SIEMENS Healthineers

(Meta) Data in Healthcare

Actionable insights for personalized care

Who we are

€13.8bn
Revenue[1)]

Market leader
in majority of businesses

>70
countries with direct presence

>48,000
highly skilled employees

18,000+
patents
IP base

~240,000
patient touch points every hour

Access to care for **~1.3bn people**
in developing countries

>70%
of critical clinical decisions are influenced by the type of technology we provide[2)]

~600,000
installed base

>90%
of global top 100 providers partner with us

1) Revenue P10 FY 2017 (not acc. to IFRS 15)

2) AdvaMedDX, "A Policy Primer on Diagnostics", June 2011, p. 3

Engineering success –
With broadest and deepest portfolio

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Engineering success –
With broadest and deepest portfolio

Medicine is Data-Driven
Healthcare is Data-Driven

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Some 50% of prescription medications are not taken as directed.

The most expensive drug is a drug that doesn't work.

If healthcare consumers check you out and they don't like you, they will shop elsewhere.

Healthcare providers discard 90% of the data they generate.

The scan of a single organ in 1 second creates about 10 gigabytes of raw data.

A third of the total spend wasted in healthcare, could be saved through Big Data analytics.

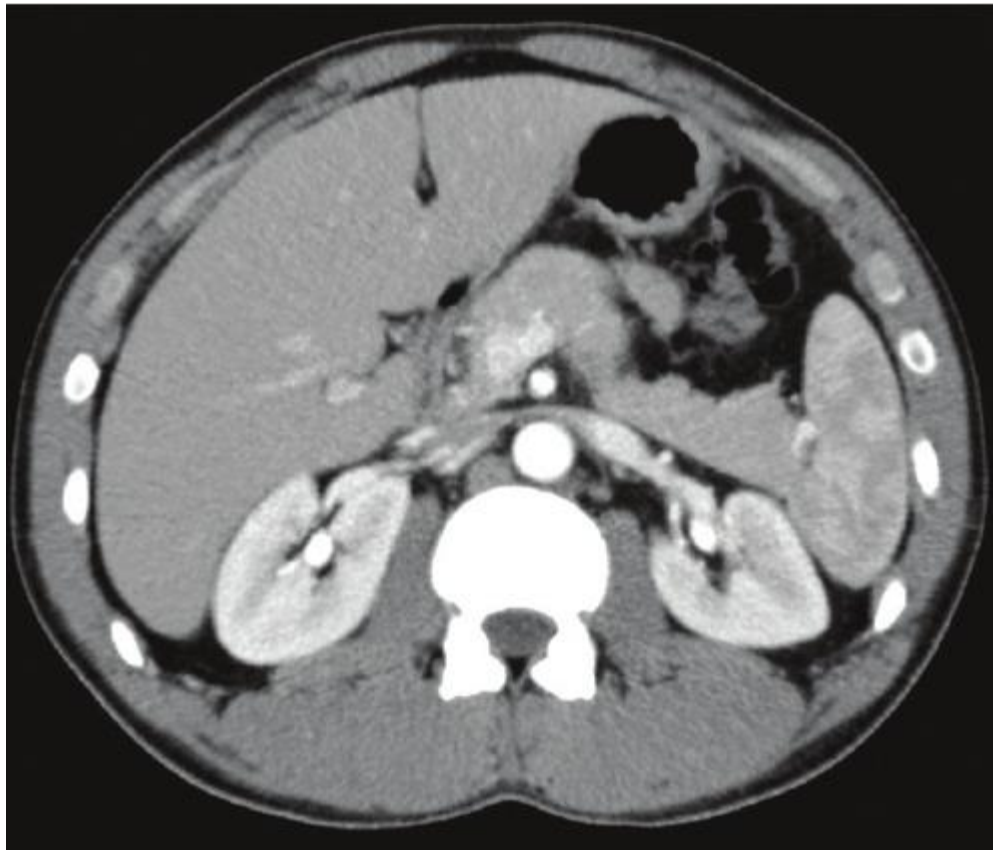
The challenge is not just in storage and access, but in making the healthcare data usable.

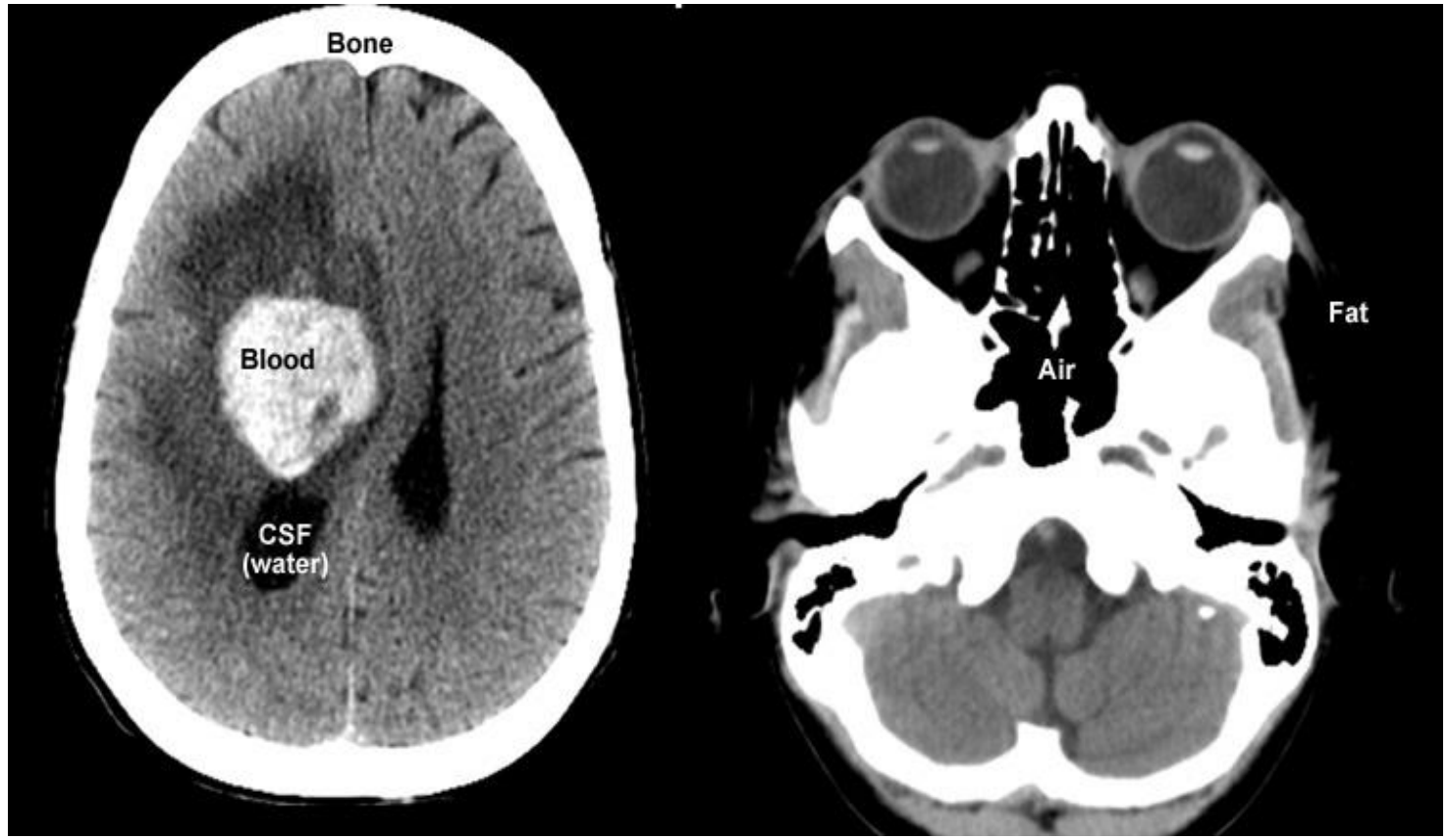
Healthcare is data driven….and growing fast!

By 2025, global estimates suggest 463 exabytes of data will be created each day. While it is difficult to picture the overall volume of data in the world, one visual is that with 44 zettabytes of data in the current digital universe, this represents 40 times more bytes than stars in the observable universe. While some of that new data doesn't need to be stored long term, experts predict that about 7.5 ZB (zettabytes = 10^{21} bytes) of data will need a long-term home in 2025, up from about 1.1 ZB in 2019. This is a 581% increase.

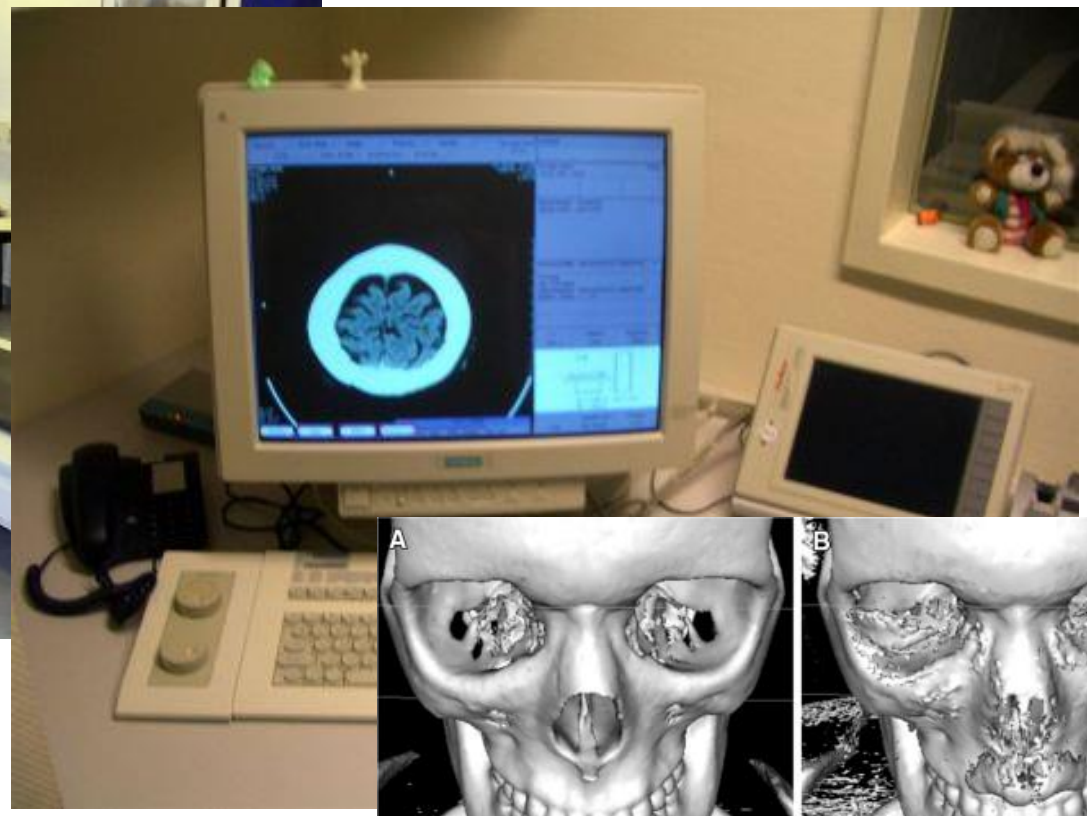
Source: https://www.harmonyhit.com/health-data-volumes-skyrocket-legacy-data-archives-rise-hie/

