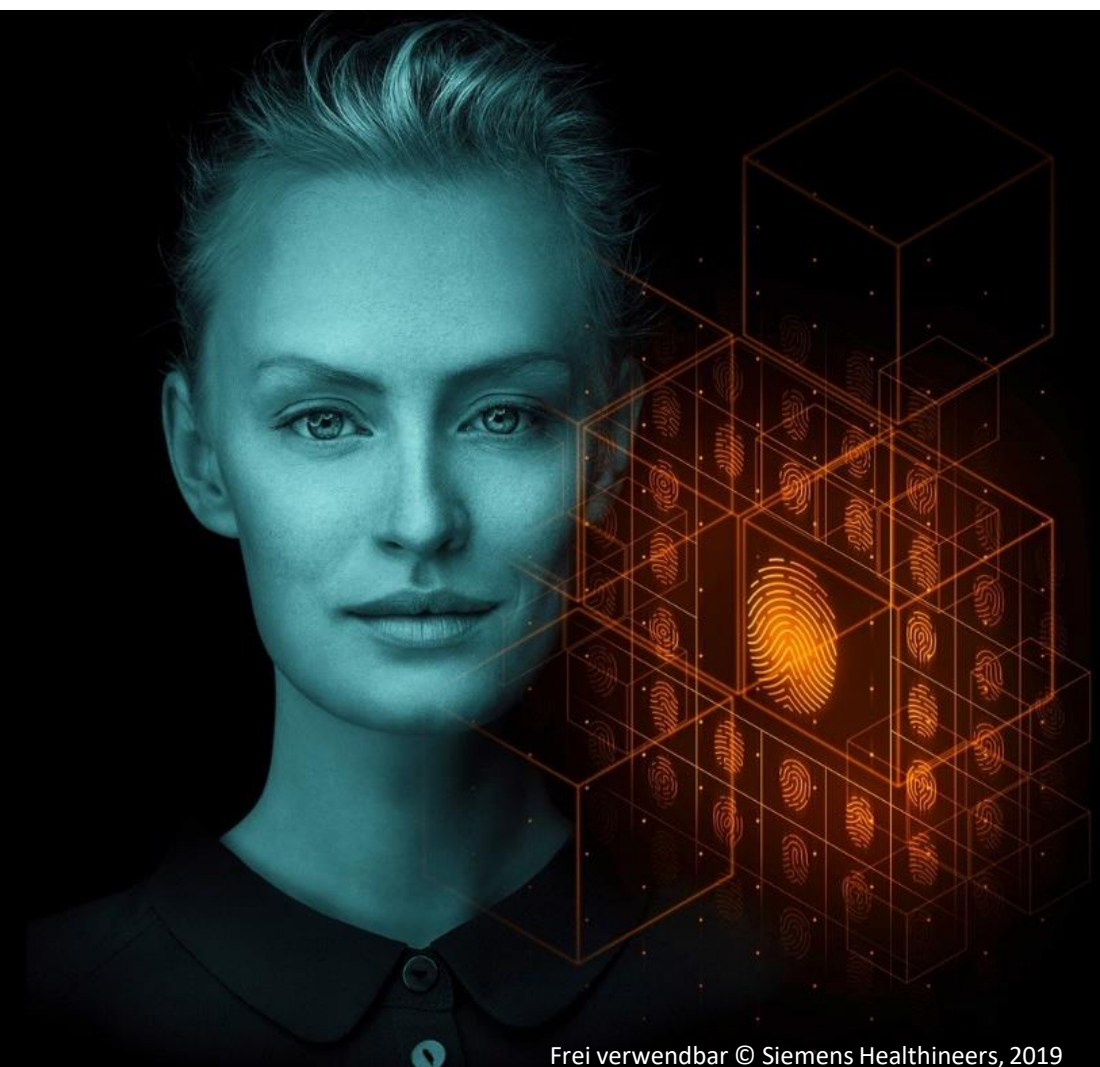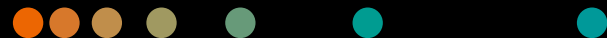# KI und Digitalisierung - Perspektiven einer besseren Medizin

