Today's Webinar Will Begin Shortly:

The Hospital of the Future

QUESTIONS?

Use the questions box on your screen

AUDIO ISSUES?

Use the global dial-in number in your confirmation email

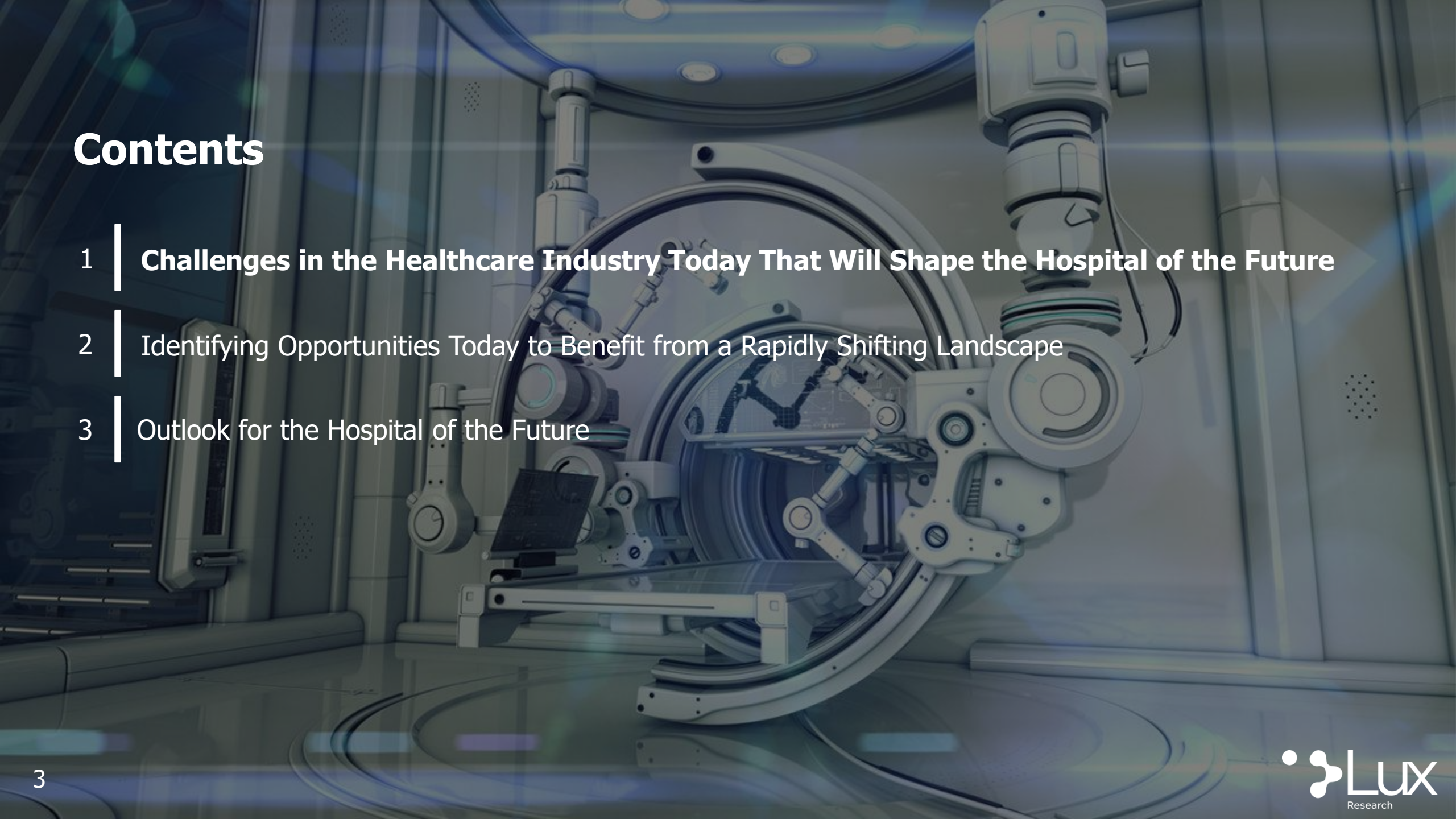
Nardev Ramanathan, Ph.D.
Senior Analyst

Lux Research

The Hospital of the Future

Nardev Ramanathan, Ph.D.
Senior Analyst

Lux Research



Contents

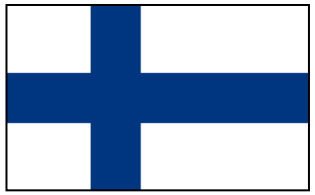
Lux Research

Healthcare industry today faces three major challenges

RISING HEALTHCARE COSTS

Rising healthcare costs are a major threat to government spending

- Arguably the biggest threat, rising healthcare costs challenge much of the developed world, with developing economies also feeling the pressure.
- The situation has been further exacerbated by the current COVID-19 pandemic



Home › Politics › BREAKING: Government collapses over failure to agree social, health and regional reforms

Domestic

BREAKING: Government collapses over failure to agree social, health and regional reforms

Juha Sipilä will offer his government's resignation to President Niinistö but there is not likely to be any changes in timetable for the general election, scheduled 14th April.

Finland's entire government resigns over failed healthcare reform plans.

Hard choices need to be made for sustainable healthcare: PM

Healthcare expenditure in Singapore will exceed growth in gross domestic product (GDP).

HEALTH + TECH / 17 JUN 2019

Timothy Denney

Healthcare Costs are Harming U.S. Competitiveness

In the U.S., healthcare spending accounts for 17.9% of its GDP, with the highest per capita spend in the world.

Healthcare industry today faces three major challenges

RISING HEALTHCARE COSTS

CHRONIC DISEASES AND AGING

The world is getting older on average

Age group	2019	2050*
Above 65 years	9.1%	16.7%
Above 80 years	1.8%	4.4%

Source: Financial Times

The rise of the 'super-aged' society (20% population aged >65)

Rank	Country	2015	2030
1	Japan	**26.4**	**30.7**
2	Germany	**21.4**	**28.2**
3	Italy	**21.7**	**26.8**
4	South Korea	13	**23.4**
5	France	18.7	**23.2**
6	Switzerland	18.2	**21.9**
7	UK	18.1	**21.7**
8	US	14.7	**20.1**
9	Australia	15	19.2
10	China	9.5	16.2

Source: Financial Times

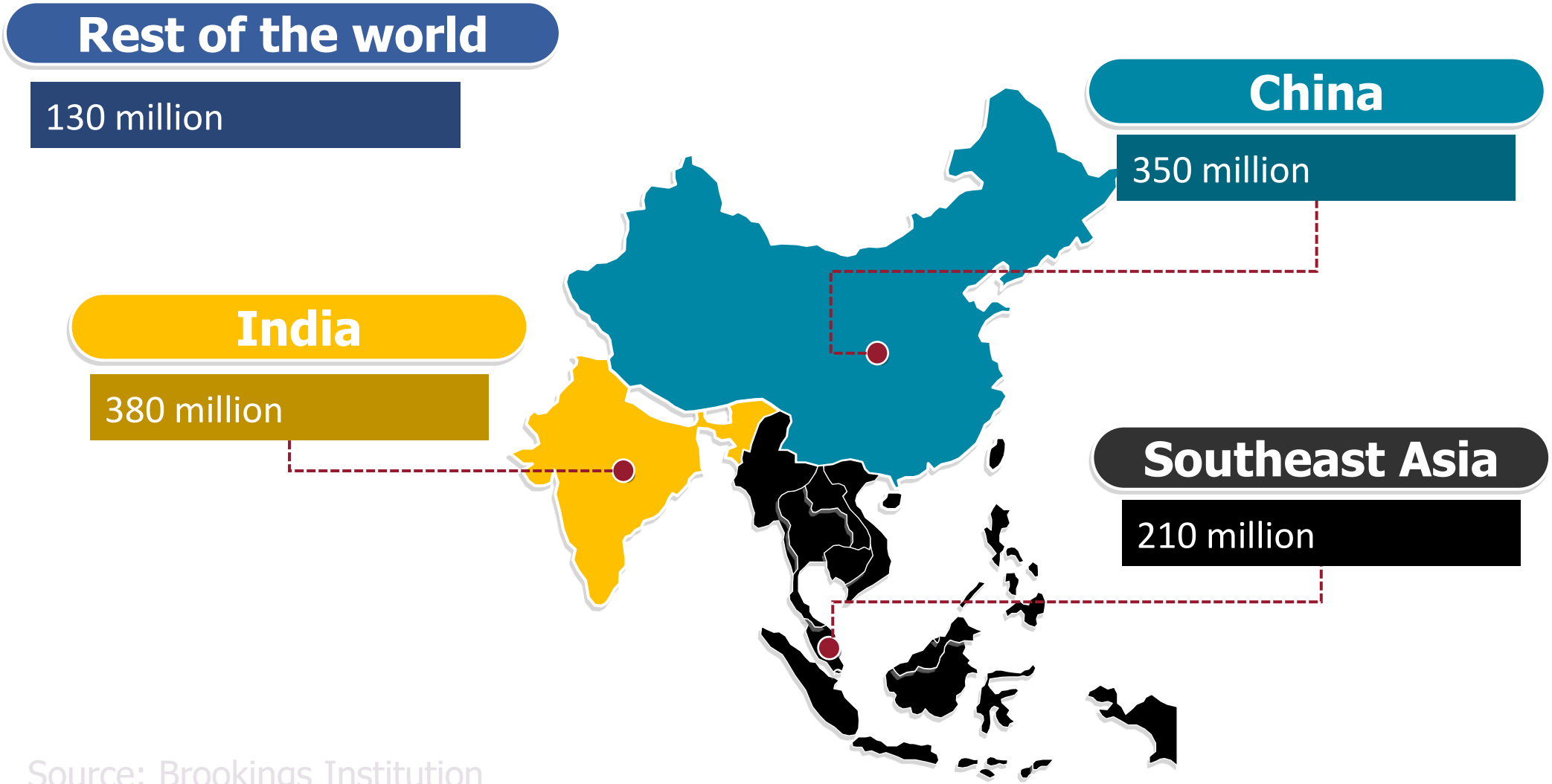
Healthcare industry today faces three major challenges