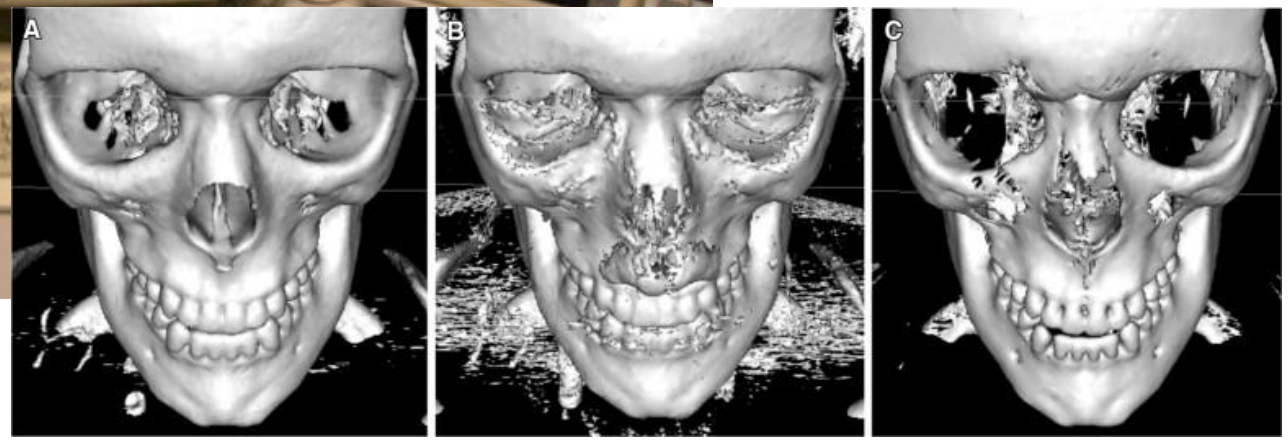
2D imaging CT



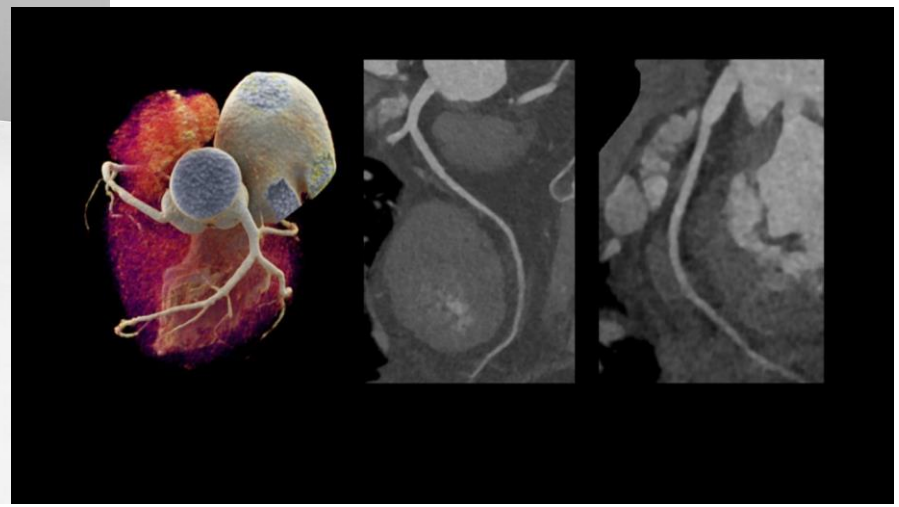


Data acquisition evolves - CT scan - Ninties





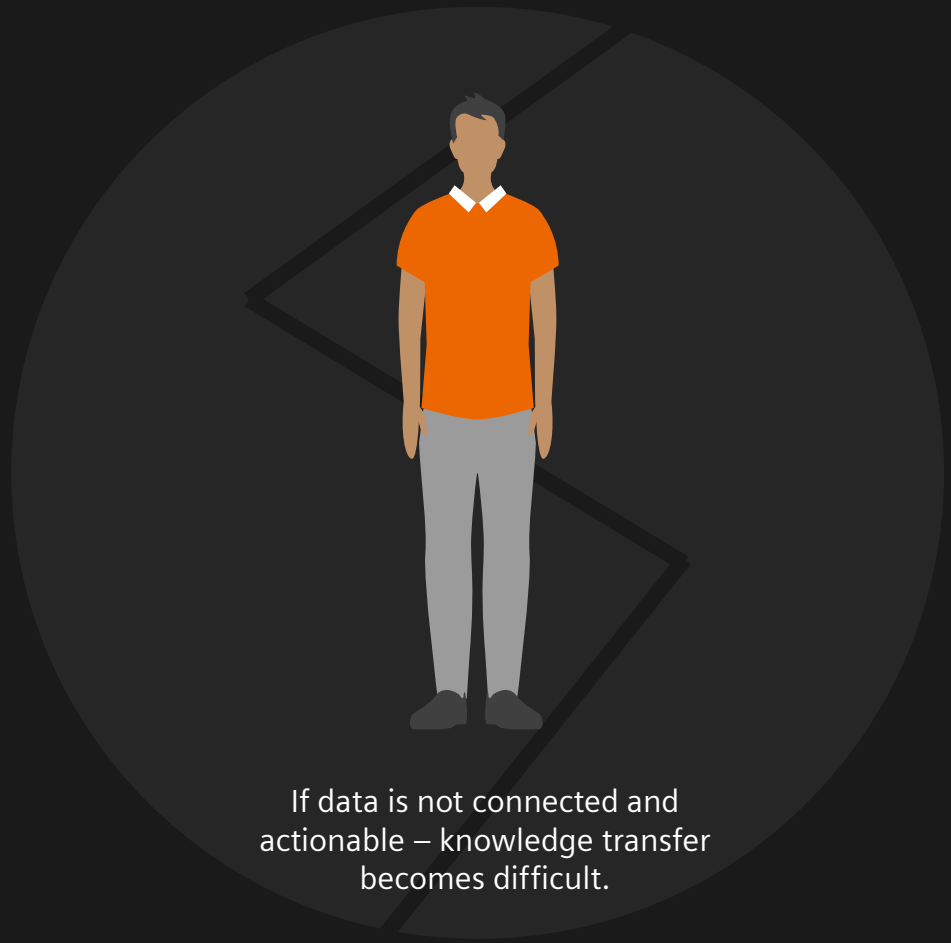
Data acquisition evolves – CT scan - 2021



Example of a lung tumor patient

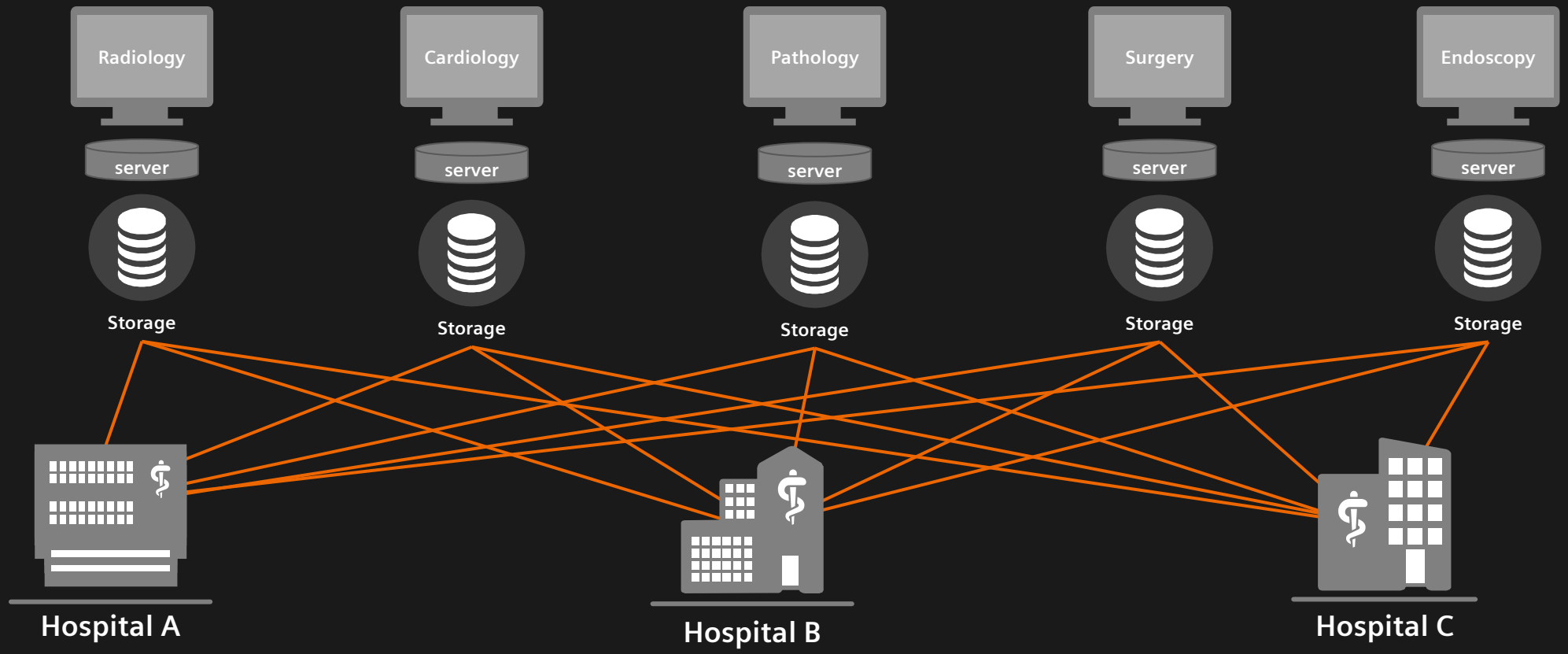
Every patient has to take various tests and examinations in different departments. A lung tumor patient has touch points with **at least six departments generating multiple reports and data** about him.

