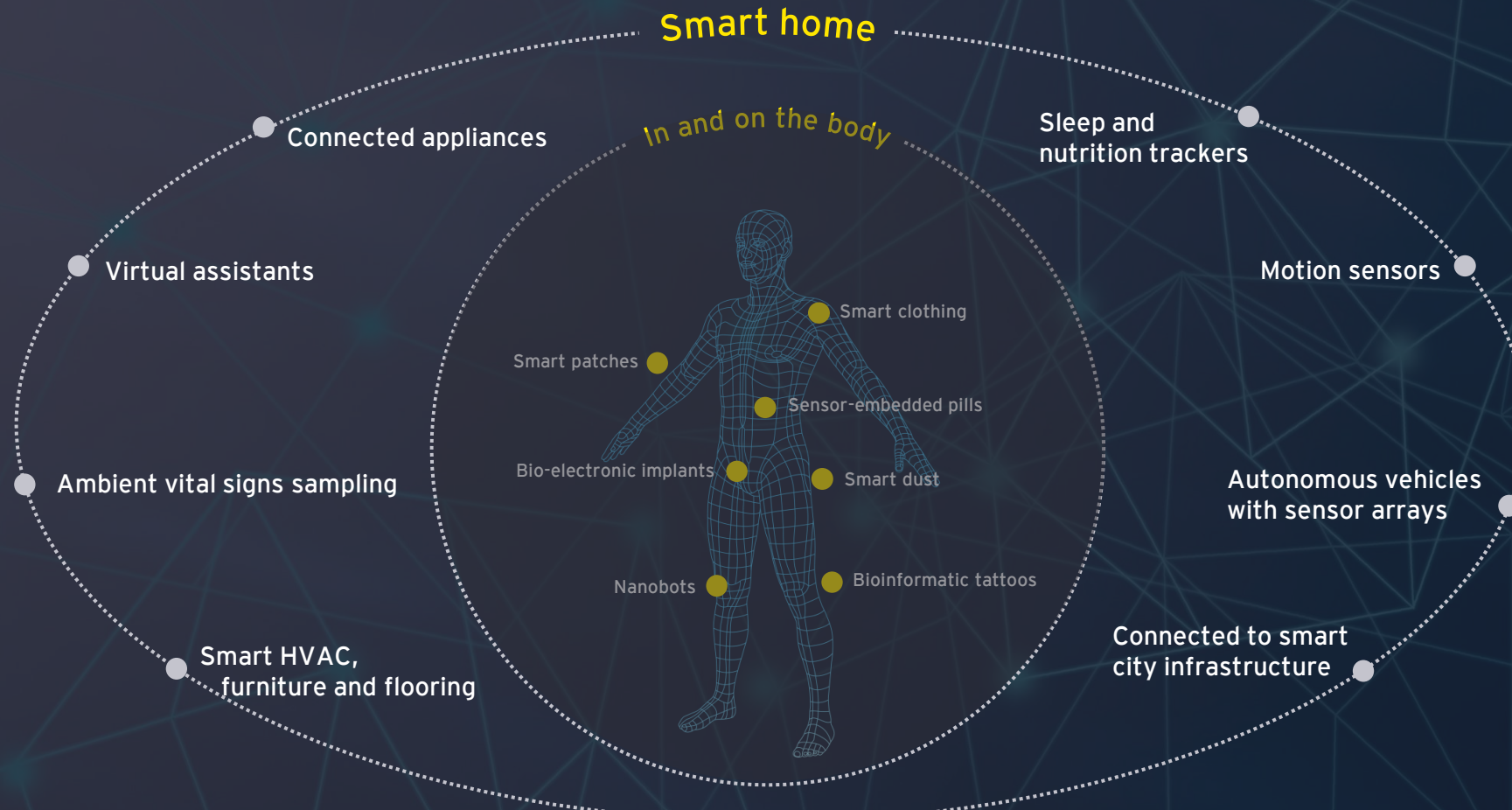




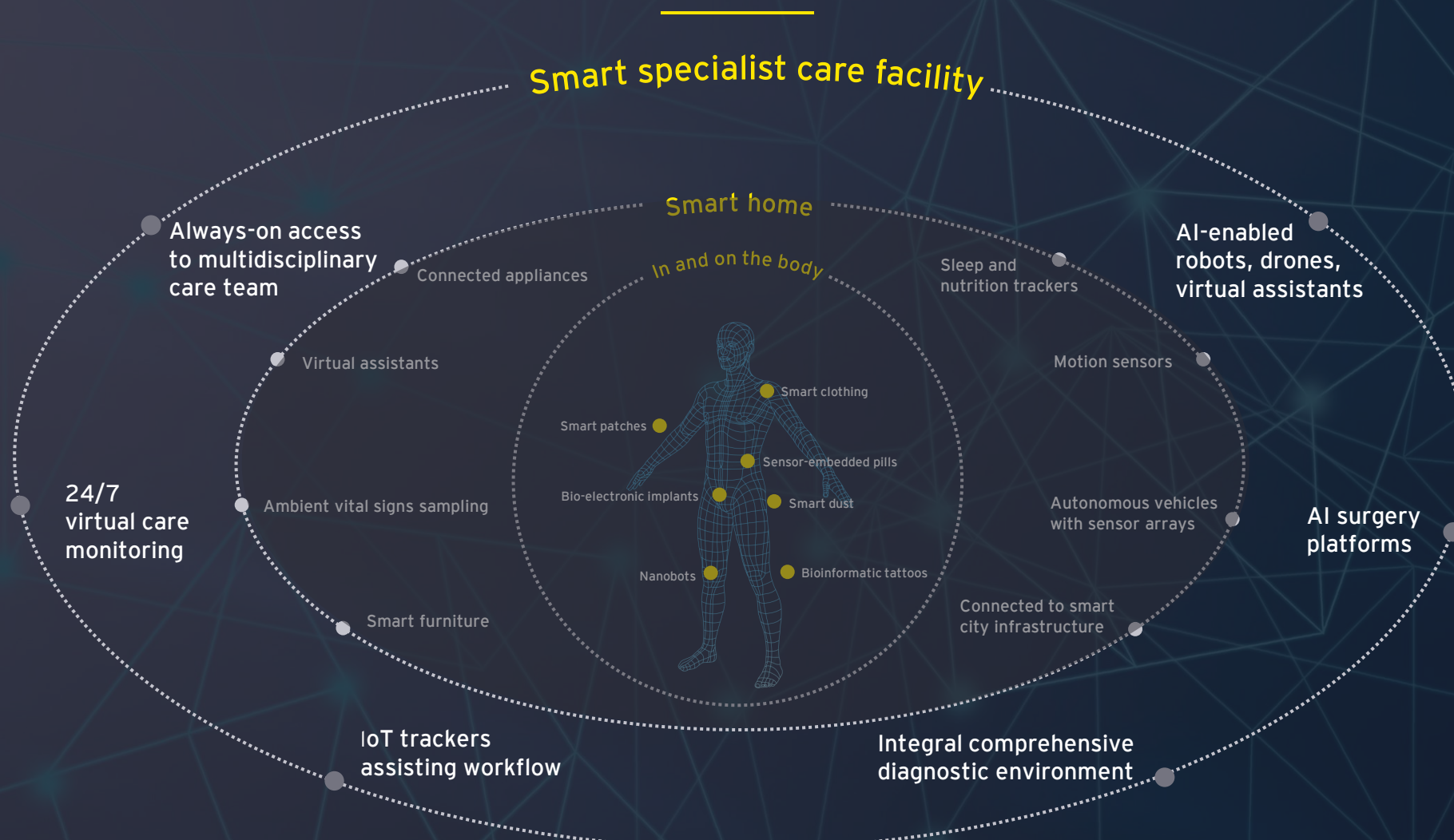
A woman with dark hair tied back is sitting up in bed, wearing a grey tank top and white bedding. She is holding a clear glass to her lips and drinking water. The background is a soft-focus bedroom setting with a lamp and a plant.

When will ingestible sensors be preferred and considered a natural part of personalized care?