RISING HEALTHCARE COSTS

CHRONIC DISEASES AND AGING

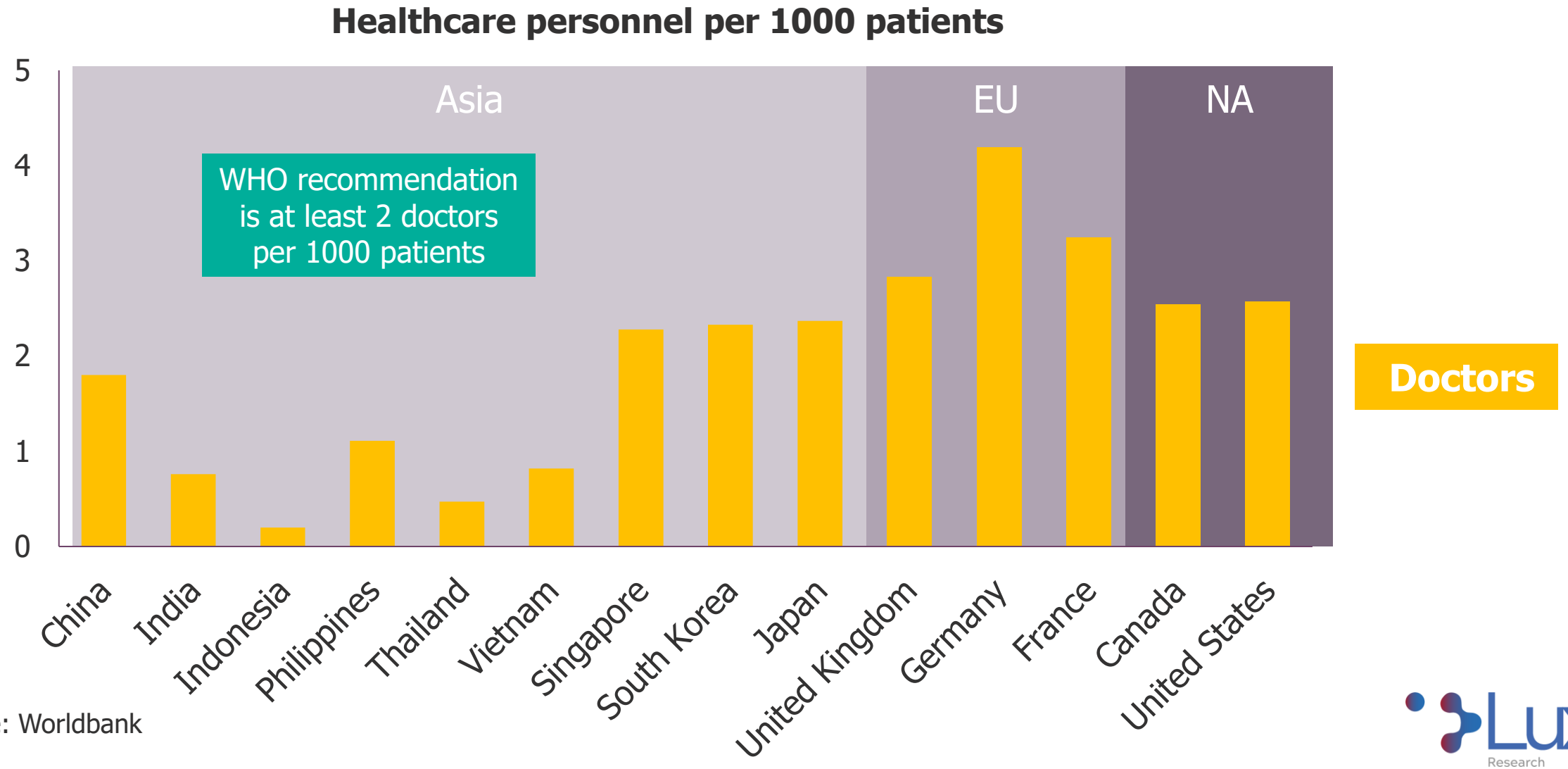
SOCIODEMOGRAPHIC SHIFTS

Around 90% of the global middle-class growth by 2030 will be from three regions of the world



Source: Brookings Institution

Emerging economies in Asia are struggling to handle workforce requirements



Source: Worldbank

Hospitals must radically evolve to address these challenges

We can’t make enough hospitals or train up healthcare personnel fast enough to meet these needs!

We need to reimagine how our hospitals can continue to meet these evolving demands efficiently

Questions to ponder

- Can we radically increase the efficiency of existing hospitals/clinical centers (**Operations**)?
- How can we maintain high quality care and reduce the workload of providers (**Provision of care)**

Contents

Digital transformation is key

Digital transformation is already playing a role today, and will continue to be a major driving force in the **provision of care** and **optimizing operations**

Provision of care

- Remote expertise
- Decision support
- Convenience of access
- Personalization

Operations

- Workflow optimization
- Risk management
- De-siloing of data

Provision of care

- **Remote expertise**
- Decision support
- Convenience of access
- Personalization

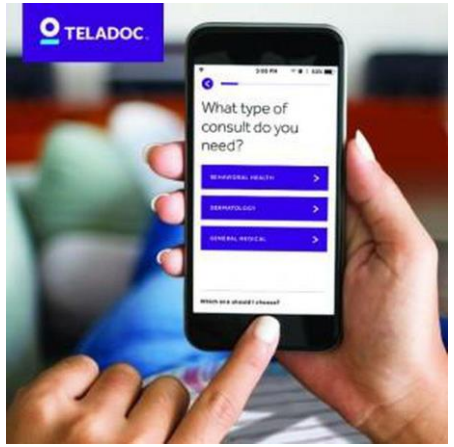
Operations

- Workflow optimization
- Risk management
- De-siloing of data

REMOTE EXPERTISE

Telehealth

- Remote provision of care outside traditional healthcare providers (HCPs) , done through smartphones and other health IoT devices, such as connected glucose patches.
- Ease of access and use on mobile devices and health IoT devices, easily integrable into larger health ecosystems and "superapps."
- Easy to scale and reach a wide population quickly.