- Ambulance Report
- Lung function Test in Pulmonology
- Lung CT in Radiology
- PET CT for tumor staging in Nuclear Medicine
- Lung Biopsy in a Thorax Surgery
- Histology in Pathology
- Tumor markers in Laboratory



If data is not connected and actionable – knowledge transfer becomes difficult.

The Matryoshka effect – knowledge silos across the enterprise



There is need for a strategy to grow from separated departmental systems with multiple applications and data silos.

Digital technology acceleration drives behavioral change of consumers taking care of their health

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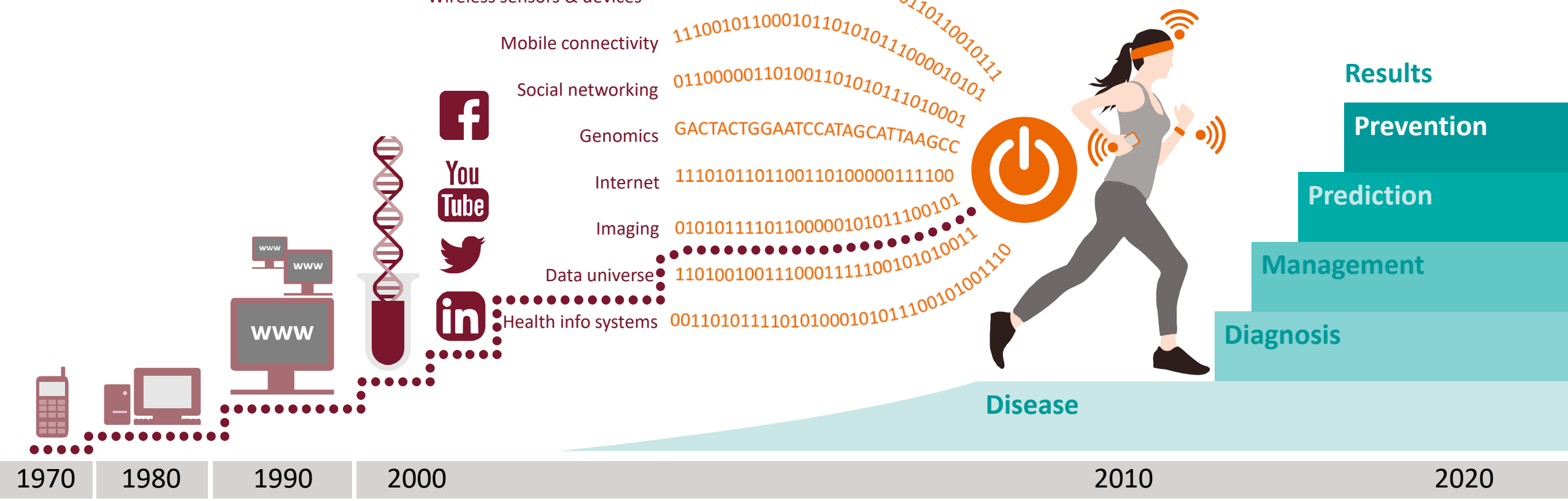
Acceleration of Digital Technology



Eric Topol: The creative destruction of medicine

Our fundamental thought

The purpose of every health system is to achieve better patient health and care.

That’s why our job is to empower everyone and everything involved in this mission. And that is why we must meet the needs of physicians, IT specialists, economists, and patients equally.

So the key question is:

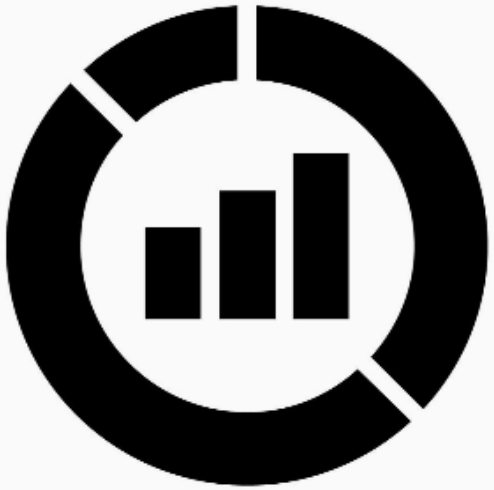
What’s this elementary need that brings them all together?

Knowledge

If you know better, then you can do better – and thus improve patient care

Supporting operational, clinical, and shared decision-making along the patient pathway

Three levers to support informed decision-making

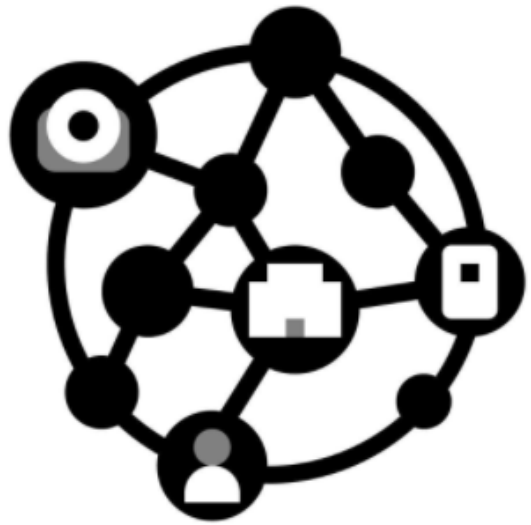


Streamlining operations management

Enabling a more effective use of resources along service lines, designed to reduce costs without sacrificing outcomes.

Supporting diagnostic and therapeutic decision-making

From test ordering to image processing – our products provide clinical decision support to aid you in personalized diagnostic and treatment decisions.



Connecting care teams and patients

Optimize your decision-making with cooperative care to save costs and speed up the processes.

Challenges in decision-making along the patient pathway

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Patient history

50%

- of patients report that information necessary to their case was not available when needed[1]

→ **Patient data not accessible**

- Doctors in intensive care units spend about **10%** of the time for searching and scrolling when reviewing electronic medical records[2]

→ **Time-consuming retrieval**

Ordering

<26%

- of all imaging examinations are ordered incorrectly when placed without evidence-based standards[3]

→ **Incorrectly ordered exams**

→ **Inefficient use of imaging resources**

Diagnosis

~30%

- of radiological diagnoses are probably error-prone, due in large part to cognitive factors[4]

→ **Diagnostic errors**

→ **Overlooked pathologies**

Therapy decision

38%

- state that most common cited reason for overtreatment was difficulty of accessing medical records[1]

→ **Information overload**

→ **Inappropriate treatment plan**

Treatment

26%

- of oncological treatment plans do not comply with clinical guidelines[5]

→ **Unwanted variation**

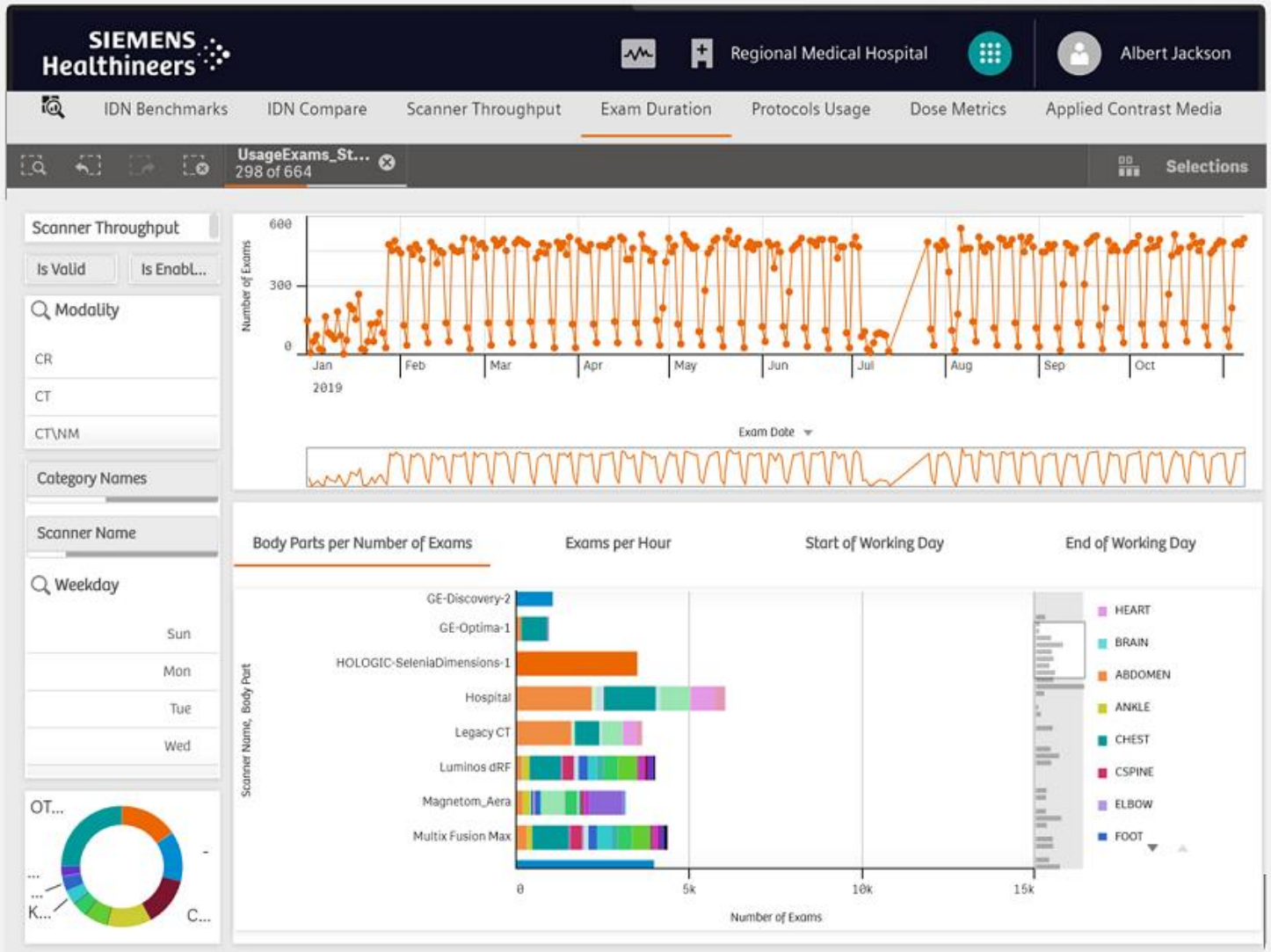
→ **Lack of personalization**

Follow-up

77%

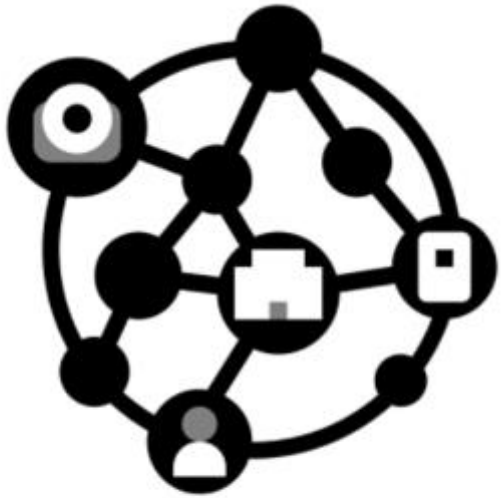
- of physicians have recommended an app or digital program to their patients,[6] it remains difficult to incorporate the collected information into care processes