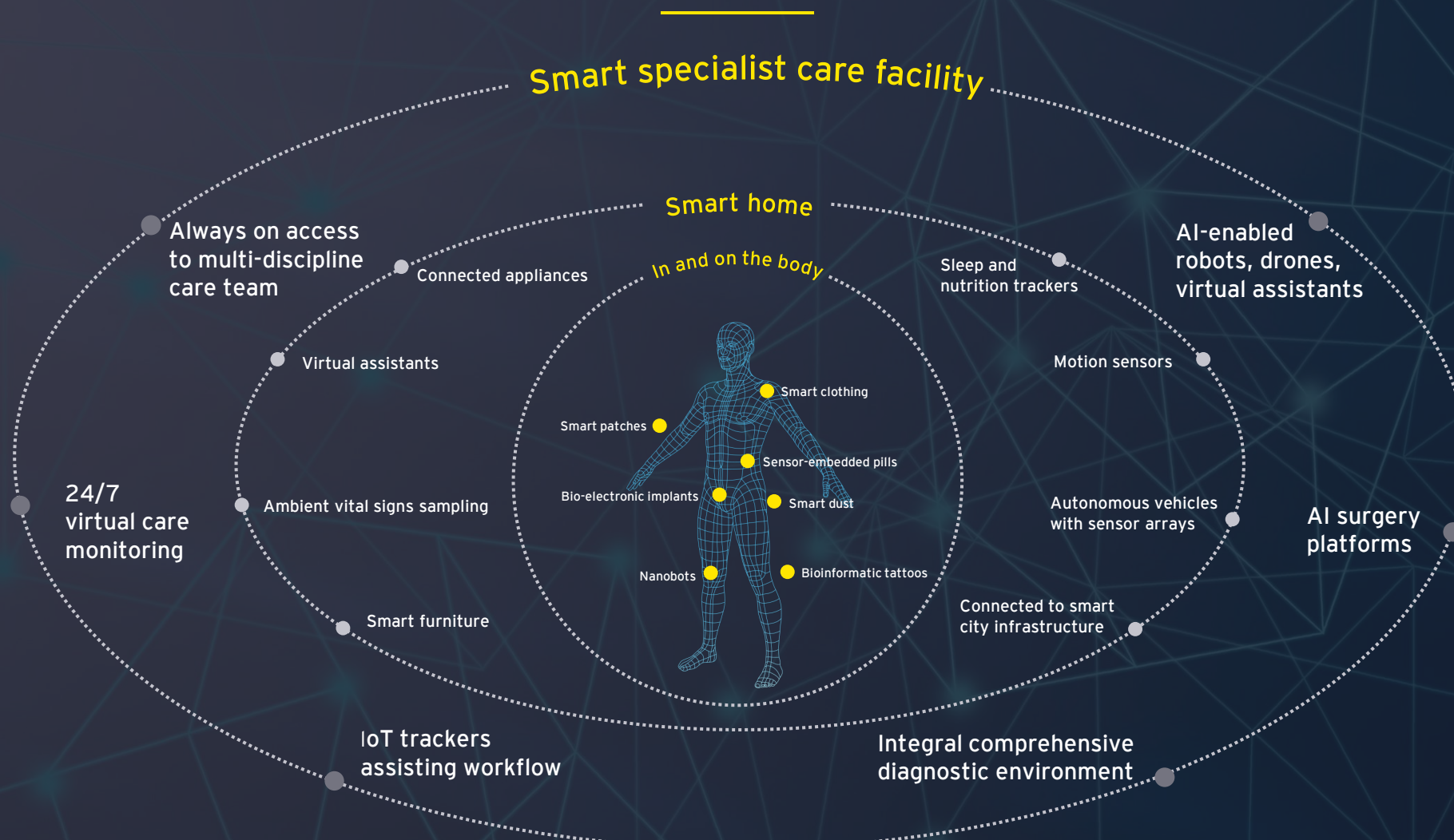
# This IoMT will extend into our homes ...