Bernd Montag,
CEO Siemens Healthineers
May 22, 2019
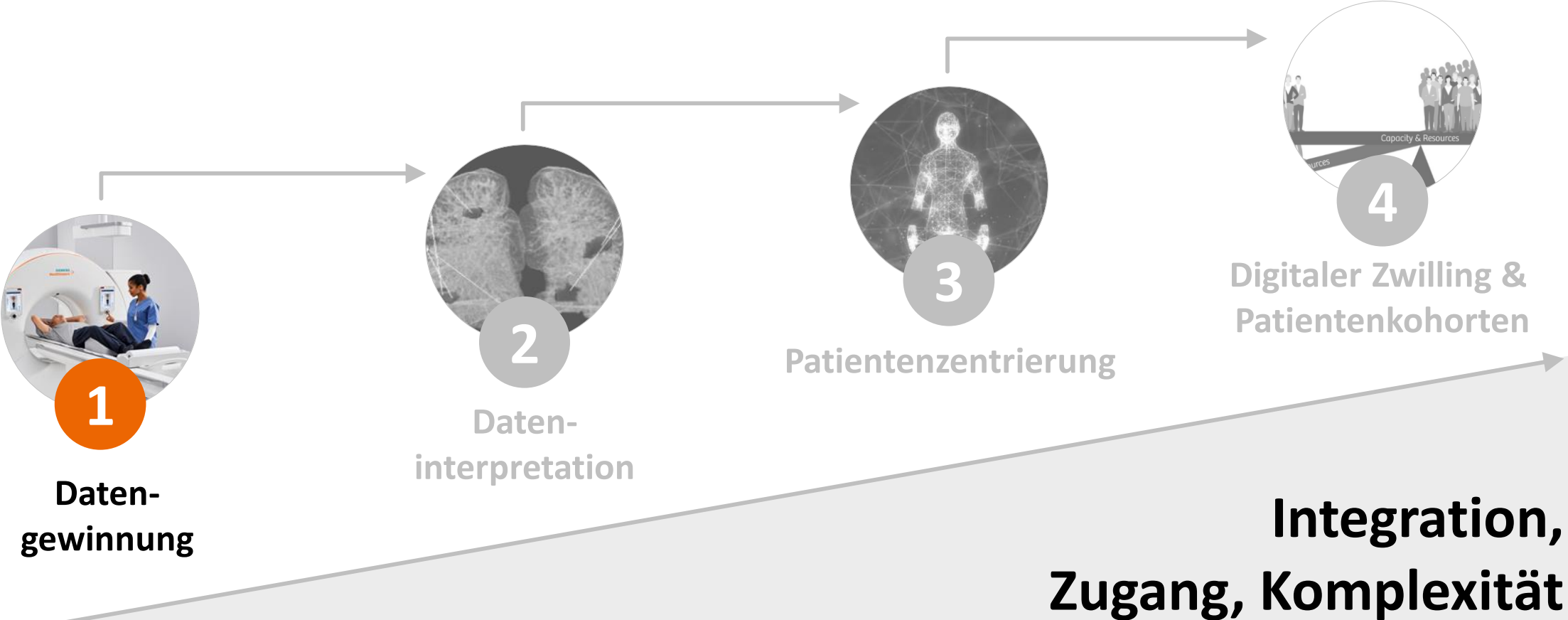
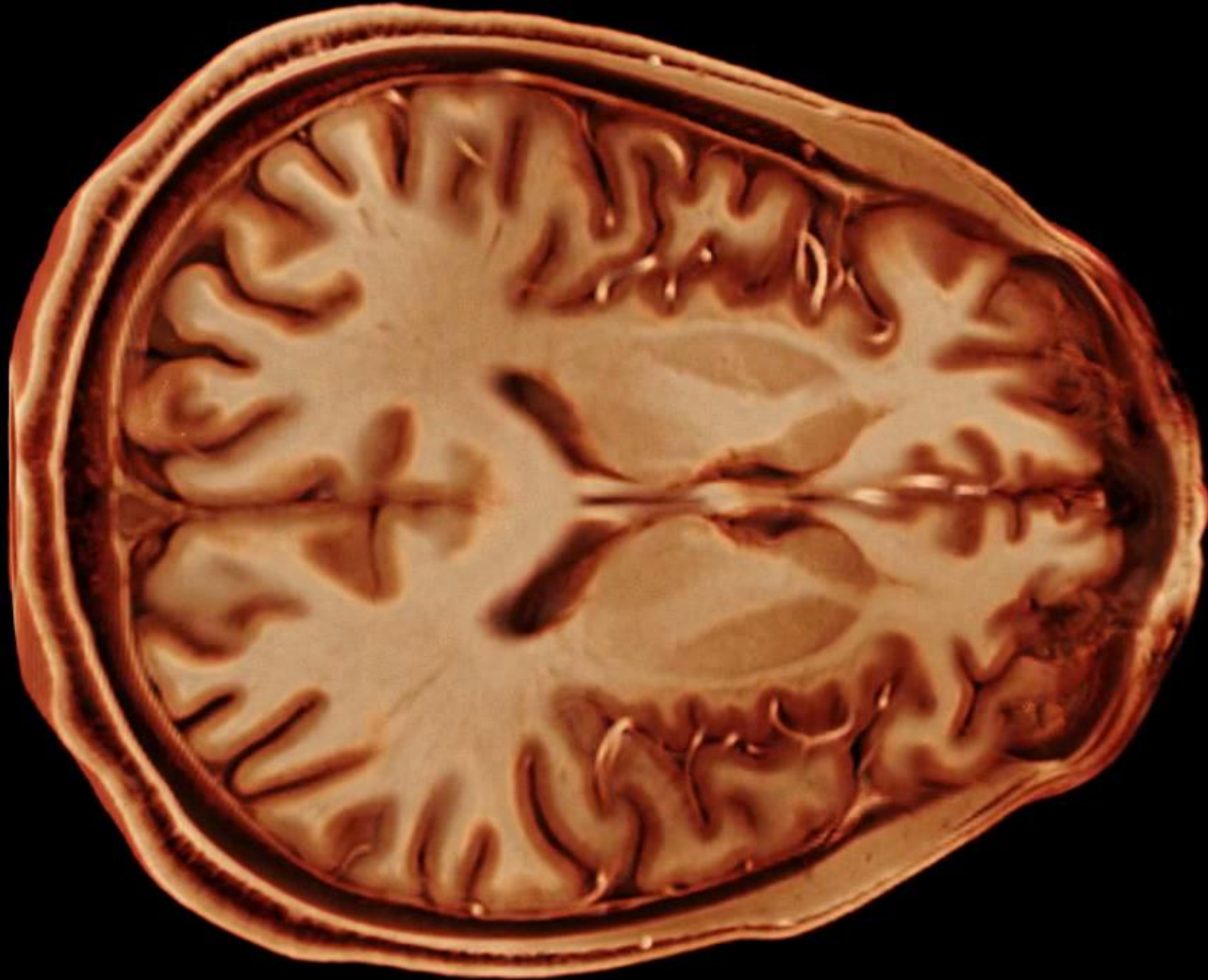# Die Medizin ist die ultimative Herausforderung für Digitalisierung und KI