→ **Difficulties in information exchange**



Streamlining operations management

Examples



Connecting care teams and patients

Our approach – for patient treatment and data availability anywhere, anytime[1]

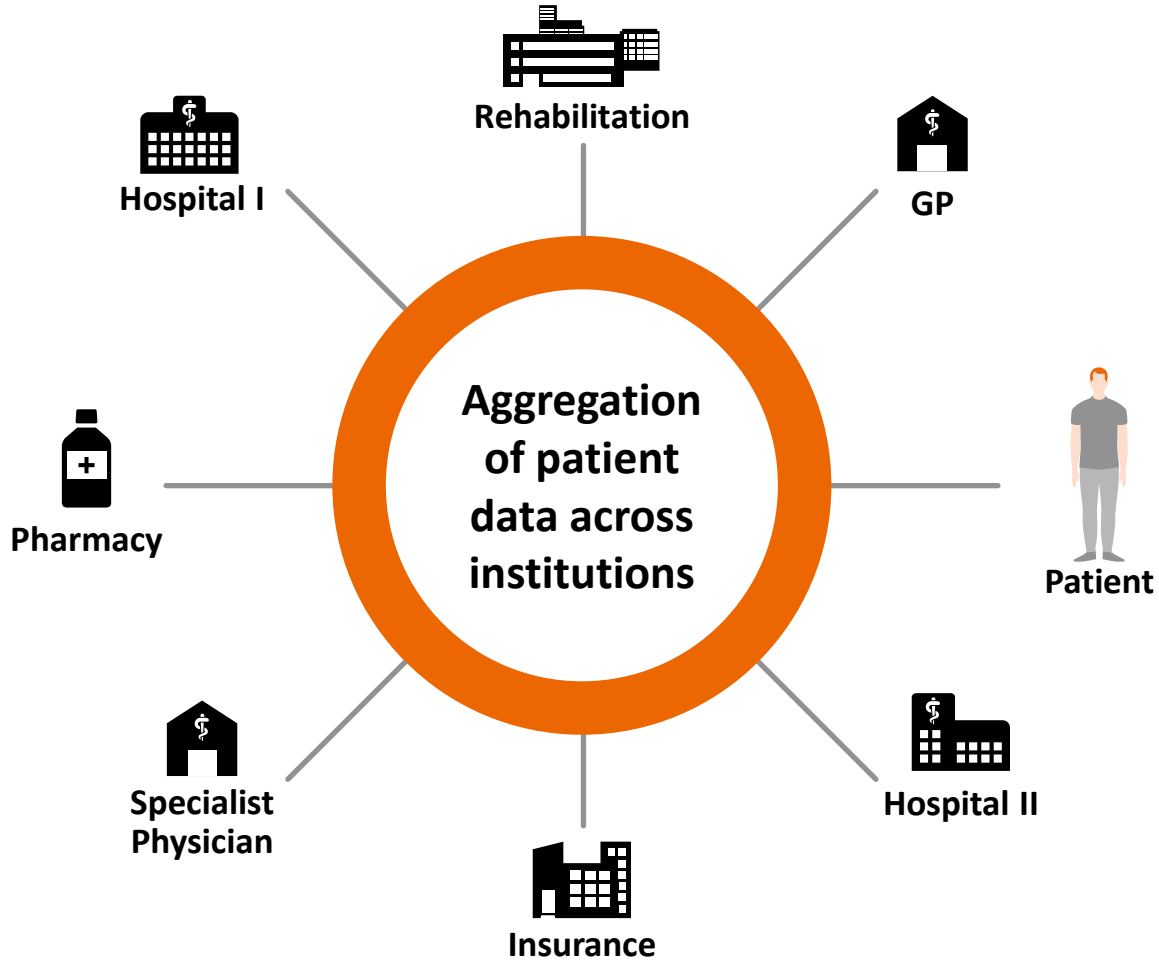
Cooperative care network with portals for professionals and patients

Access to data – the Electronic Health Record

Collaborative treatment processes

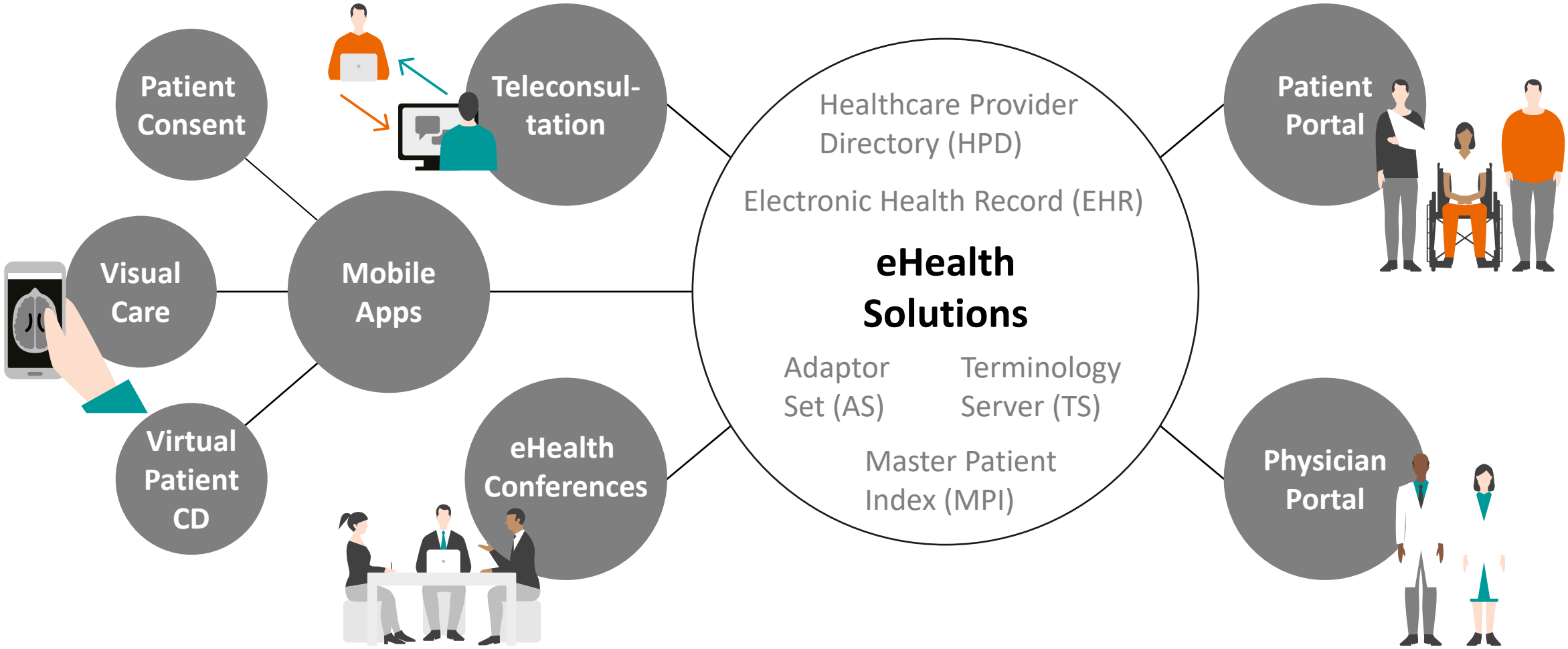
Advantages

- The community is easily expandable (on-the-fly)
- No limitation regarding type of institution (hospitals, GPs, patients, etc.)
- Individual access rights
- Seamless integration due to international standards (IHE)
- Access to data could help to avoid redundant examinations

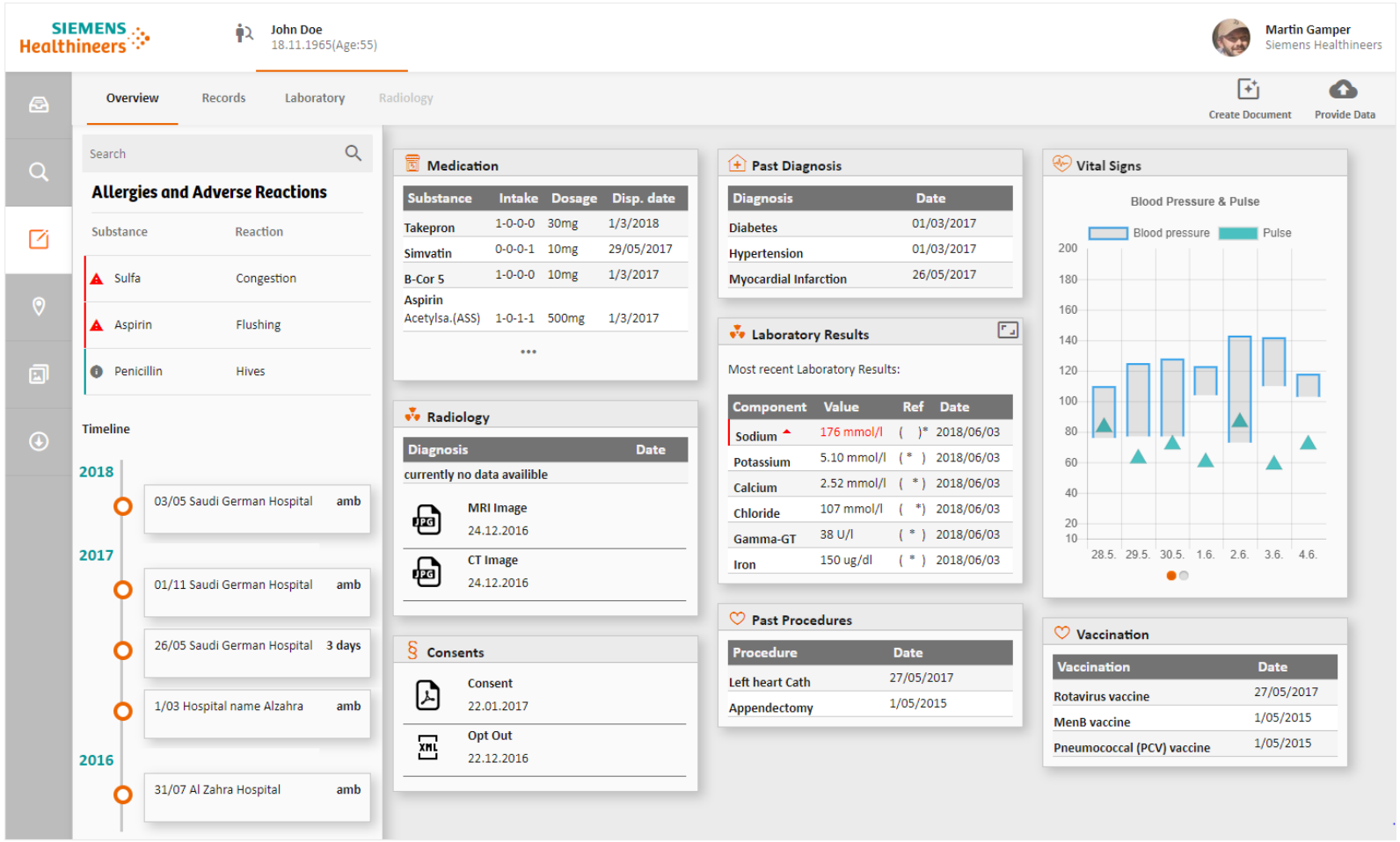


[1] Internet connection is required.