# ... and beyond, to specialist care facilities ...



# ... resulting in an IoMT “everywhere”

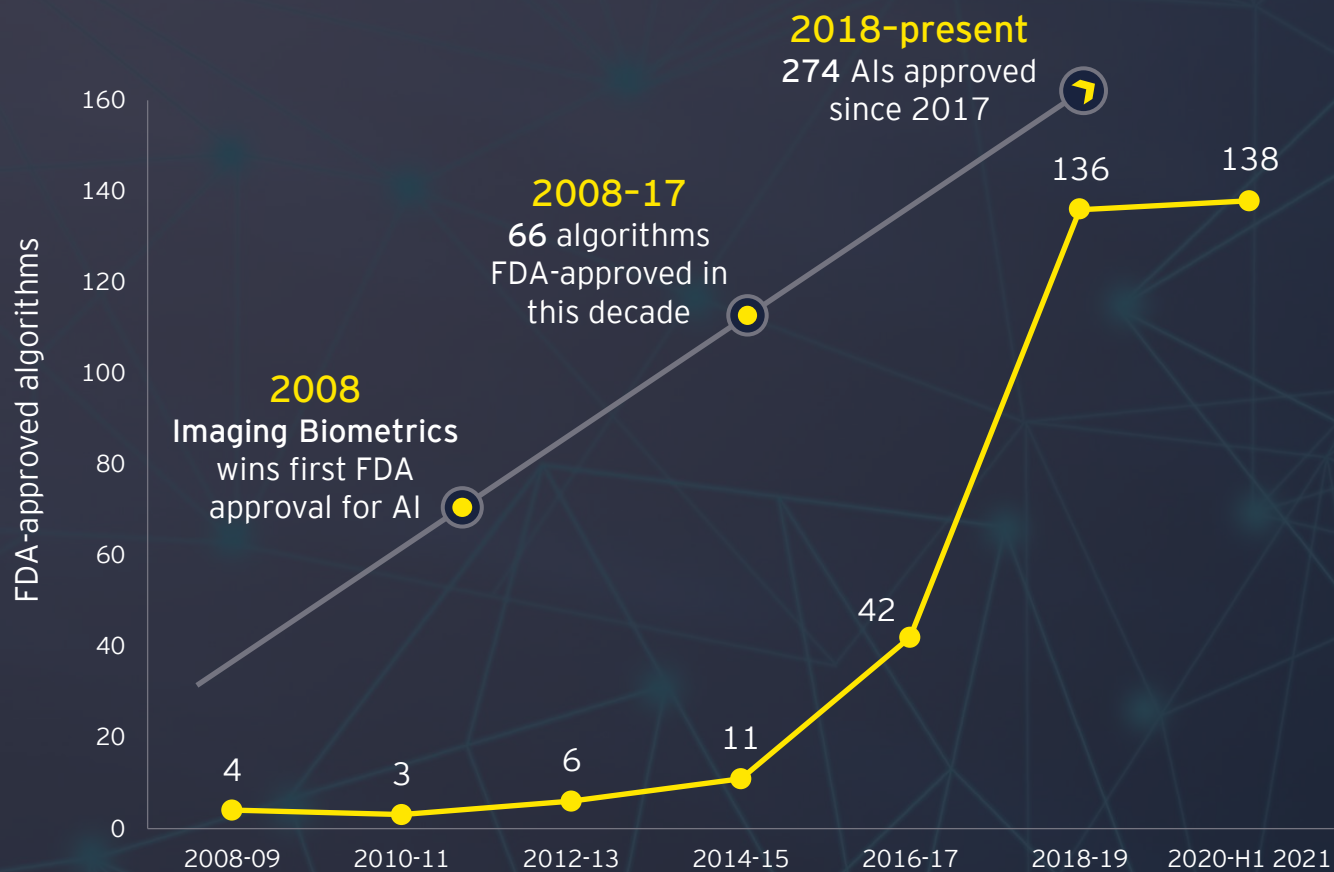


But data by itself is meaningless ... the journey from data to actionable insights and thus health value must be made



# AI is already optimizing insights from large quantities of health data that humans alone are unable to compute with comparable precision

## FDA approvals for AI algorithms



## Recent FDA approvals for AI

Feb 2022

Viz.ai wins approval for AI that detects cerebral aneurysm

Jan 2022

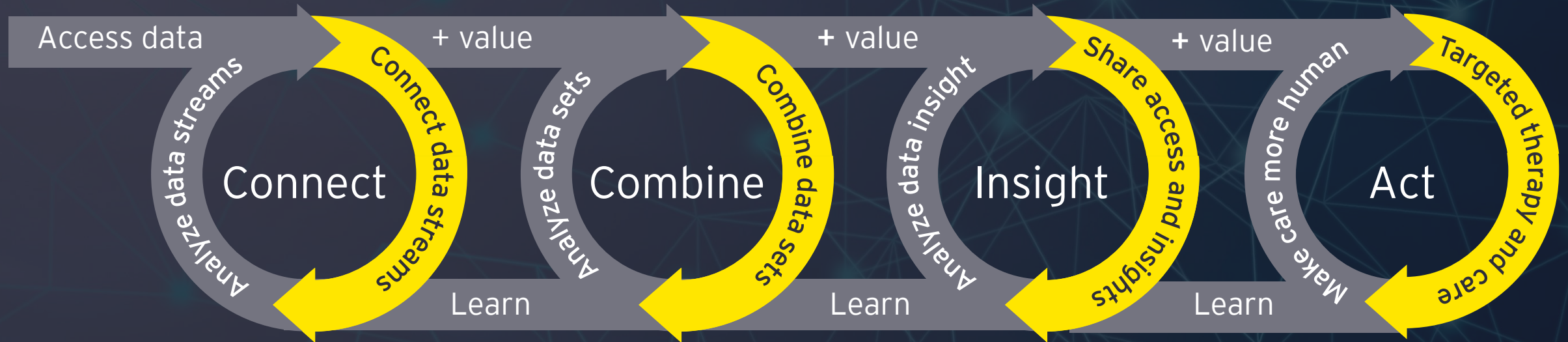
Caption Health: algorithm approved for cardiac imaging

Jan 2022

Follicle clarity: algorithm for calculating number and size of ovarian follicles approved