…denn es geht um…

> **Menschenleben**

> **Vertrauen**

> **Privatsphäre**

> **Komplexe Zusammenhänge**

> **Fest etablierte Strukturen**

Digitalisierung und KI sind die Basis unserer Strategie

Digitalisierung, Daten und Künstliche Intelligenz

Medizin präziser machen

Therapie der Zukunft gestalten

Technologiebasierte Dienstleistungen ausbauen

Behandlungspfade optimieren

Wir treiben Digitalisierung und KI in einem Stufenmodell

1

Daten-gewinnung

2

Daten-interpretation

3

Patientenzentrierung

4

Digitaler Zwilling & Patientenkohorten

Integration, Zugang, Komplexität

High-Tech zur Visualisierung

High-Tech zur Visualisierung

Data courtesy of Vancouver General Hospital, Vancouver, Canada

Durch KI passt sich der Scanner dem Patienten an

Richtige Dosis

Richtige Positionierung

Richtiger Fokus

Atellica – automatisierte Vorfahrt für Notfälle

SIEMENS
Healthineers

Wir treiben Digitalisierung und KI in einem Stufenmodell

1

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gewinnung

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Patientenzentrierung

4

Digitaler Zwilling &
Patientenkohorten

Integration,
Zugang, Komplexität
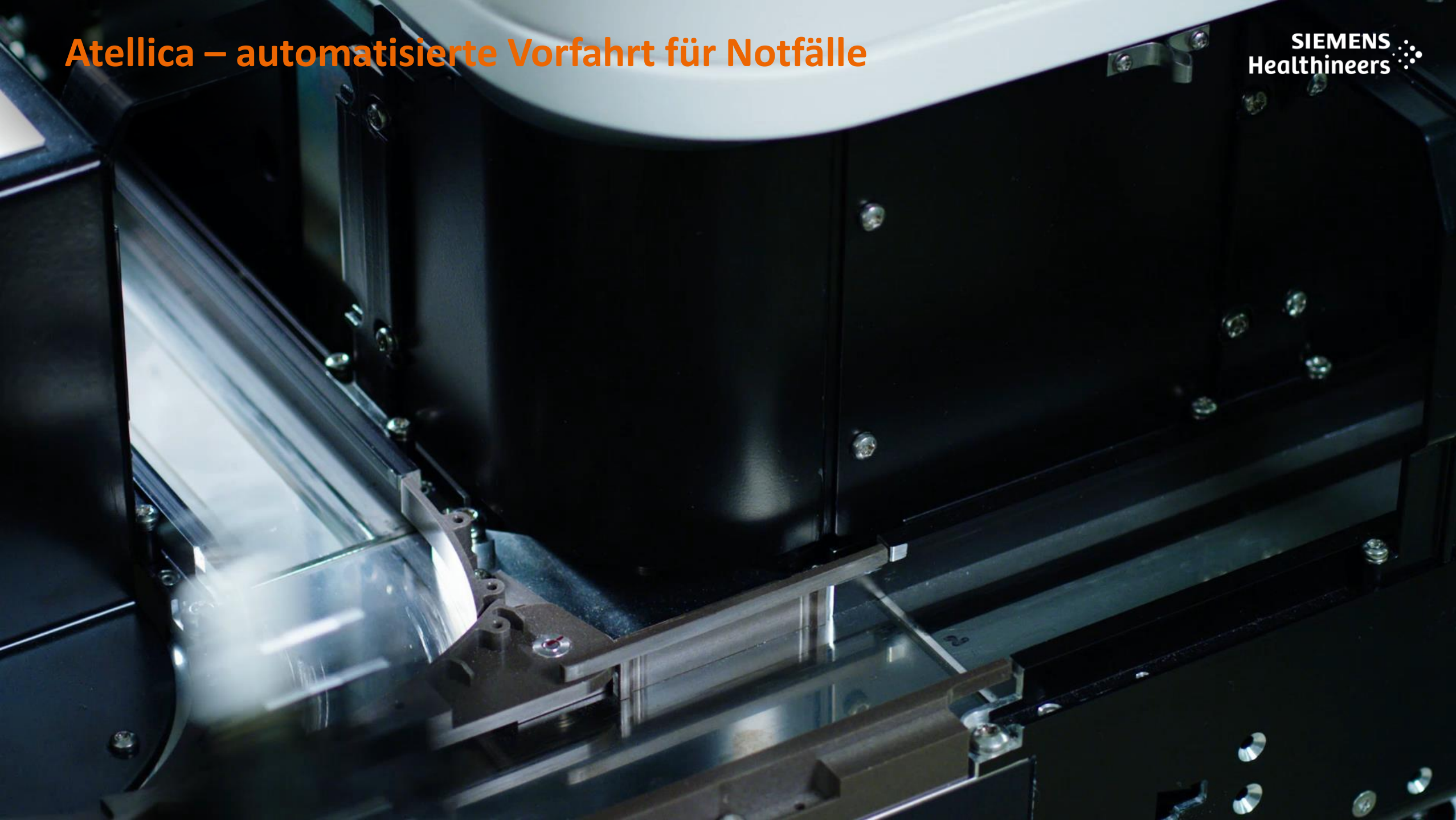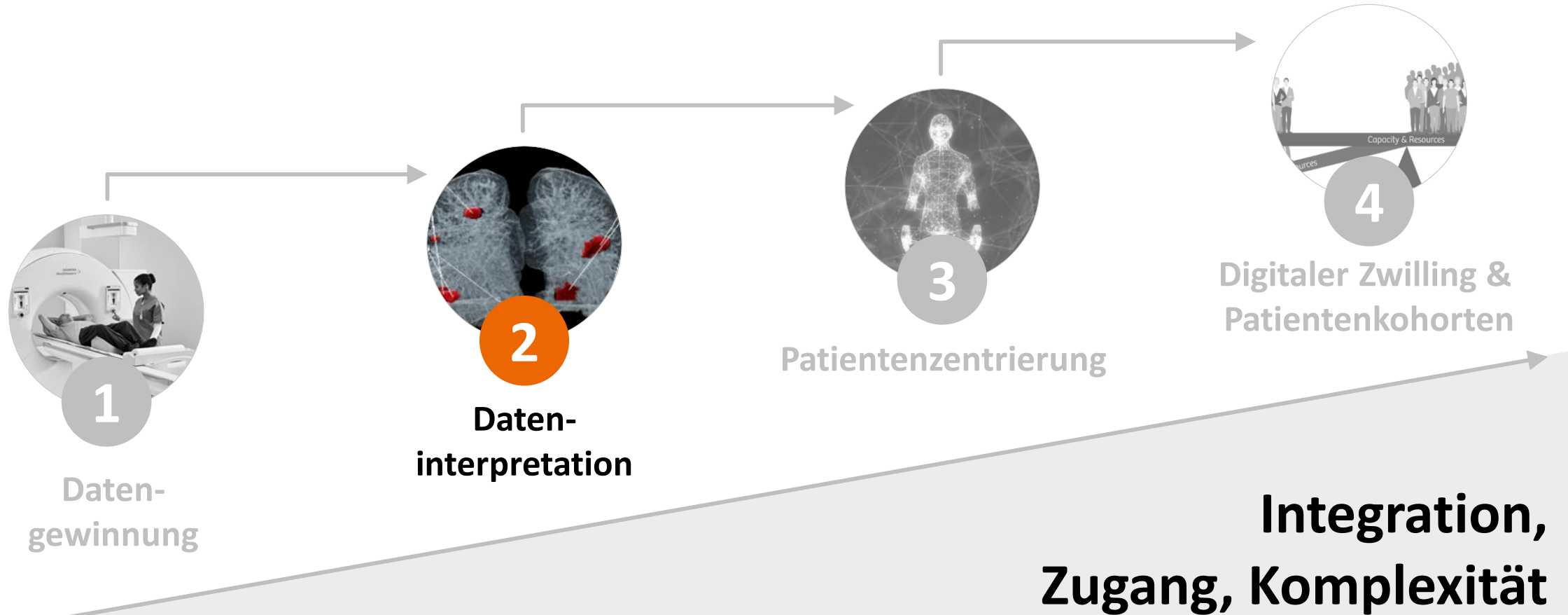
Eine führende Position bei Digitalisierung und künstlicher Intelligenz erfordert signifikante Investitionen
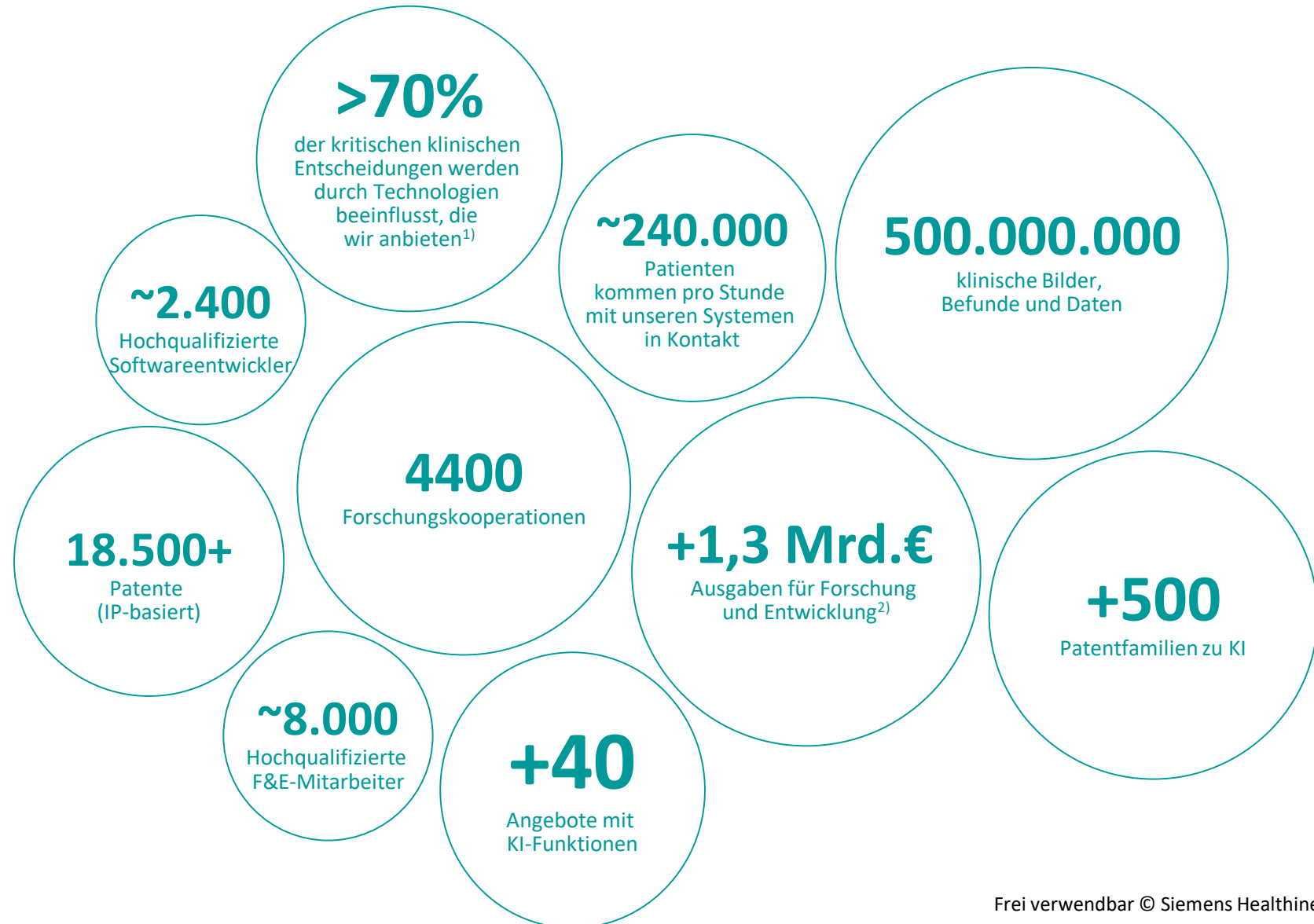
>70%
der kritischen klinischen Entscheidungen werden durch Technologien beeinflusst, die wir anbieten[1]