EXAMPLE DEVELOPERS

babylon

AbleTo

TELADOC

平安好医生

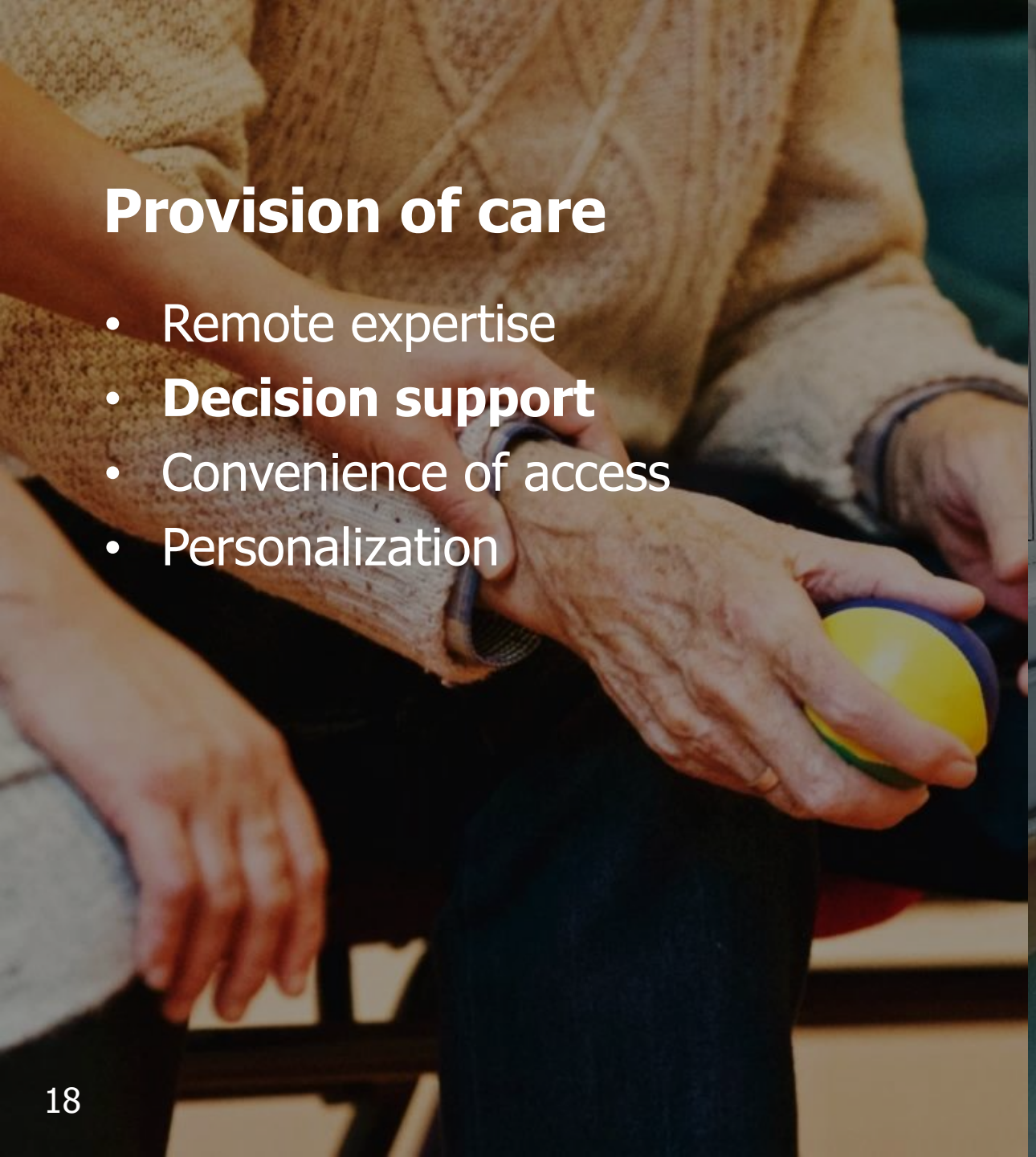
tytocare
health is in your hands

halodoc
simplifying healthcare

MATURITY

HIGH

Lux Research



Provision of care

- Remote expertise
- **Decision support**
- Convenience of access
- Personalization

Operations

- Workflow optimization
- Risk management
- De-siloing of data

Lux Research

DECISION SUPPORT

Medical imaging

- AI for medical imaging capitalizes on computer vision and machine learning for clinical decision support.
- Trained using millions of medical image datasets, the AI capabilities attempt to simulate the experience and reasoning an expert develops through the course of his/her training.
- Straightforward cases can be rapidly processed, freeing up time for doctors to focus on more complex cases.
- Shorter wait time for patients from getting a scan done to getting an expert diagnosis.

EXAMPLE DEVELOPERS

ARTERYS

Google AI

zebra MEDICAL.VISION

aidoc

PathAI

MATURITY

MODERATE

Image source: Zebra Medical Vision

Lux Research

Provision of care

- Remote expertise
- Decision support
- **Convenience of access**
- Personalization

Operations

- Workflow optimization
- Risk management
- De-siloing of data

CONVENIENCE OF ACCESS:

Digital therapeutics

- Digital therapeutics (DTx) deliver evidence-based therapeutic interventions through software or software-enabled products to prevent, manage, or treat a broad spectrum of diseases.
- Automation of therapy sessions that require brick-and-mortar centers, equipment and trained personnel saves costs.
- Technology is easily scaled and allows rapid dissemination to a wide group of patients.
- This removes pressure for the provider, allowing it to realign and redistribute resources to meet urgent cases more effectively.

EXAMPLE DEVELOPERS

PEAR THERAPEUTICS

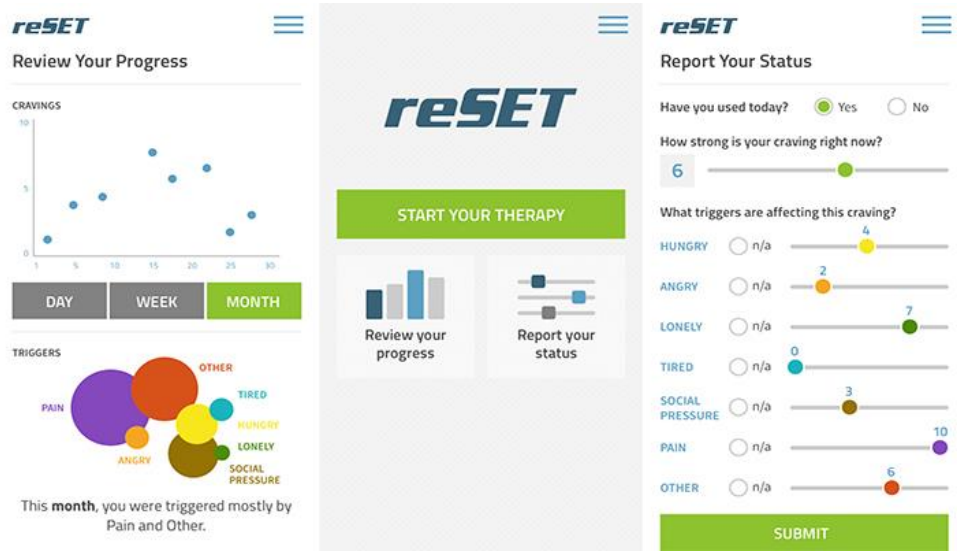
Better

biofourmis

oxfordvr
A University of Oxford spinout

AKILI

wellthy THERAPEUTICS



MATURITY

LOW

Lux Research

Provision of care

- Remote expertise
- Decision support
- Convenience of access
- **Personalization**