# Unlocking the power within the data is key to delivering personalized care

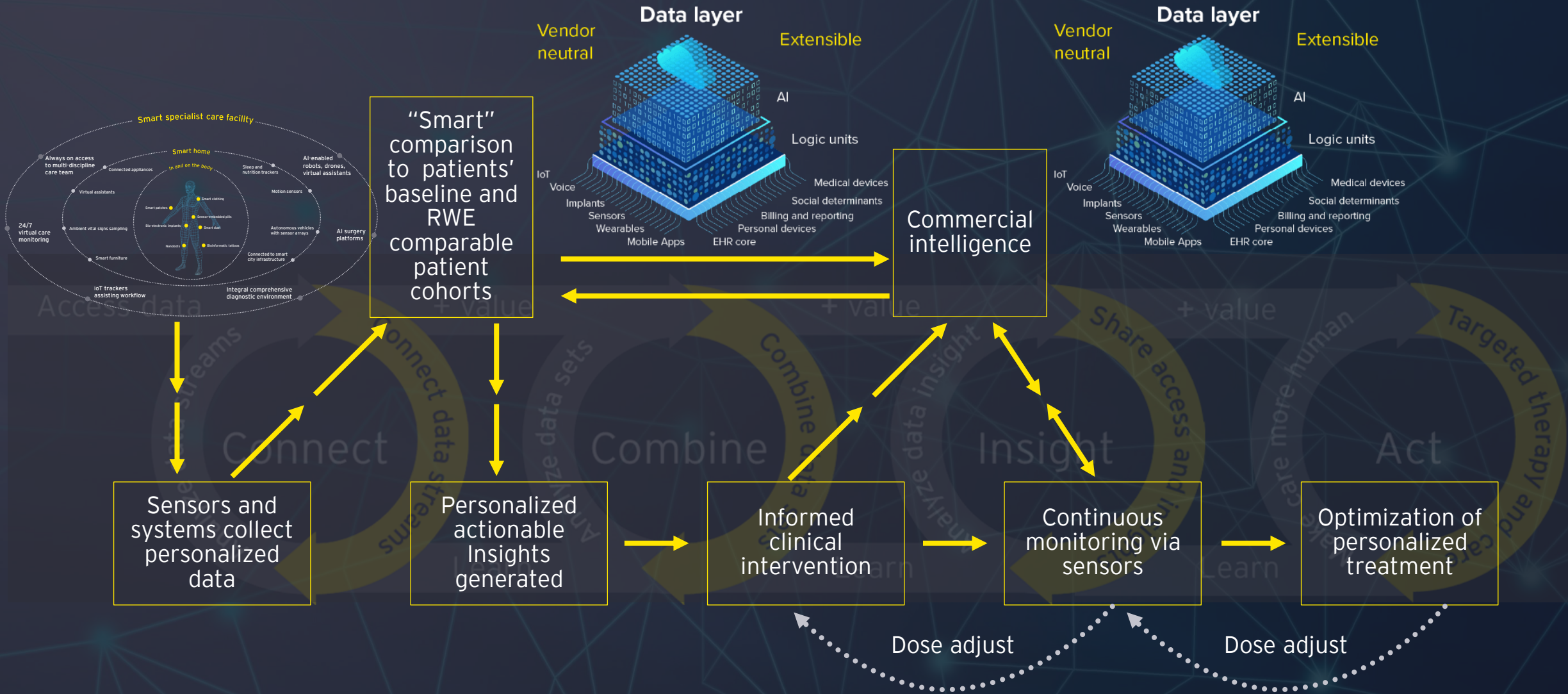
Connecting and combining data sets with targeted analyses ...




... sharing insights and continuous learning

Data and technology continually learning, becoming more intelligent (and their health "value" increasing)

# With better targeted personalized care comes improved health outcomes





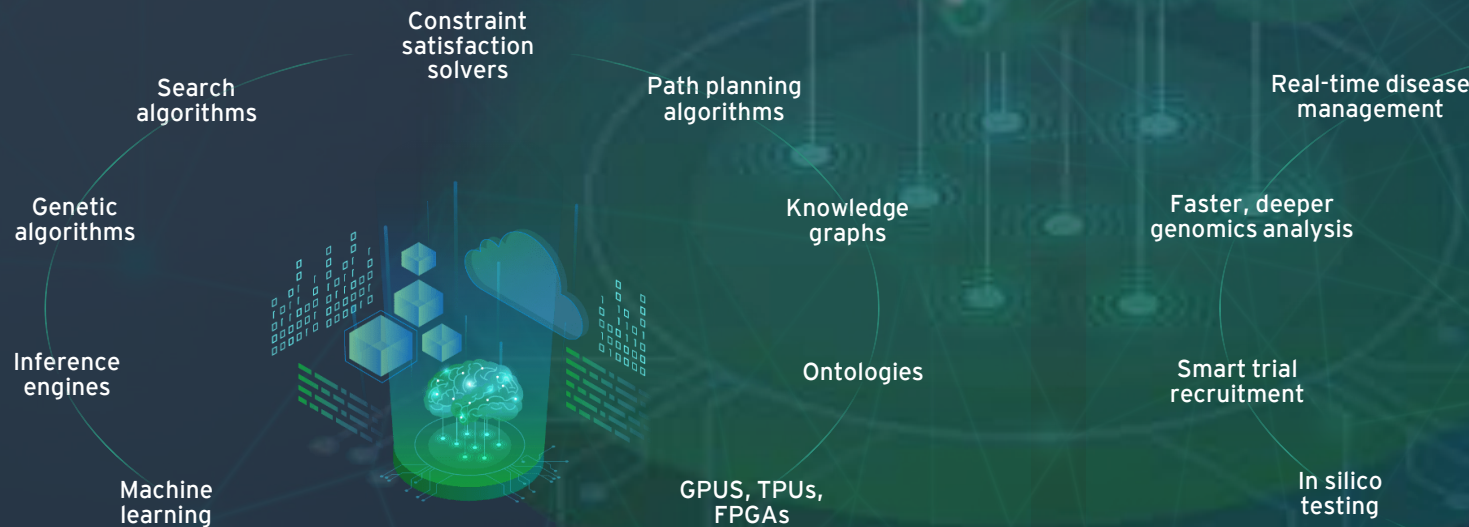


How can targeted interventions with better outcomes be measured by stakeholders and thus valued?