eHealth Solutions
Our solution to connect systems and people



eHealth Physician Portal
Patient Chart



- Extracts discrete data from CDA findings or directly fills with discrete data via FHIR interfaces
- Retrieves date from homecare devices or point-of-care devices, even from fitness trackers
- Patient can add data by upload to patient portal

The eHealth Physician Portal simply displays received/endered data. The product itself does not issue alerts or similar.

Examples

Supporting diagnostic and therapeutic decision-making

AI RAD Companion

Radiology Decision support systems

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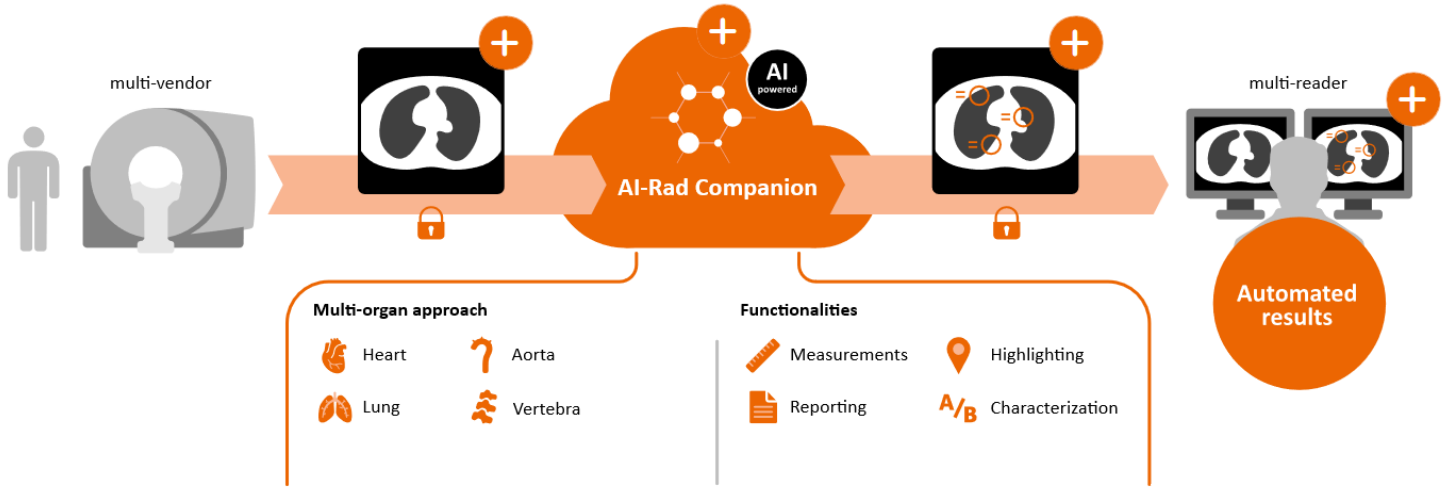
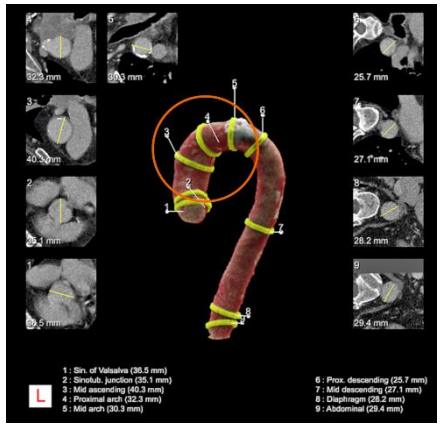
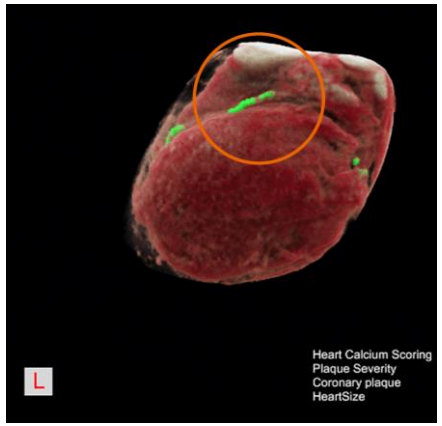
AI RAD Companion Chest CT

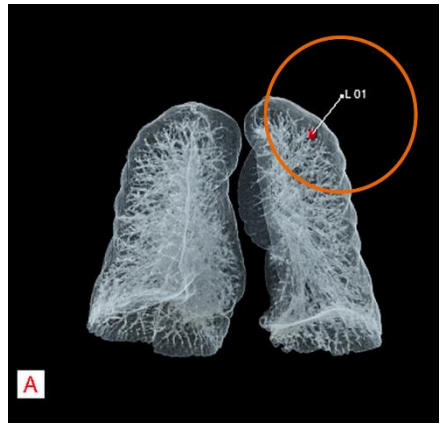
Op AI gebaseerde software voor lezen en rapporteren van chest CT beelden.

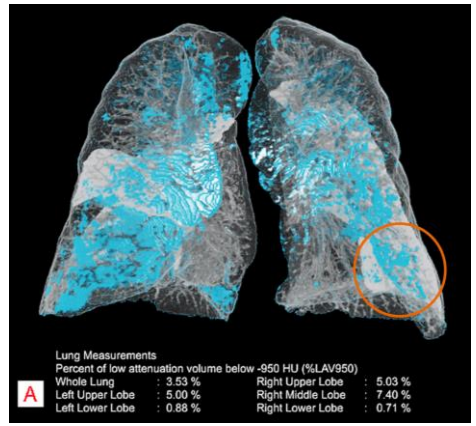
- 50% kortere beoordeling beelden
- 16,6% minder fouten.

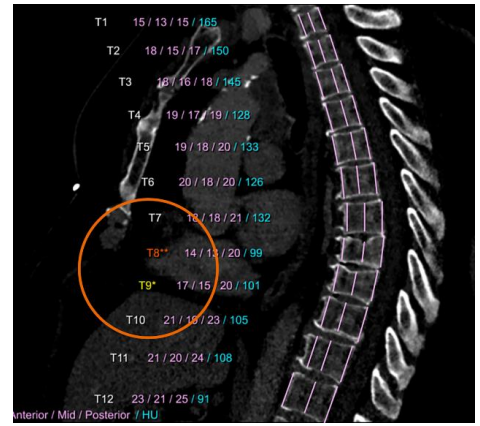




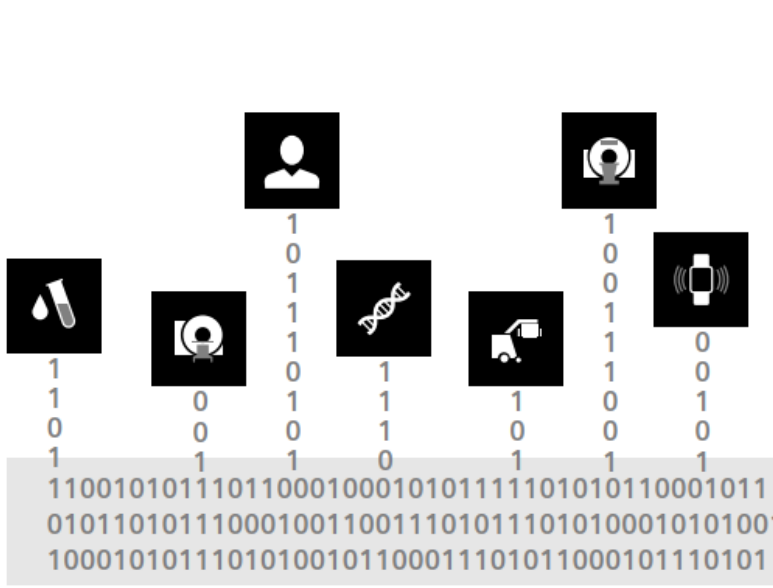


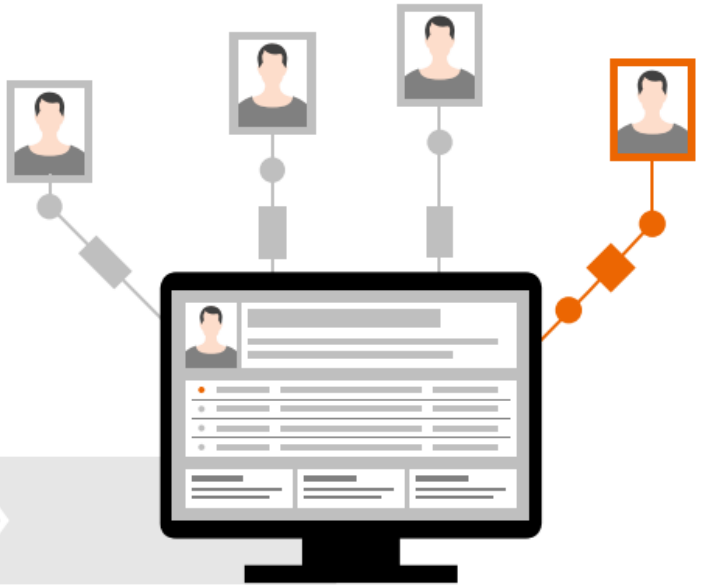






Holistic Approach to complex decision-making in a digitalized care environment





Multi-modal data input

- Family/medical history
- Clinical notes
- Clinical examination
- Medical images
- Lab results
- Pathological findings
- Medication
- Genetic information
- Microbiome, immune status
- Physical activity, nutrition
- Behavioral, social data
- Biosensors, wearables
- Medical literature
- ...