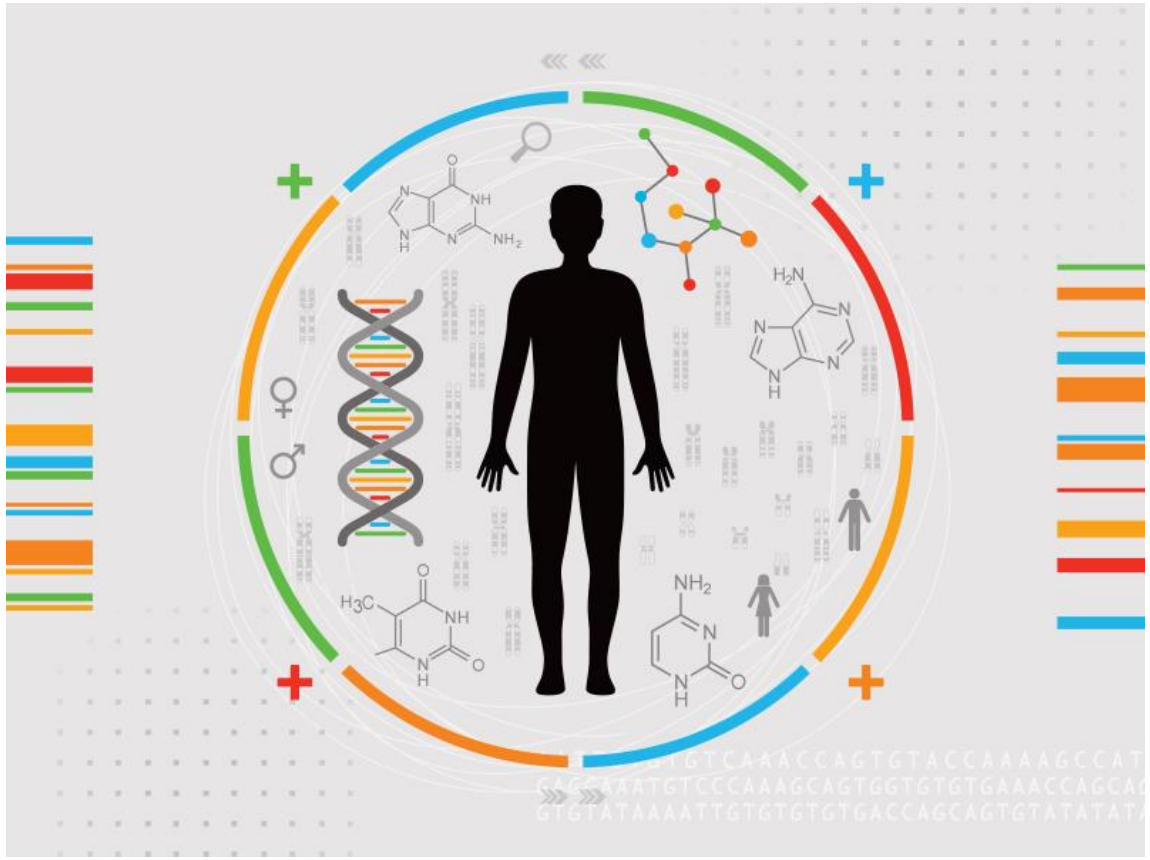
Operations

- Workflow optimization
- Risk management
- De-siloing of data

PERSONALIZATION

Precision medicine

- Precision medicine (PM) aims to improve healthcare delivery by combining biological, environmental and lifestyle information to develop tailored approaches to predicting disease progression and treatment responses for individual patients.
- Targeted treatment and/or prevention is more likely to improve health outcomes and manage unsustainable healthcare costs for all stakeholders.



EXAMPLE DEVELOPERS

Abbott

Roche

Medtronic

illumina

Johnson & Johnson

WuXiNextCODE
Leading Genomics

MATURITY

LOW

Lux Research

Provision of care

- Remote expertise
- Decision support
- Convenience of access
- Personalization

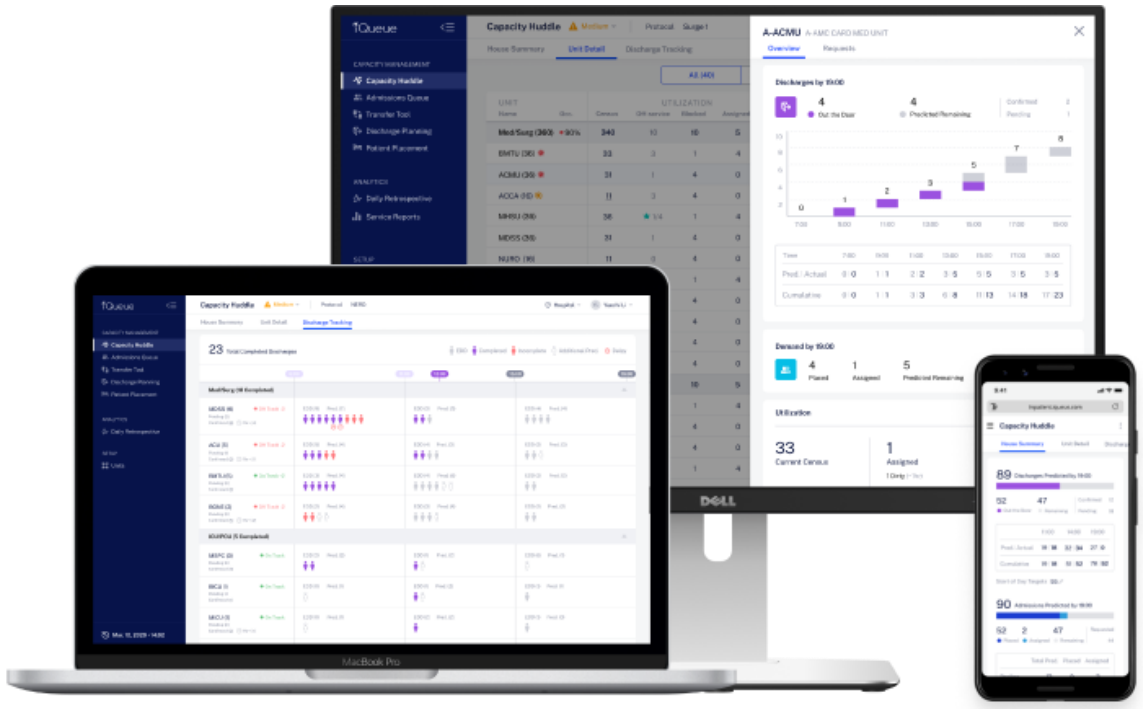
Operations

- **Workflow optimization**
- Risk management
- De-siloing of data

WORKFLOW OPTIMIZATION

Hospital operations

- AI-assisted tools study the utilization and movement of physical assets and manpower and find ways to best optimize their usage to boost productivity and efficiency in healthcare organizations.
- Improves operational performance, productivity, and efficiency for a given set of resources.
- Patients receive care in a timely manner, supporting better health outcomes.
- Reduces costs associated with improper utilization of resources.



EXAMPLE DEVELOPERS

Qualaris

Qventus

LeanTaaS
Better Healthcare Through Math

森亿智能 SYNYI·AI

MATURITY

MODERATE

Lux Research

Provision of care

- Remote expertise
- Decision support
- Convenience of access
- Personalization

Operations

- Workflow optimization
- **Risk management**
- De-siloing of data

RISK MANAGEMENT

Patient population risk analysis

WHAT IT IS

- AI to manage population health for hospital systems and insurers.
- Features provided include predictive analytics and risk scoring for falls, readmission, missed appointments, and patient fatalities.
- Visibility into health trends of patient populations helps HCP administrators better stratify different risk groups accordingly and provide the right care plan.
- Payers can better adjust risks based on patient population clinical data, saving costs.