# Will AI technologies be able to simulate human behaviors?

Sense | Perceive | Learn | Know | Reason | Plan | Act

## AI technologies

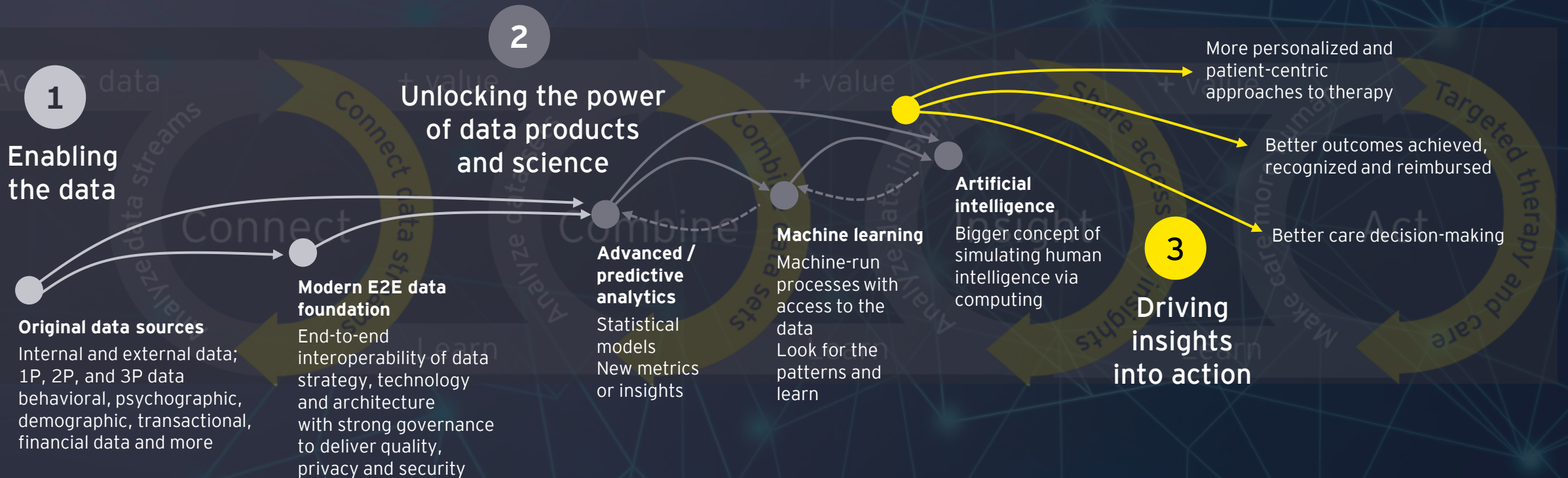


## Use cases

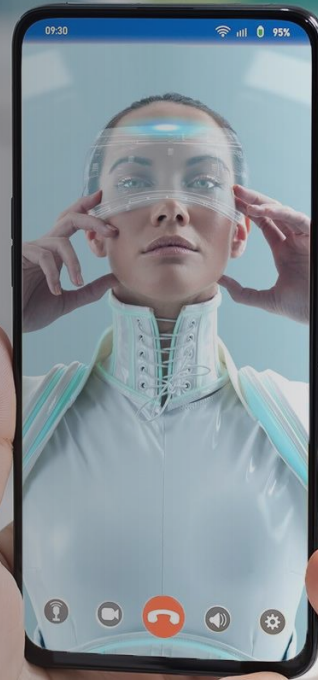


GPU: graphics processing unit  
TPU: tensor processing unit  
FPGA: Field-programmable gate array






# Transforming data into value is an ongoing, non-linear journey and benefits from connected, end-to-end thinking



How will you utilize  
AI technologies to  
make health care  
even more human?



# Patient expectations are higher than ever. In other industries, the “winning characteristics” of user experience drive market leadership

Winning characteristics	Amazon	AirBnB	Netflix	Uber
 Convenience	Easy ordering, cost-competitive, rapid delivery	Single interface for all activities	Easy selection/can view on any device	Simple mobile booking and payment
 Seamless trading exchange	Wide range of suppliers in network	Network of available properties for rent	Single point to access content from different media producers	Anytime, anywhere access
 Predictive and personalized	Recommendations based on user history	Search algorithm based on user profile	Recommendations based on past viewing	Recommendations to improve travel time
 High consumer choice	Buying options (used vs. new)	Wide range of accommodations	Vast and expanding content library	Tiered options based on cost and service
 Transparency	Responsive, accountable customer service	Customized interactions between parties	Flat-rate subscription model	Real-time tracking of mobility options

# These characteristics are delivered by business models based on linked data platforms that become the “routers” within a digital backbone

**Platform:** an interface that enables a seamless “superfluid” trading exchange



● Platform interfaces

# An enhanced data exchange architecture will allow superfluid access and processing to enable operations in real time

## Present-day enterprise system

- ▶ Many systems, all with bound data logic and applications
- ▶ Hundreds of vendors, often not complementary
- ▶ Logic bundled with application

Today



## Intermediate-state platform

- ▶ API connected dynamic infrastructure built around existing systems
- ▶ Legacy EHR and new platforms coexist
- ▶ Basic functionality in legacy systems maintained