Technology-enabled data integration

Physician/ care team

Standardization/ guidelines

Personalization/ patient preferences

High-complexity decision

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Data supporting the patient pathway

AI based decision support along the patient pathway






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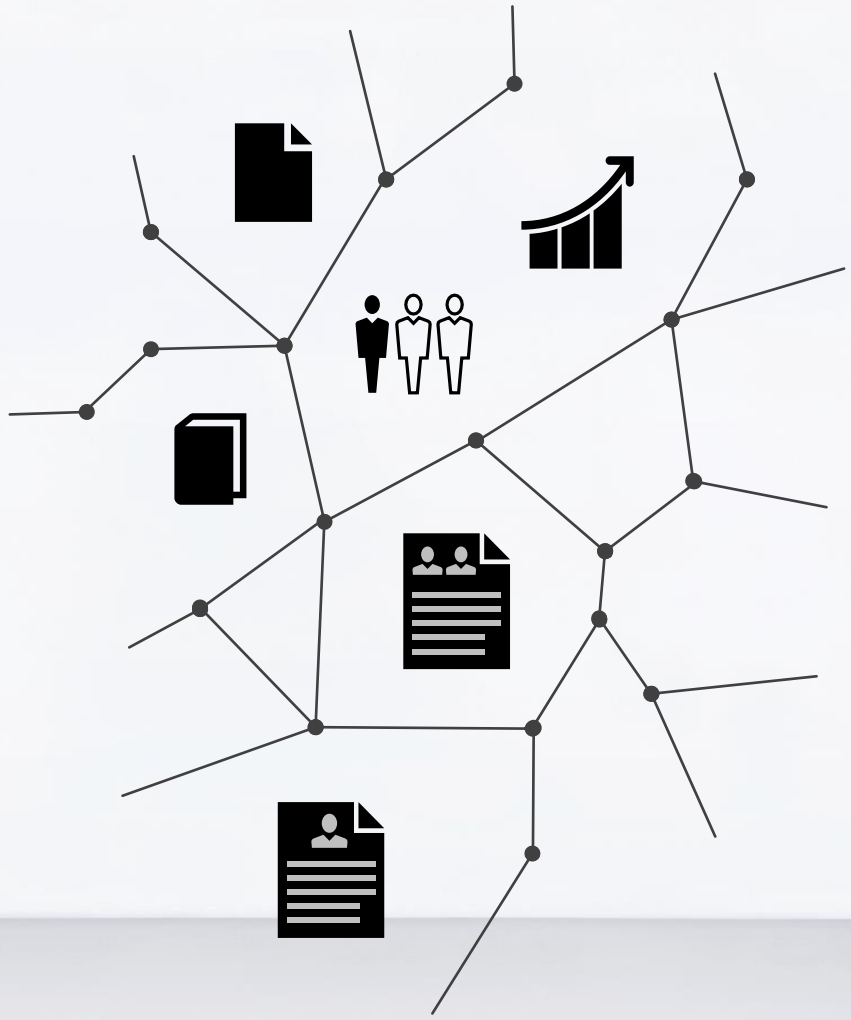

AI-Pathway Companion

Your source of information to facilitate diagnostic and therapeutic decisions along the patient care pathway

AI Pathway Companion setup

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Accessible through common web service

Prostate Cancer | **Lung Cancer[1]** | **Breast Cancer[1]** | **Coronary Artery Disease[1]** | **Analytics KPIs**

Standardized & Harmonized Model

AI

Structured Data Aggregation & Image Access

Based on patient, clinical pathway and decision in the pathway

Holistic "patient" model
Intelligent "disease" model
Intelligent "cohort" model

FHIR[1]/HL7[1] SQL	**HL7[1]**	**HL7[1]**	**HL7[1]**	**DICOM**
mandatory	optional	optional	optional	mandatory
EMR/HIS Patient Data	**OIS/CVIS Therapy Data**	**LIS Lab Data**	**RIS Rad Data**	**PACS Images**

The products/features (mentioned herein) of AI-Pathway Companion are not commercially available in all countries. Their future availability cannot be guaranteed.
1 This product/feature is under development and not commercially available. Its future availability cannot be ensured.

Author | Department

Delivering benefits along the entire care continuum

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Multidisciplinary Tumor Board[2]
Collaborate across clinical expertise

Pathway Positioning System[2,4]
Identify patient location along pathway

EHR interface[1]
Access relevant data for informed decisions

Patient preference[2]
Personalize patients needs

Pathway KPI analytics[3]
Act on key outcome indicator

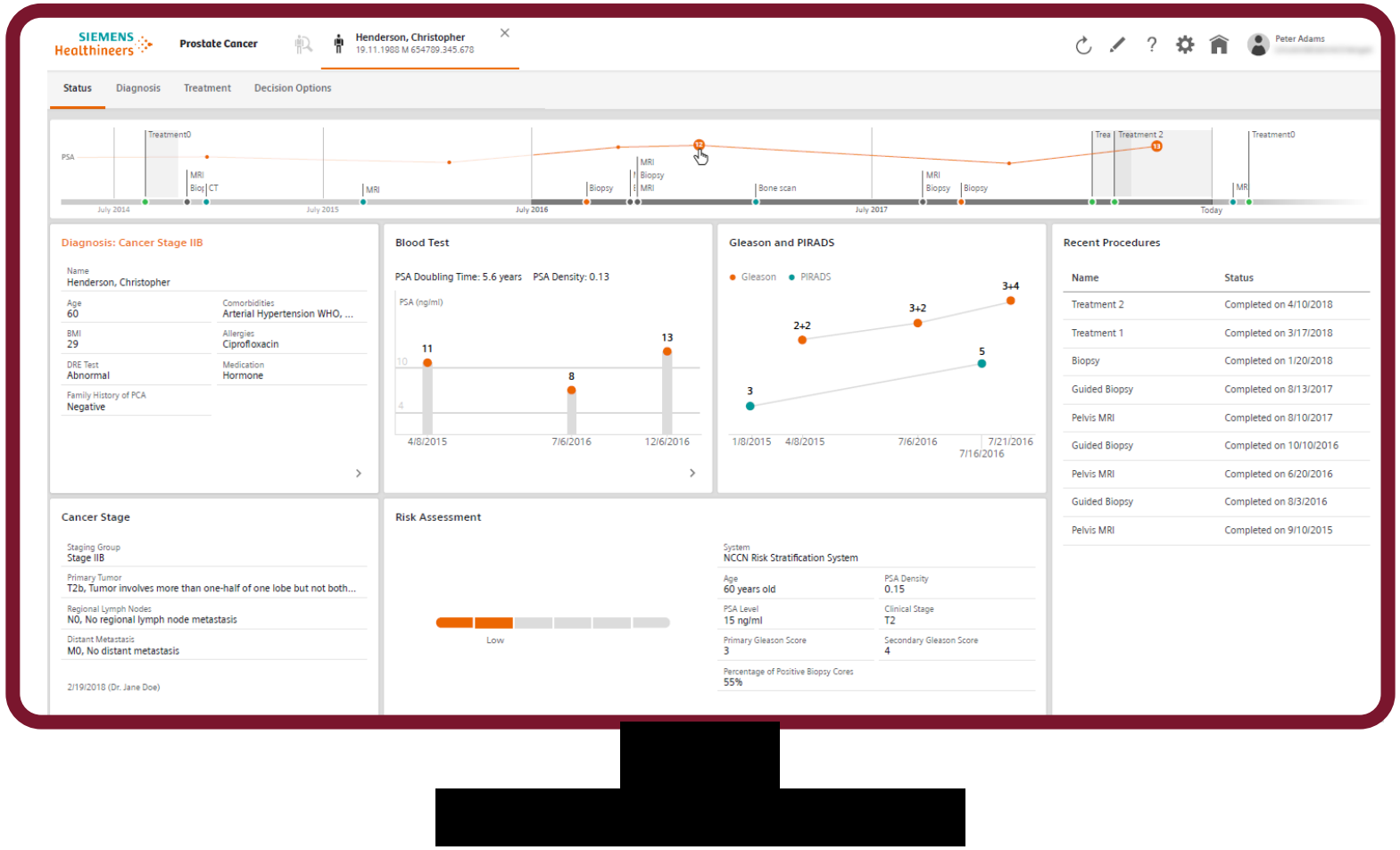
Designed intuitive Usability
Navigate user-friendly interface

NLP for unstructured data[1]
Improve clinical data integrity

International Guidelines[2]
Standardized treatment decisions

The products/features (mentioned herein) of AI-Pathway Companion are not commercially available in all countries. Their future availability cannot be guaranteed. **1** This function is supported by AI-Pathway Companion Connector **2** This function is supported by AI-Pathway Companion Prostate Cancer **3** This function is supported by AI-Pathway Companion Analytics **4** Prerequisite for automatic patient-specific mapping: All data is available as required per guideline.; AI-Pathway Companion Prostate Cancer VA10A supports prostate cancer adenocarcinoma cases only. AI-Pathway Companion Prostate Cancer VA10A supports prostate cancer guidelines by NCCN and EAU only