EXAMPLE DEVELOPERS

MEDALOGIX
Smarter Home Health Care

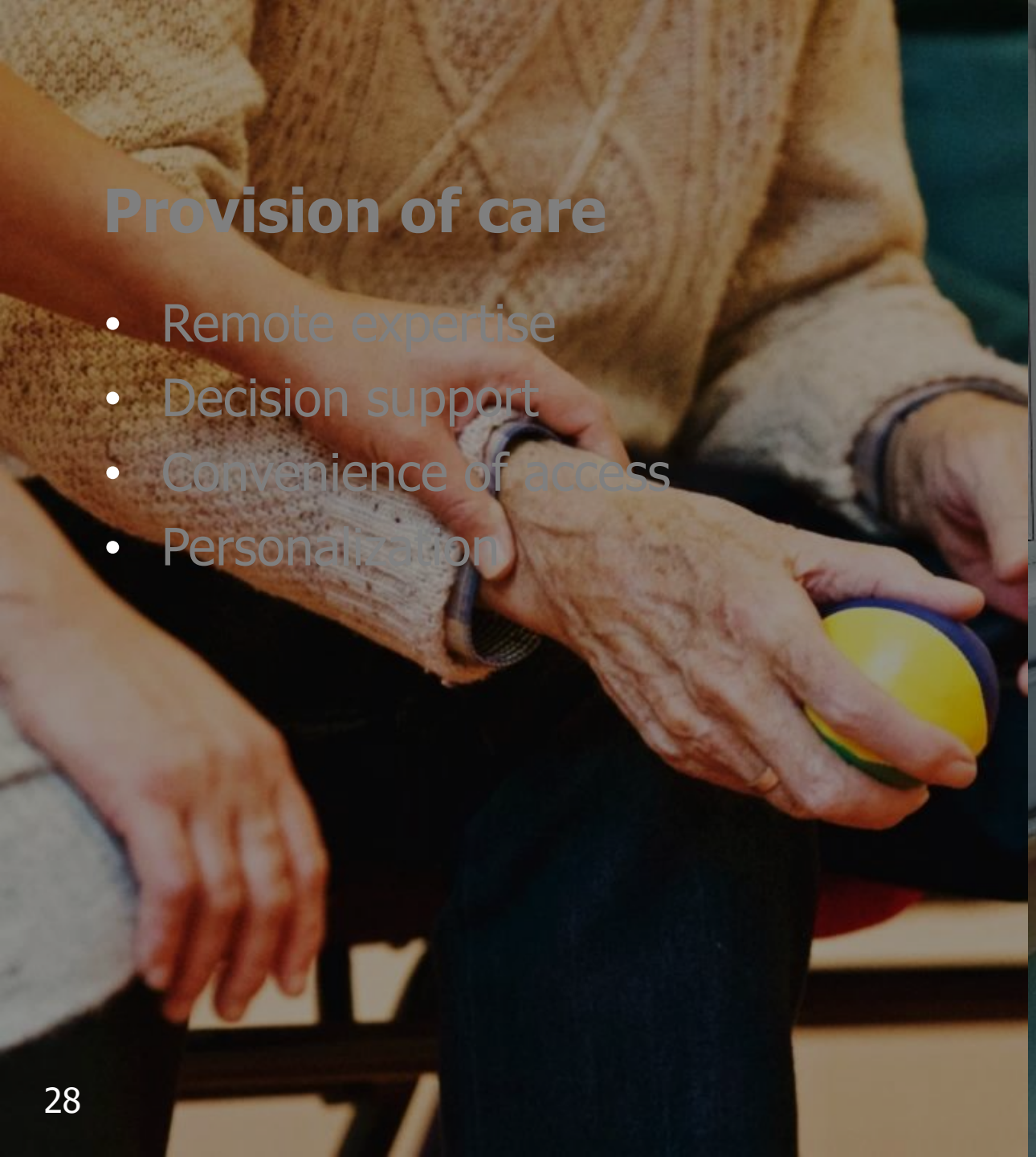
AYASDI

Medial EarlySign

MATURITY

MODERATE

Lux Research



Provision of care

- Remote expertise
- Decision support
- Convenience of access
- Personalization

Operations

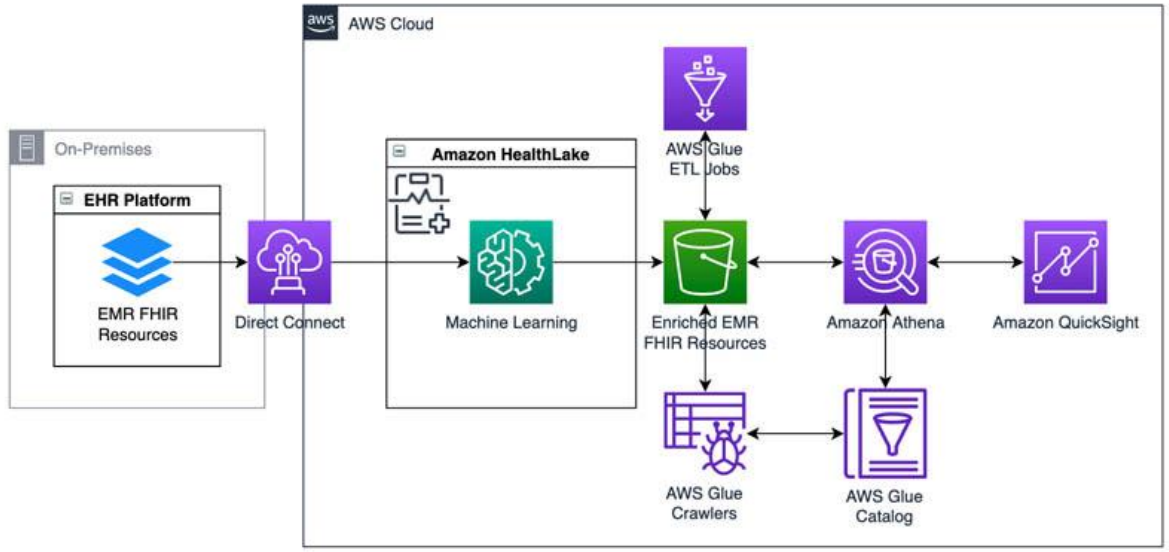
- Workflow optimization
- Risk management
- **De-siloing of data**

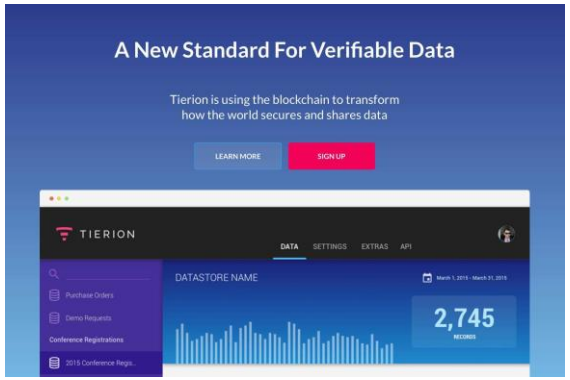
DE-SILOING OF DATA

Interoperability of electronic health records (EHRs)

WHAT IT IS

- Digital solutions that allow different EHR systems to be interoperable in a largely heterogenous and siloed environment today. The interoperability extends beyond just HCPs to the patients themselves.
- Bringing the "sharing" concept and removing the complexities of trust, security, and privacy for EHR promises to support better health outcomes and reduce healthcare costs for the industry and for the consumer.





EXAMPLE DEVELOPERS

amazon

Gem

TIERION

MATURITY

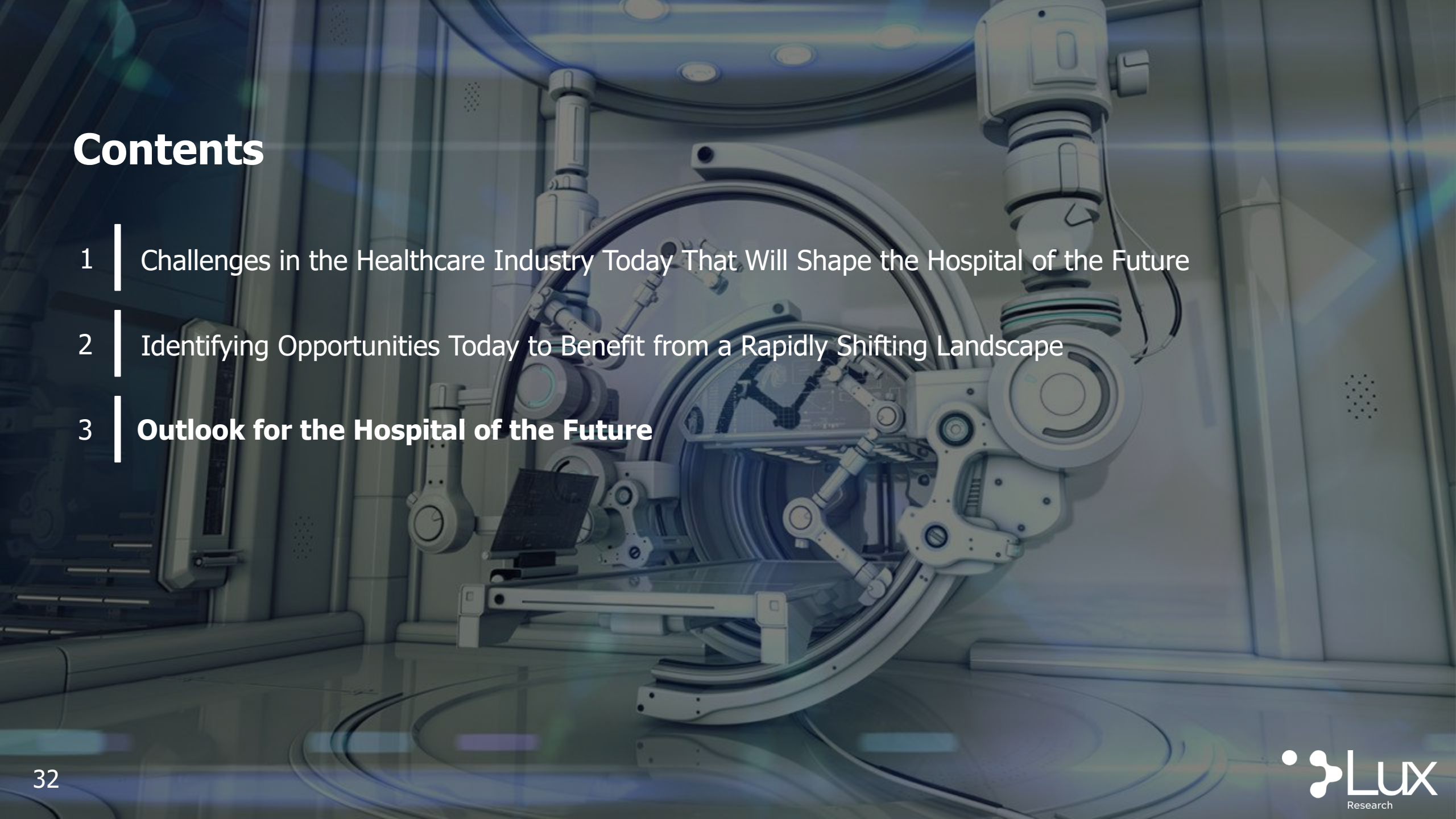
LOW

Lux Research

Summary of near-term opportunities that align with a rapidly shifting healthcare landscape