1 year



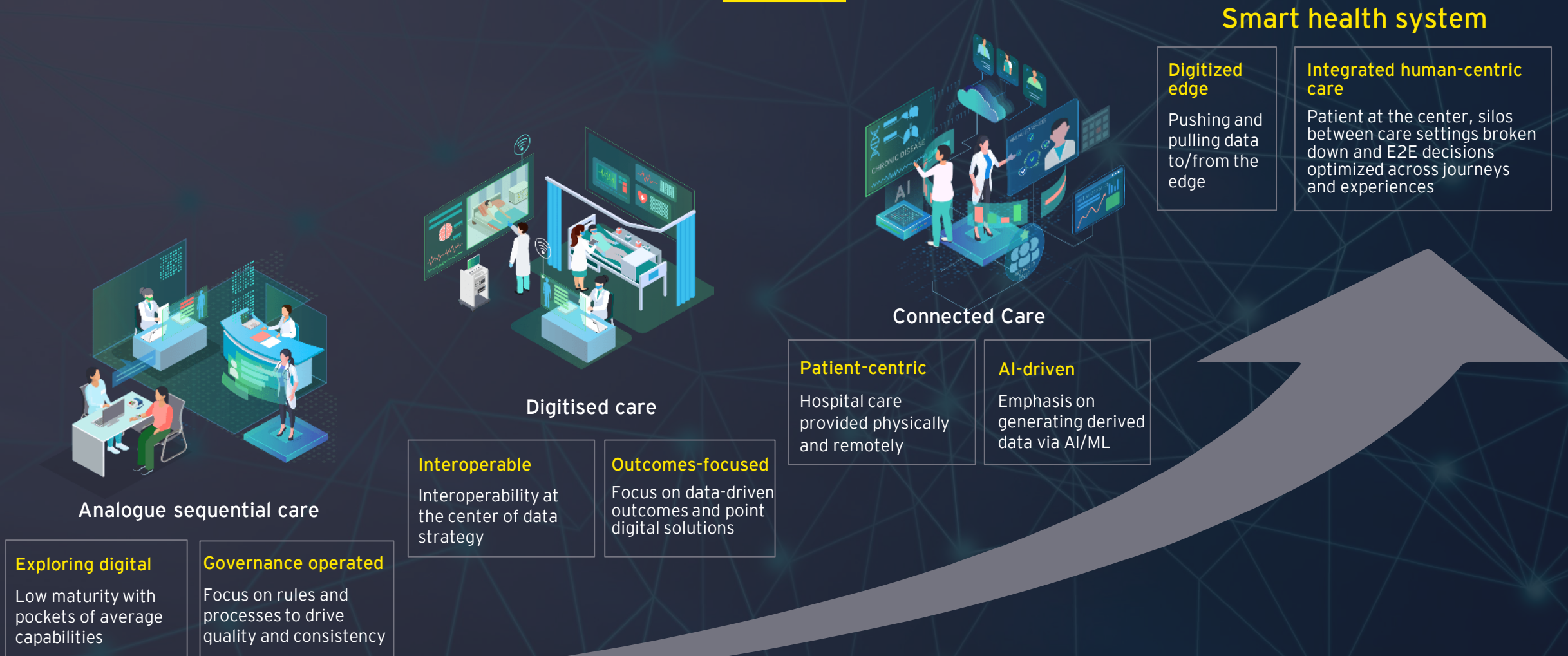
## Future-state platform

- ▶ Cohesive tech stack giving a unified experience
- ▶ Open and “of value” to all users
- ▶ Unique data accessed by applications in real time by “micro systems”