~240.000
Patienten kommen pro Stunde mit unseren Systemen in Kontakt

500.000.000
klinische Bilder, Befunde und Daten

~2.400
Hochqualifizierte Softwareentwickler

4400
Forschungskooperationen

18.500+
Patente (IP-basiert)

+1,3 Mrd.€
Ausgaben für Forschung und Entwicklung[2]

+500
Patentfamilien zu KI

~8.000
Hochqualifizierte F&E-Mitarbeiter

+40
Angebote mit KI-Funktionen

SIEMENS Healthineers

Sherlock Supercomputer

500 KI Experimente/Tag mit 20 PetaFlops:
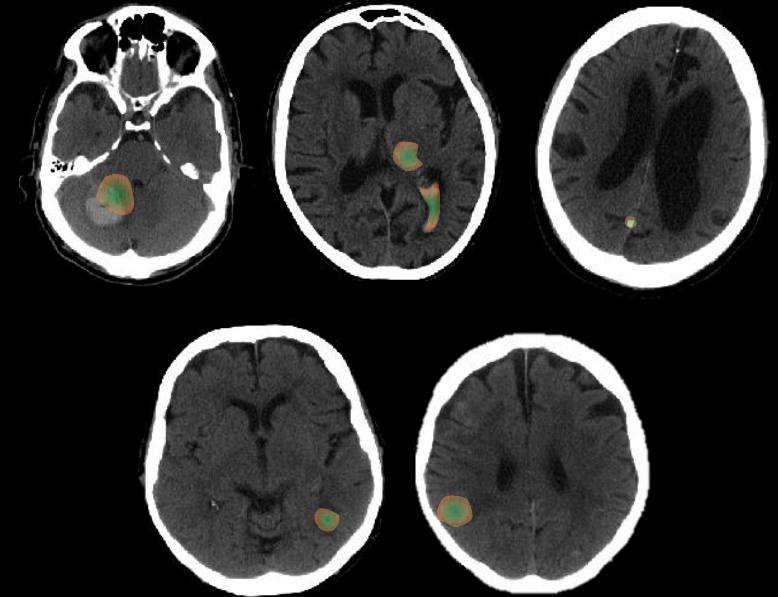
825 km
Berlin – Budapest
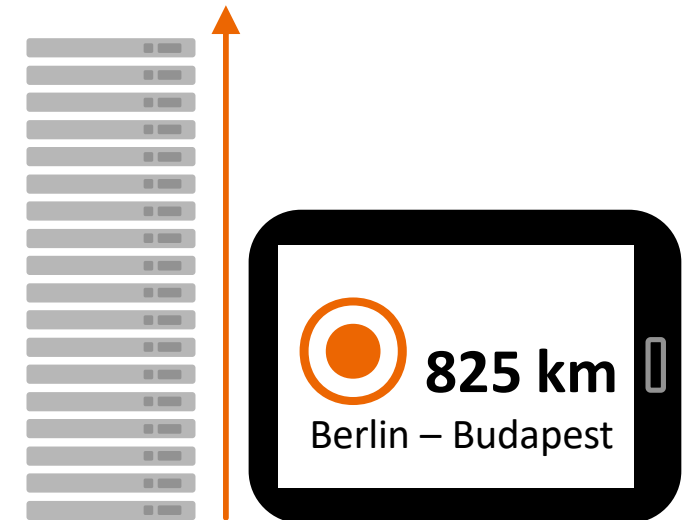
KI wird auf Schlaganfalldiagnostik trainiert