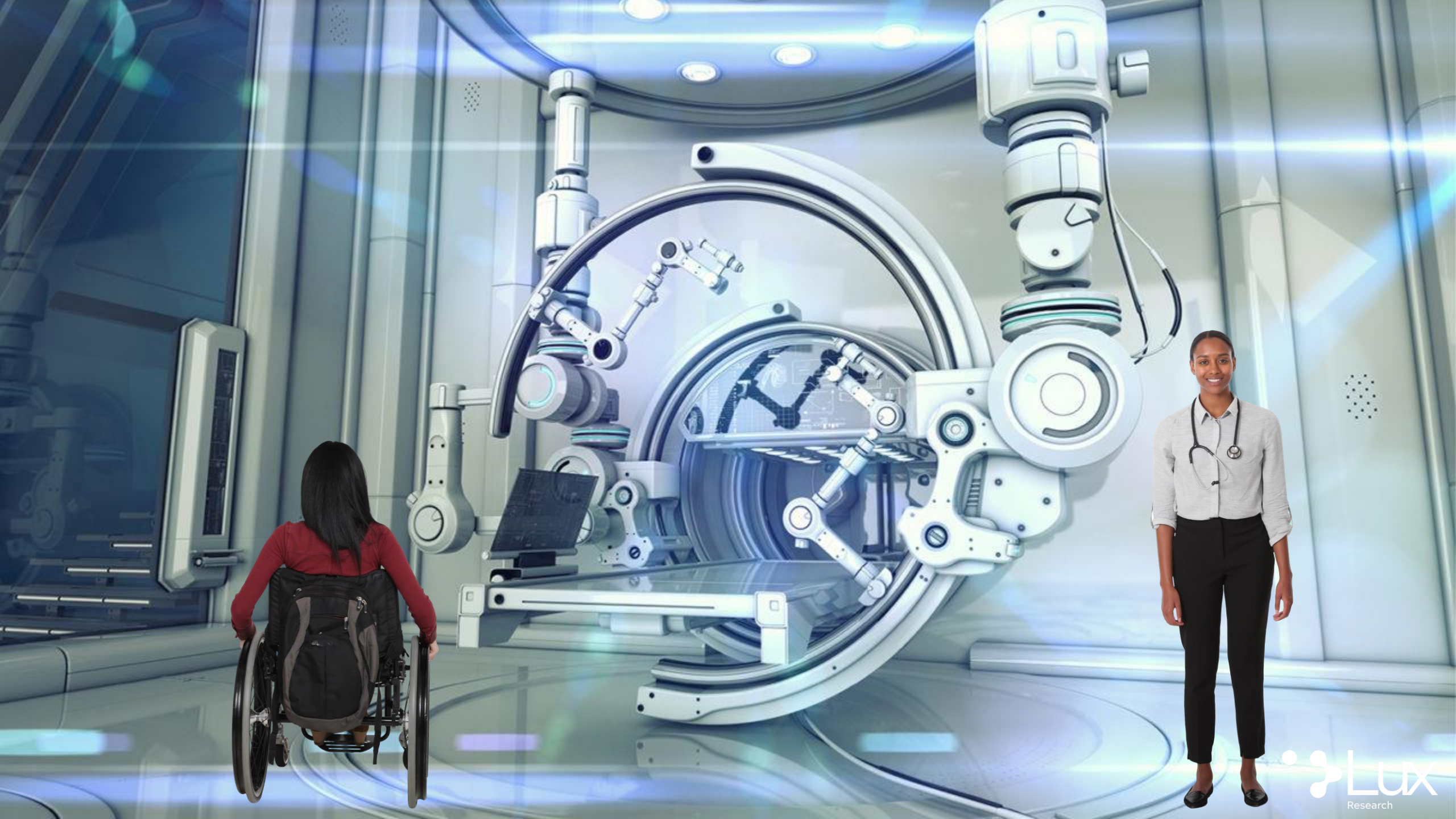
KEY AREAS	USE CASE	MATURITY
Provision of care		
Remote expertise	Telehealth	High
Decision support	Medical imaging	Moderate
Convenience of access	Digital therapeutics	Low
Personalization	Precision medicine	Low
Operations		
Workflow optimization	Hospital operations	Moderate
Risk management	Population risk analysis	Moderate
De-siloing of data	Integration of EHR	Low

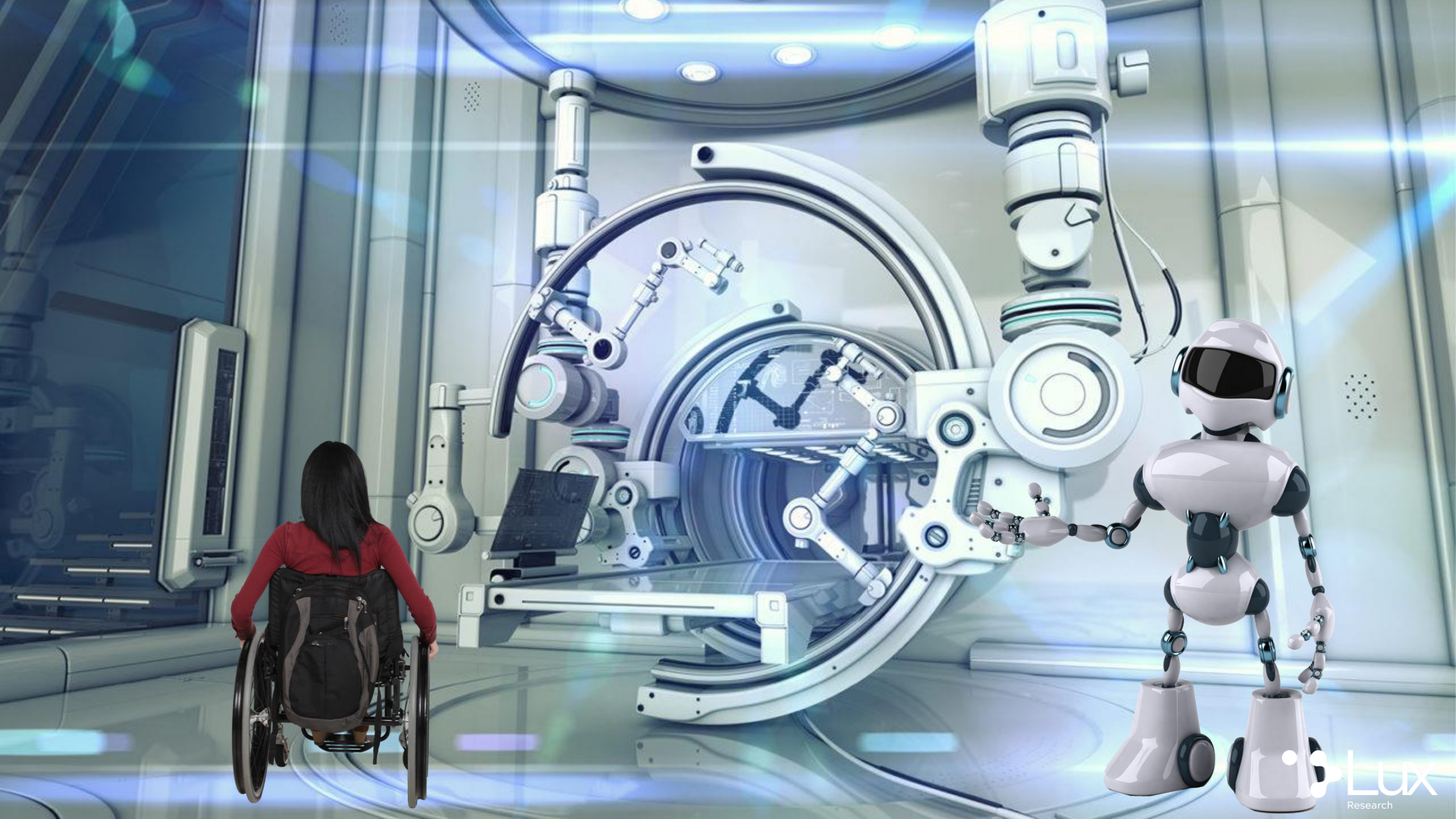
So, what will the hospital of the future really look like?