2+ year



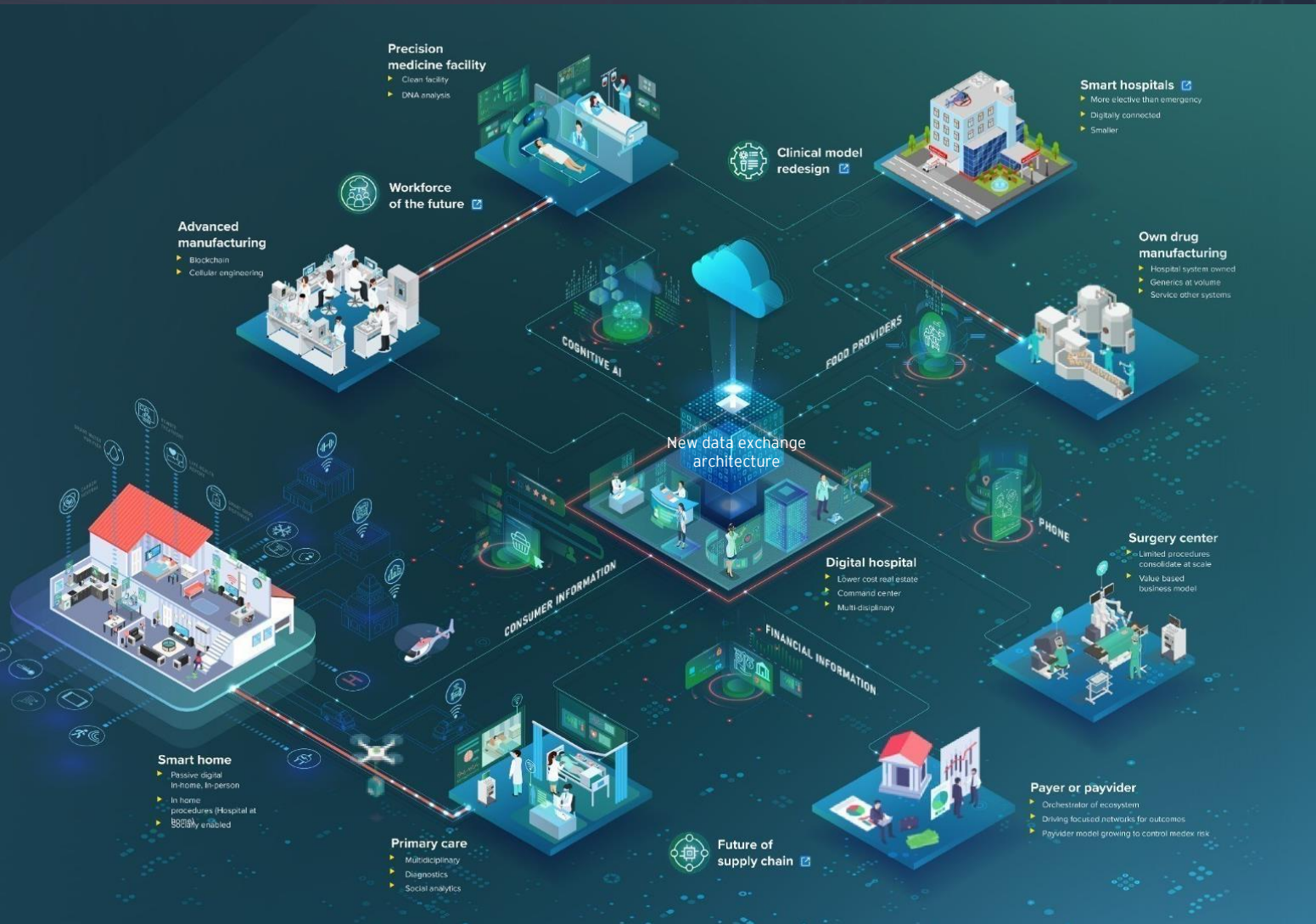
# Such potential smart health systems of tomorrow will go beyond simply being “digitized” and “connected”



Sources: Frost & Sullivan, *Healthcare IT News*, Mordor Intelligence.



They will depend on an inclusive operating model or ecosystem powered by *all participants* opting in



## The Intelligent Health Ecosystem will

- ▶ Be Hyperconnected
- ▶ With super fluid data flows ...
- ▶ Have fast (real time) operation
- ▶ Operate "human" AI
- ▶ Deliver personalized care and health experiences

Unlocking the power of data to deliver a personalized health experience is the key to future value in this new Smart Health ecosystem

$$FV = (pHEX)$$

**Future Value**  
for any participant in this smart ecosystem)

**Personalized Health Experience**  
for the user / patient / consumer / physician



Leading characteristics

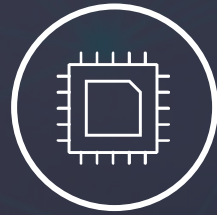
- Convenient
- Seamless "trading" exchange
- Predictive and personalized
- Wide choice
- Transparent

# In summary ...



**Data**

is the fuel



**Science and  
technology**

comprise the  
engine



**Insights**

are  
personalized



**Measures**

are equally  
clinical and  
non-clinical



**User  
experience**

defines  
the value



**Demonstrated**

health outcomes  
are reimbursed

# Are you ready ... ?

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## To make smart moves in the “Next”

### Adapt operations

- ▶ Proactively partner to access data, new skills
- ▶ Virtualize operations e.g., clinical trials/remote patient monitoring
- ▶ Use AI technologies to in cognitive as well as computational ways
- ▶ Strengthen regulatory relationships
- ▶ Give weight to user experience above product or service features

### Increase resilience

- ▶ Build supply resilience through cross registration of products and services
- ▶ Regionalize aspects of manufacturing
- ▶ Invest in digital pharmacovigilance
- ▶ Increase cybersecurity protocols across the value chain

## To power the “new normal” of the Beyond

### Reframe

- ▶ Develop integrated, interoperable solutions that help patients, providers and payers manage disease
- ▶ Develop and scale outcomes-based payment models
- ▶ Adopt analytics for end-to-end supply chain visibility
- ▶ Pursue virtualization across the whole value chain



When the human  
body is the biggest  
data platform, how  
will you create value?

■ ■ ■  
The better the question. The better the answer. The better the world works.



**EY**  
Building a better  
working world

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