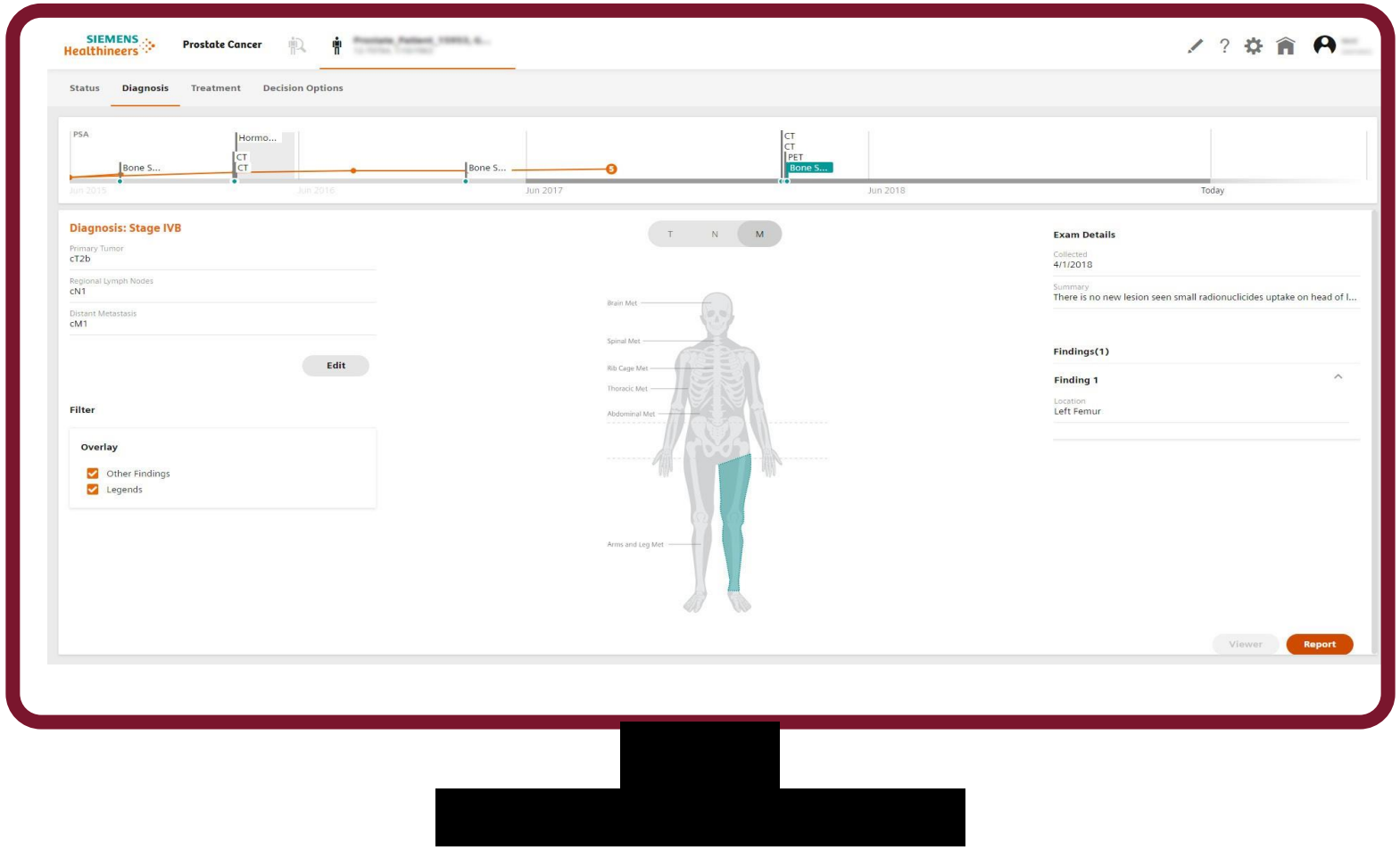
Status Overview
Clinical context summarized within one single view



CE 0123

AI-Pathway Companion applications are not commercially available in all countries. Their future availability cannot be guaranteed. AI-Pathway Companion Prostate Cancer is CE-compliant in accordance with Directive 93/42/EEC. AI-Pathway Companion Analytics and AI-Pathway Companion Connector are not intended for use in the diagnosis of disease or other conditions, or in the cure, mitigation, treatment, or prevention of disease.

Diagnosis Overview
Correlated imaging and pathology results



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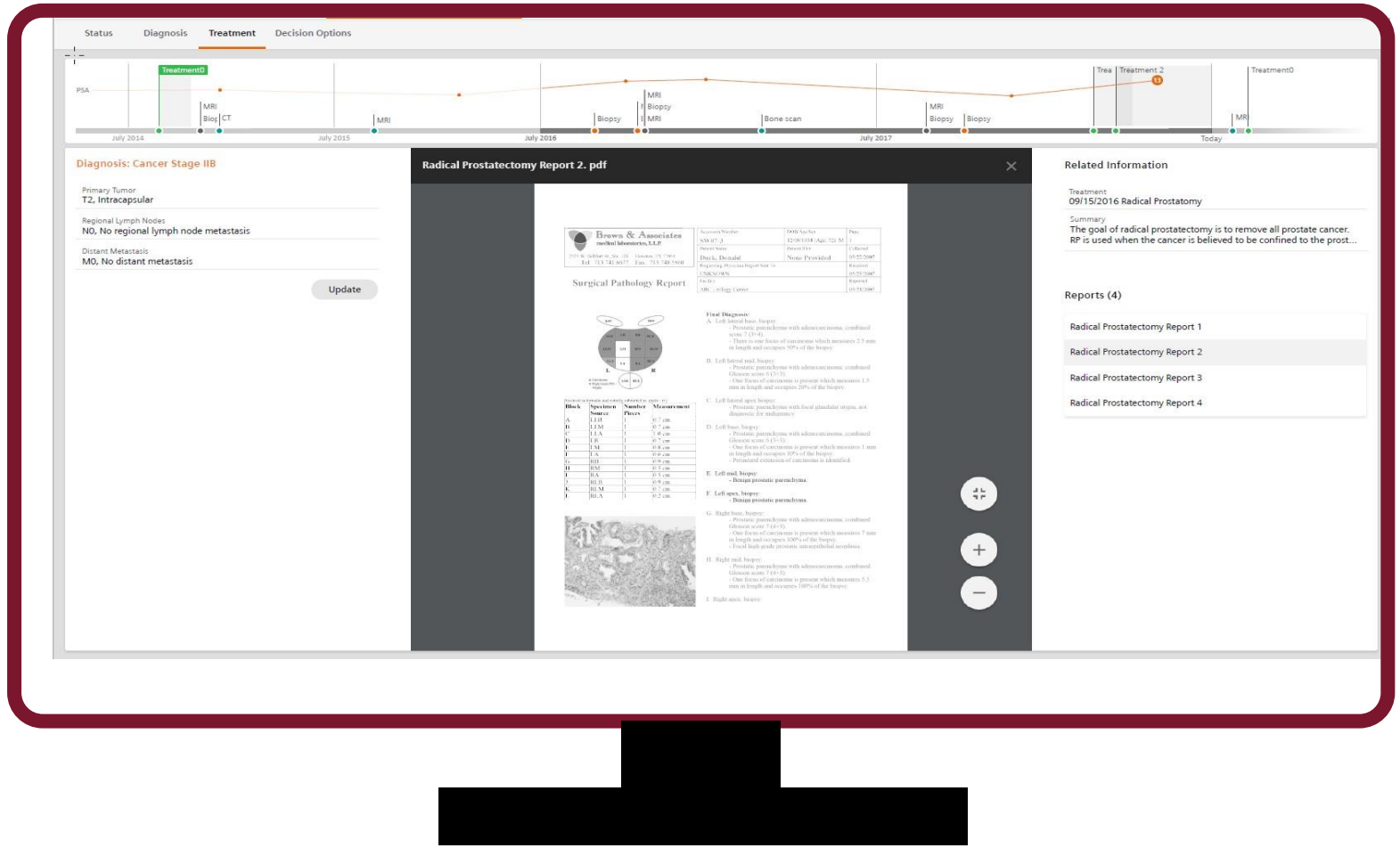
Treatment Overview
Summary of completed therapeutic procedures



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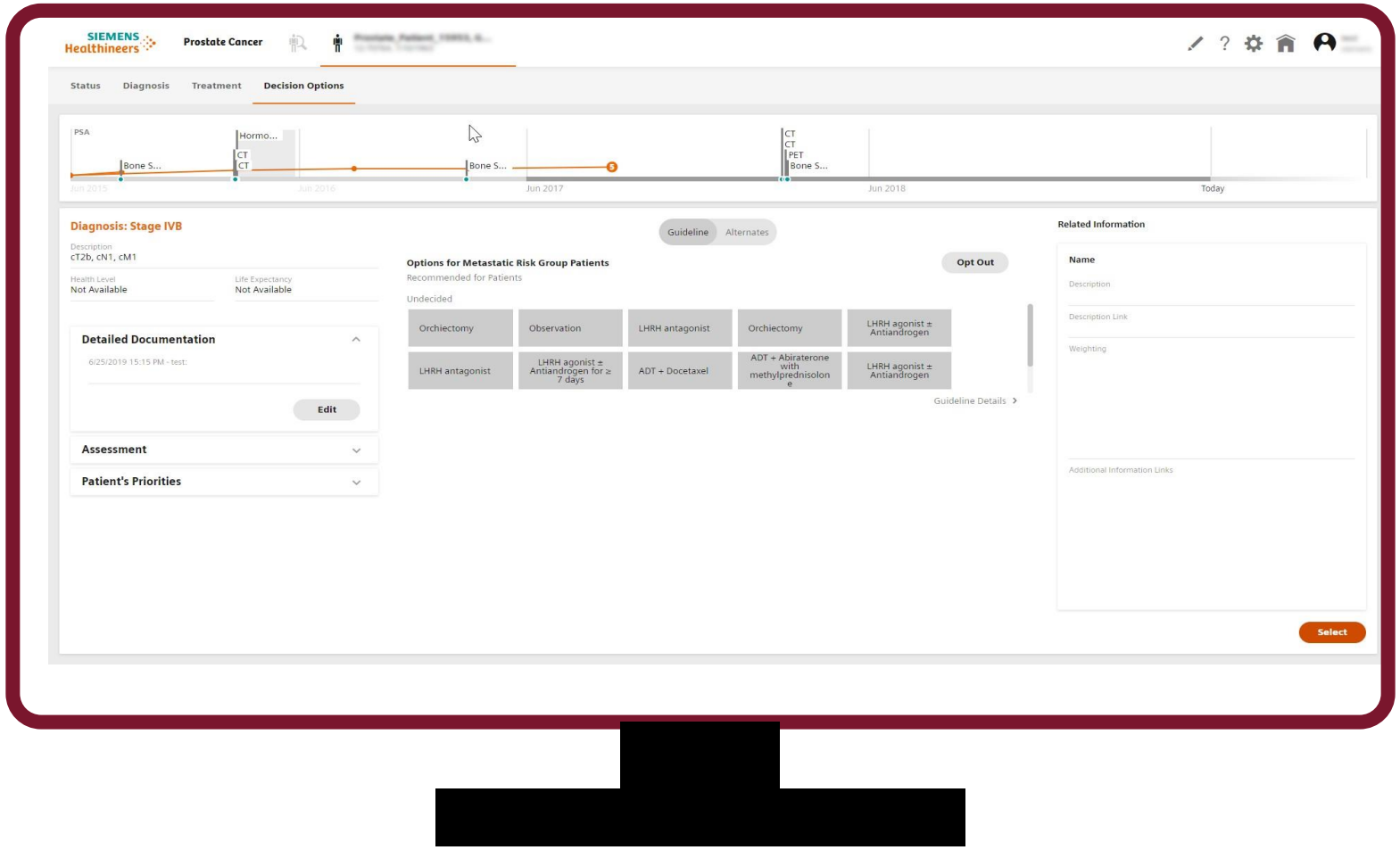
Decision Options Features
Evidence-based recommended treatment options