Contents

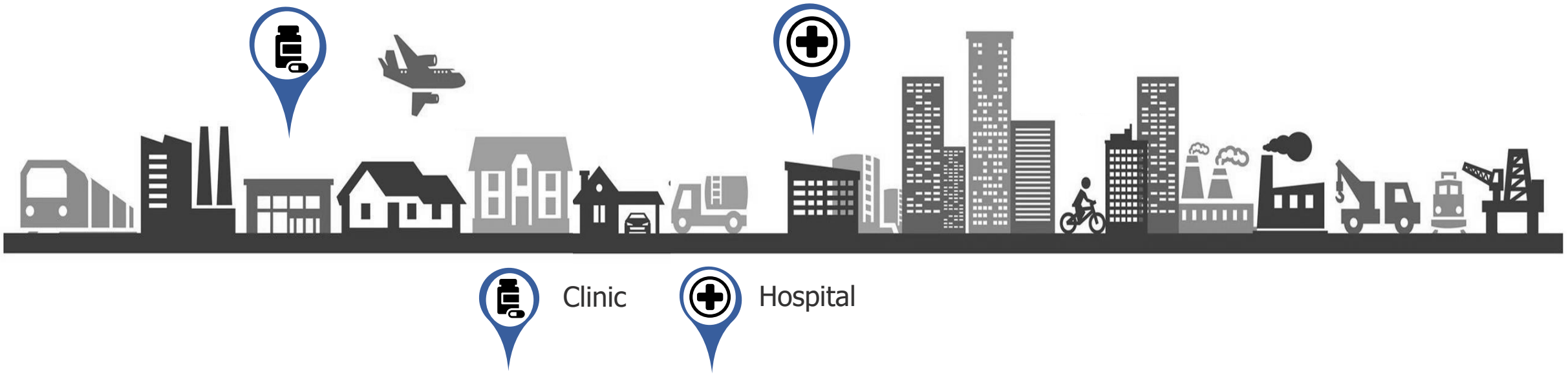
Lux Research


Lux
Research


Lux
Research

HOSPITAL OF TODAY

The hospital of today operates in specific locations only



Locations of Care Today

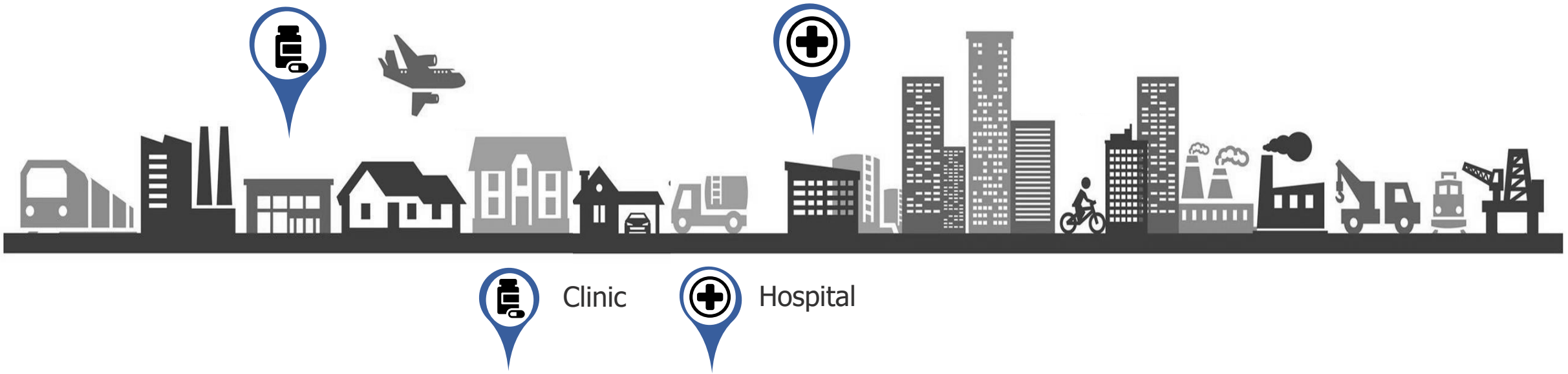
Lux Research

HOSPITAL OF TODAY

The technologies are mostly intrinsic to the hospital

- Telehealth (primary care)
- Interoperability

- AI-based medical imaging
- Telehealth (tertiary)
- Workflow optimization
- Interoperability



Locations of Care Today

Lux Research

Connected devices (Health IoT) provide real time information to providers

Off-the-body sensors*

Vehicle
Driving activity sensor

Computer
Computer activity sensor

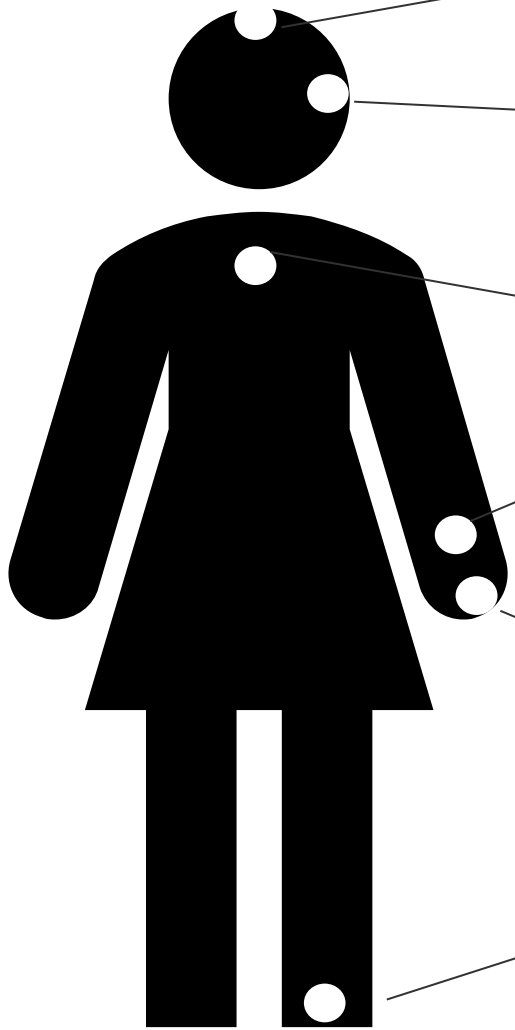
Smartphone
IMU, accelerometer, microphone, camera, GPS, keystroke monitoring app*

Digital Assistant
Smart home assistants

Wall or ceiling mount
UWB, PIR

Flooring, Bed
Pressure sensors

On-the-body sensors



Headband form factor
EEG

Earworn form factor
PPG, accelerometer, IMU, GPS

Necklace form factor
Accelerometer, IMU, gyroscope

Wrist form factor
ECG, PPG, accelerometer, gyroscope, IMU, thermometer, GPS

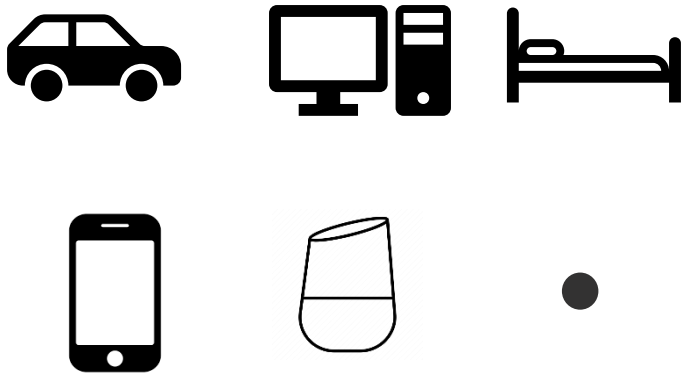
Ring form factor
ECG, PPG, accelerometer, gyroscope, IMU, thermometer, GPS