Kopf-CT ohne Kontrastmittel
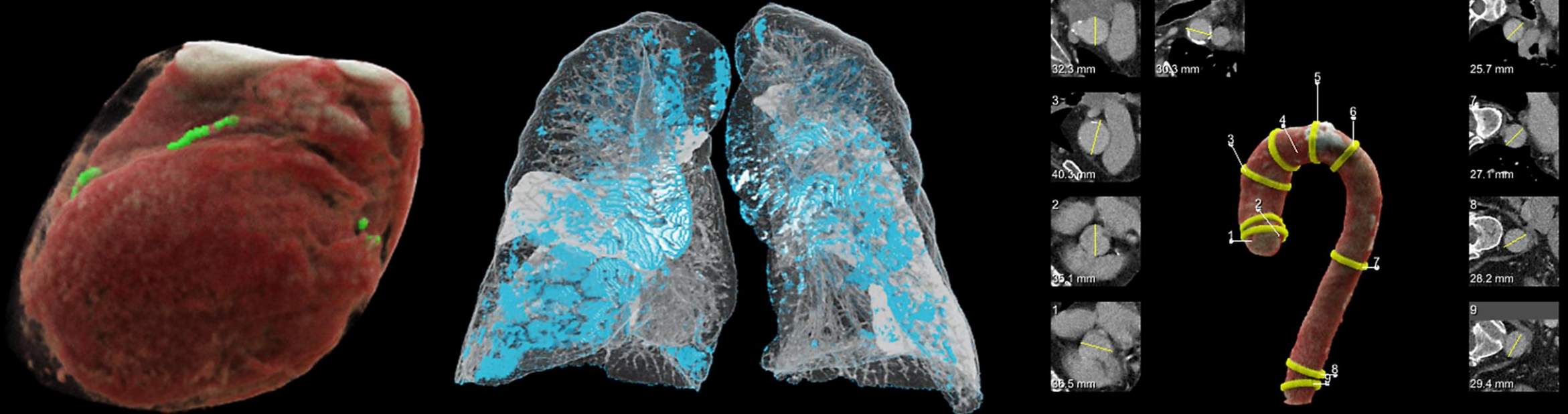und Radiologiebefunde