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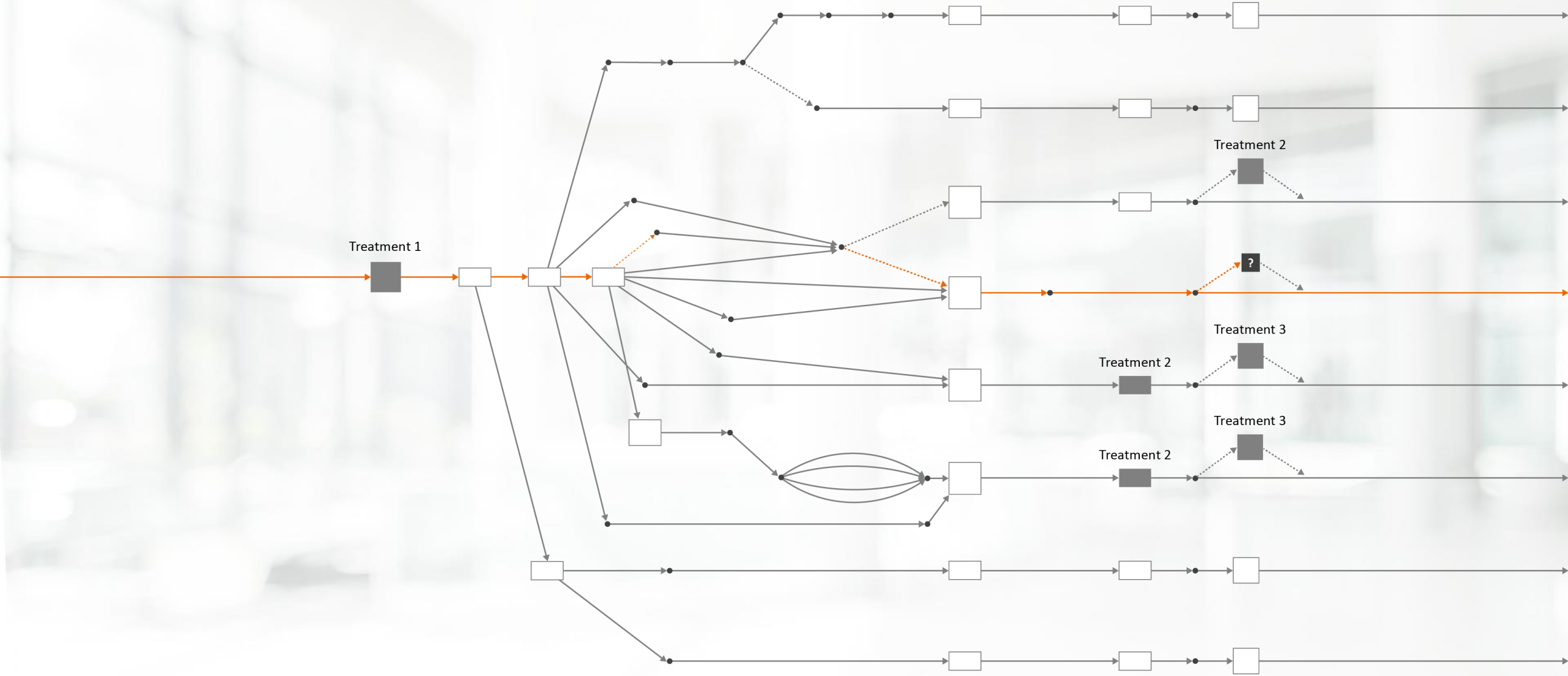
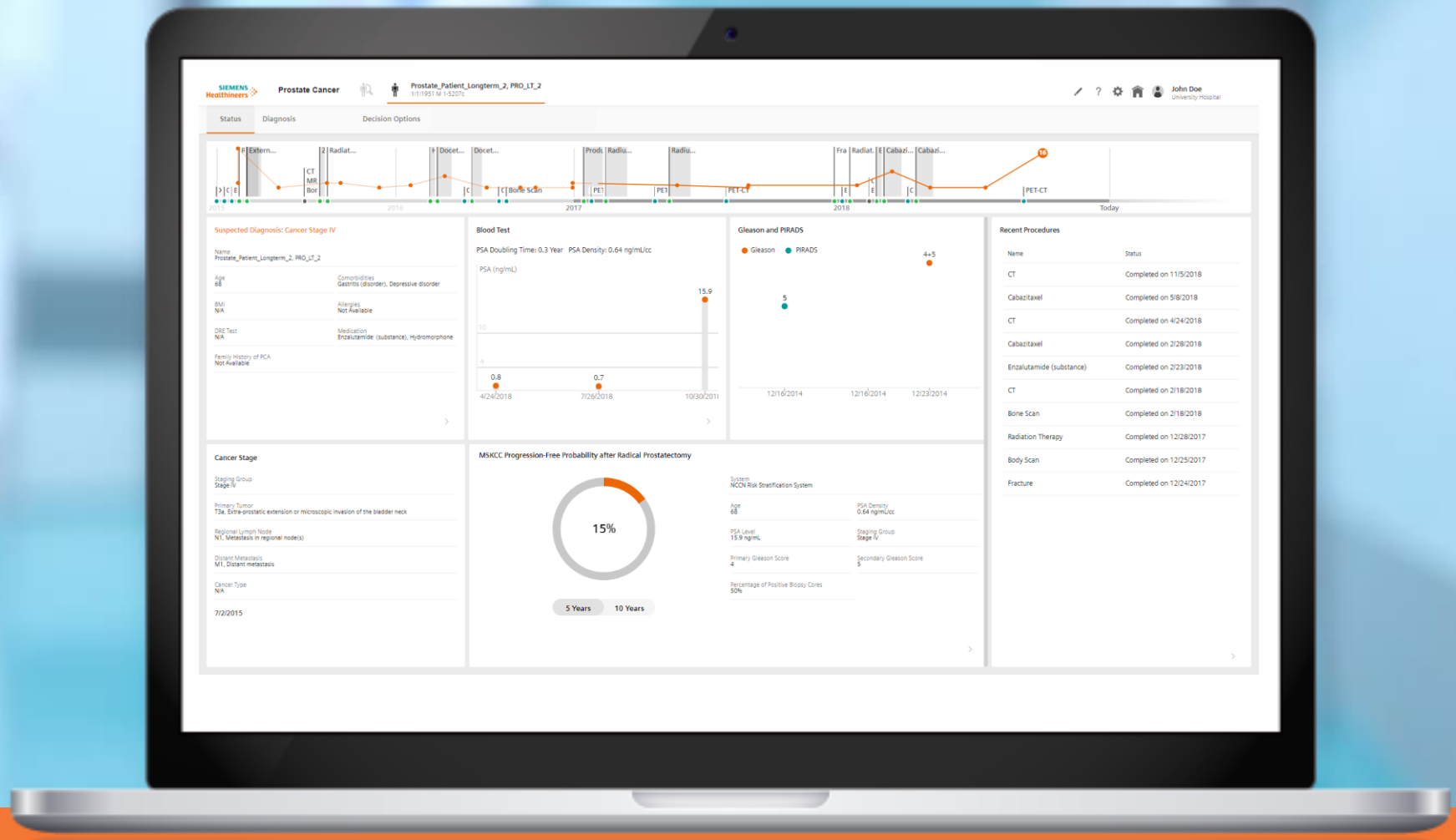

Treatment 1
Treatment 2
?
Treatment 3
Treatment 2
Treatment 3
Treatment 2

GPS – Where am I and what is the next step?

AI-Pathway Companion could become a GPS of medicine



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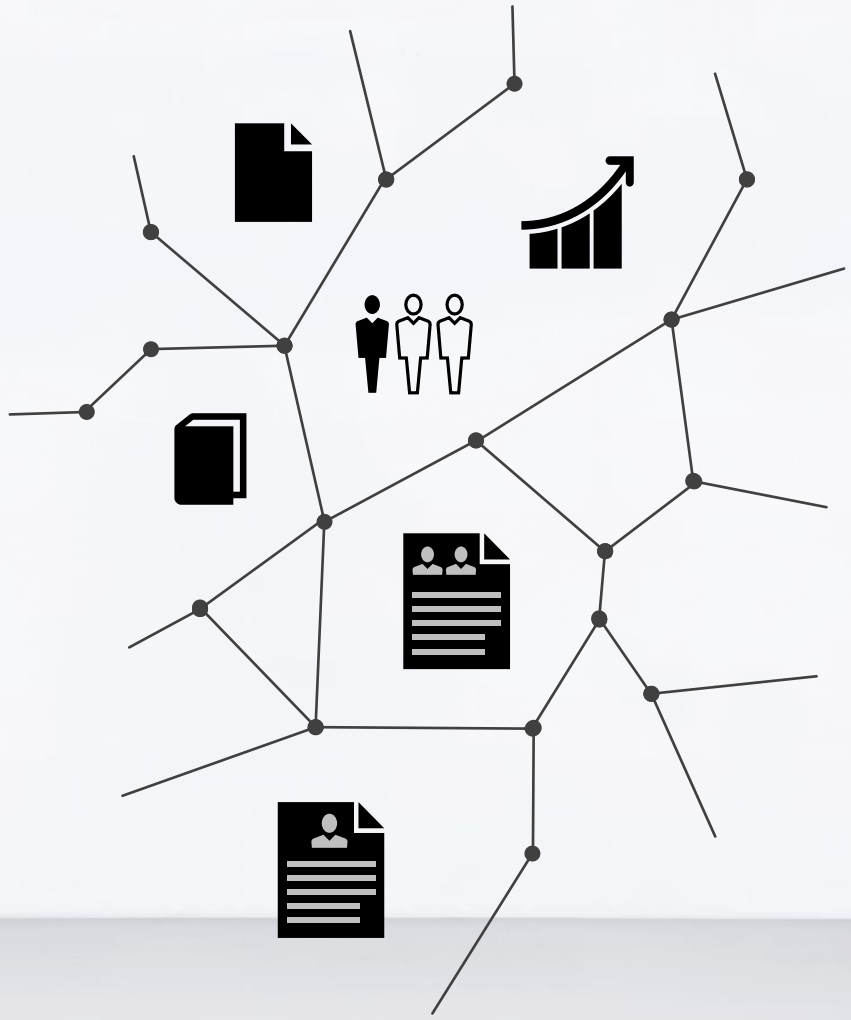

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Don’t **limit** your imagination
to what we are manufacturing –

Add **value** and become **more relevant**