Insoles
Pressure sensors

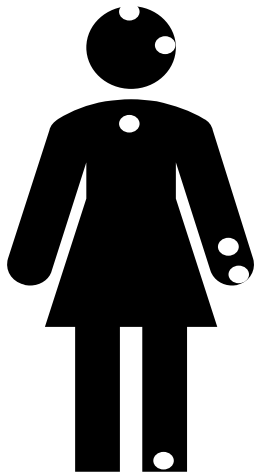
*Most of these sensors can be connected to on-the-body sensors

Health IoT will become an integral component contributing to both the provision of care and improving hospital operations

Off-the-body sensors



On-the-body sensors



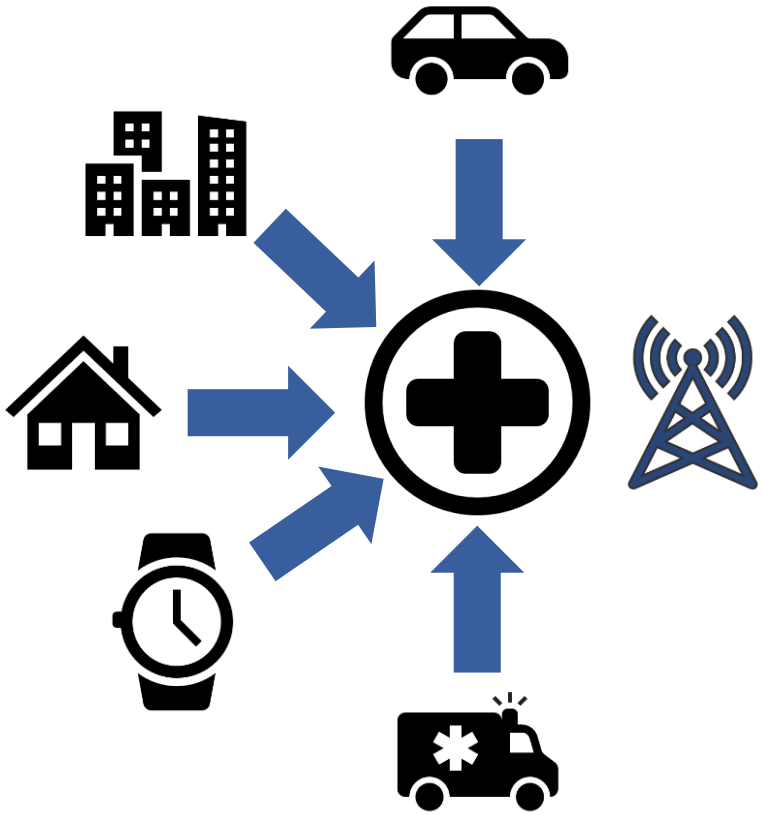
PROVISION OF CARE

- Convenience of access
- Remote expertise
- Decision support
- Personalization

OPERATIONS

- Workflow optimization
- Risk management
- De-siloing of data

We will still need a physical hospital, but it will serve more as a control tower



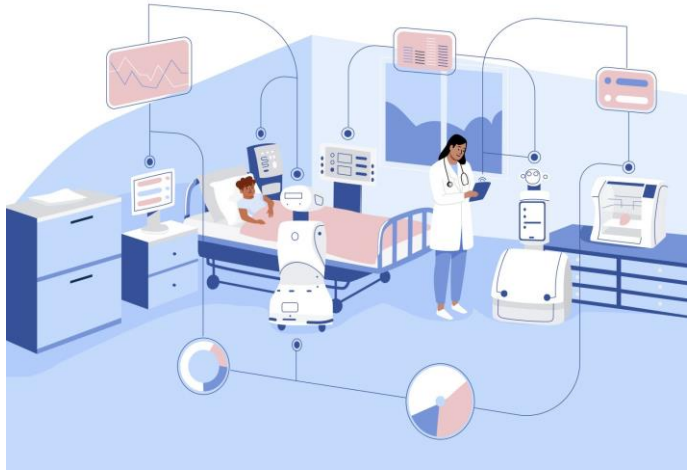


Image source: Verizon, Kapersky

The hospital of the future is not a place, it's a people!

Just like how internet has given rise to the 'Internet of Things' (IoT), the hospital of the future will be pervasive, ubiquitous and part of everything we do.

Source: Marvel Studios

Lux Research

HOSPITAL OF TODAY

The hospital of the future is wherever you want it to be

- Digital biomarkers/therapeutics
- Facial recognition
- 5G for first responders

:) Affectiva

verizon

WINTERLIGHT

- Digital therapeutics
- Digital biomarkers

PEAR THERAPEUTICS

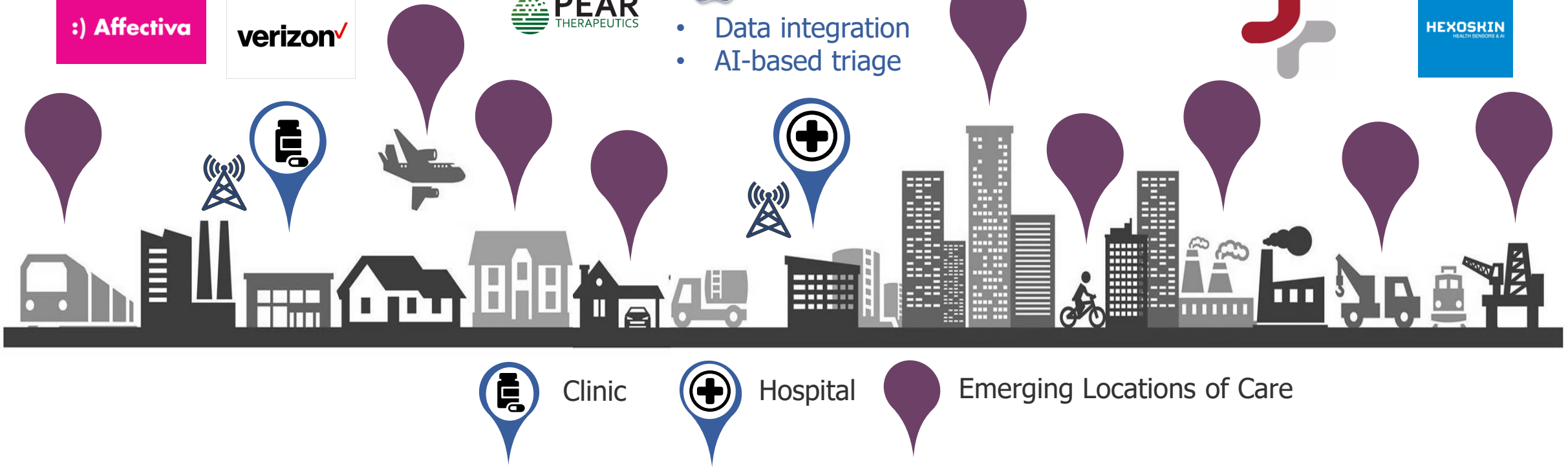
amazon

- Data integration
- AI-based triage

- Environmental biosensors (off-body)
- Smart textiles (on-body)

RespiFit

HEXOSKIN HEALTH SENSORS & AI



Clinic

Hospital

Emerging Locations of Care

Locations of Care Tomorrow

Lux Research

Key Takeaways

1. Challenges in the healthcare system today will shape the hospital of the future
2. New and emerging technologies today are already making an impact and will continue to shape the healthcare industry
3. Ultimately, this all leads to a more patient-centric, decentralized model of care, allowing the hospital of the future to transcend beyond a physical location

Thank you

A link to the webinar recording will be emailed within 24-48 hours

UPCOMING WEBINARS

- **October 26th**

  Taking a Pragmatic Approach to the Circular Economy

- **November 23rd**

  Key Takeaways from COP26

- **December 7th**

  The Lux Foresight Report: Implications and Innovations in a Post-COVID World

UPCOMING EVENTS

- **October 5th - 6th or October 7th - 8th**
  Lux Executive Summit 2021

KEEP IN TOUCH

Email: questions@luxresearchinc.com

Visit: www.luxresearchinc.com

Read: http://www.luxresearchinc.com/blog/

@LuxResearch

Lux Research

Lux Research