KI-System
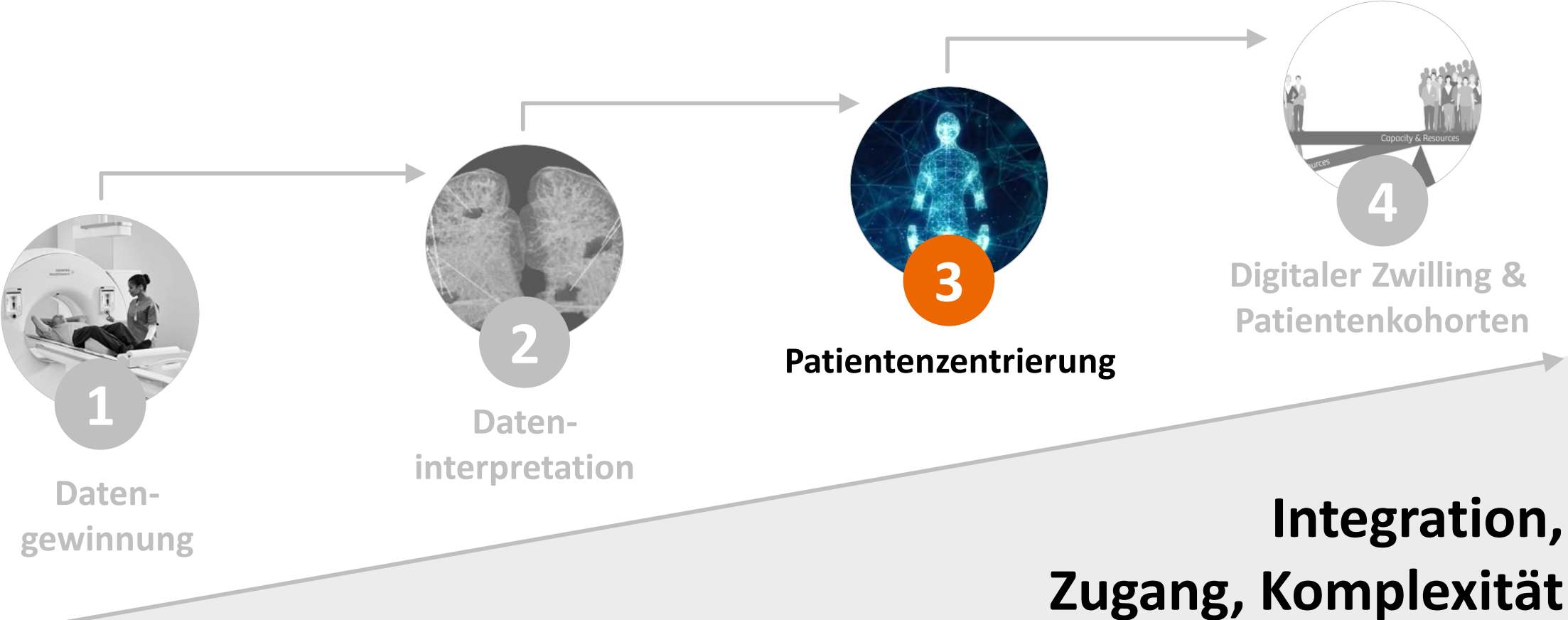mit 100.000 Bildern
trainiert

Nachweis einer Hirnblutung
Kleinhirn, Endhirn, Cerebraler Cortex,
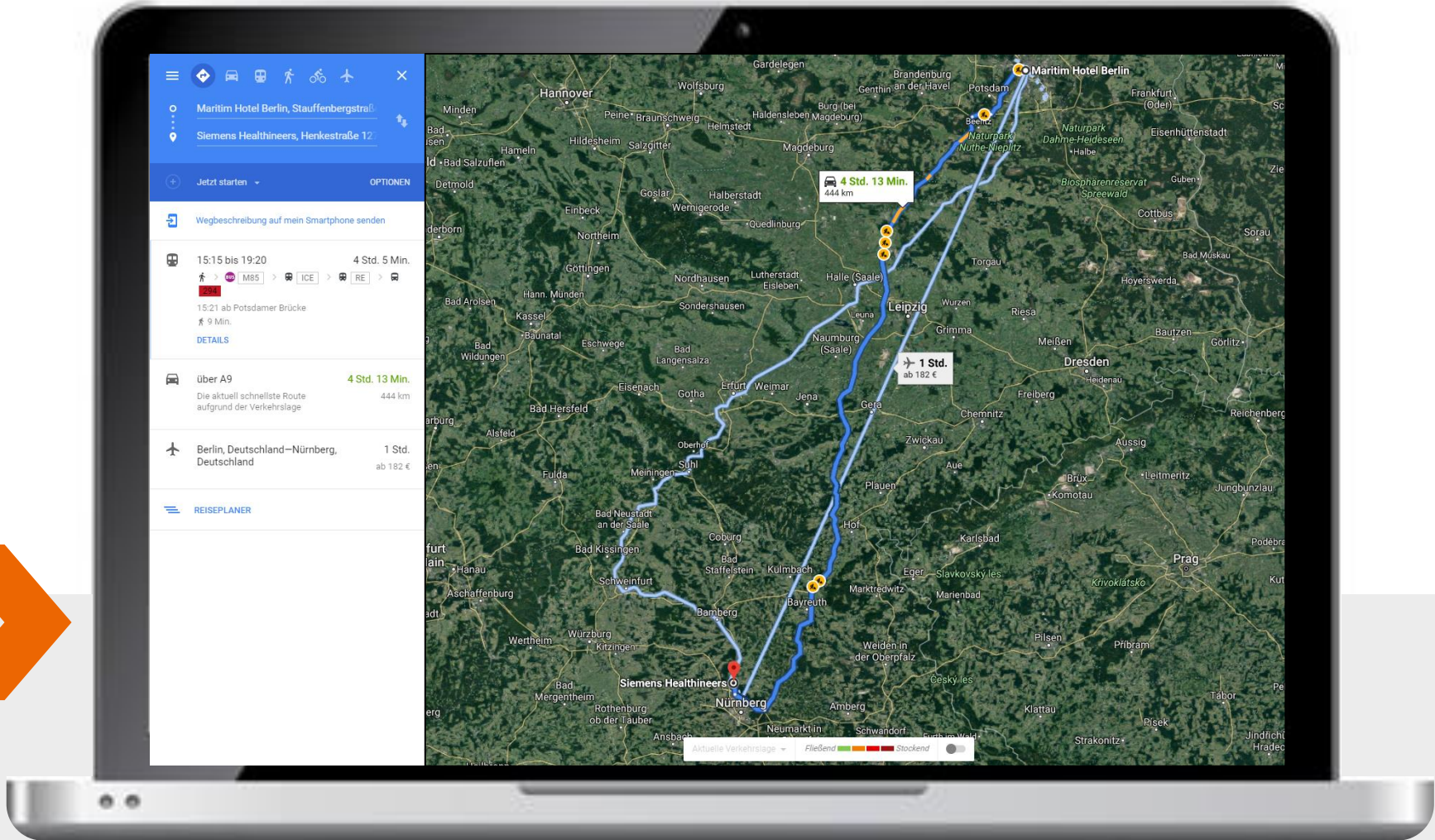Linker Schläfenlappen, Rechter Parietallappen

AI-Rad Companion markiert Auffälligkeiten
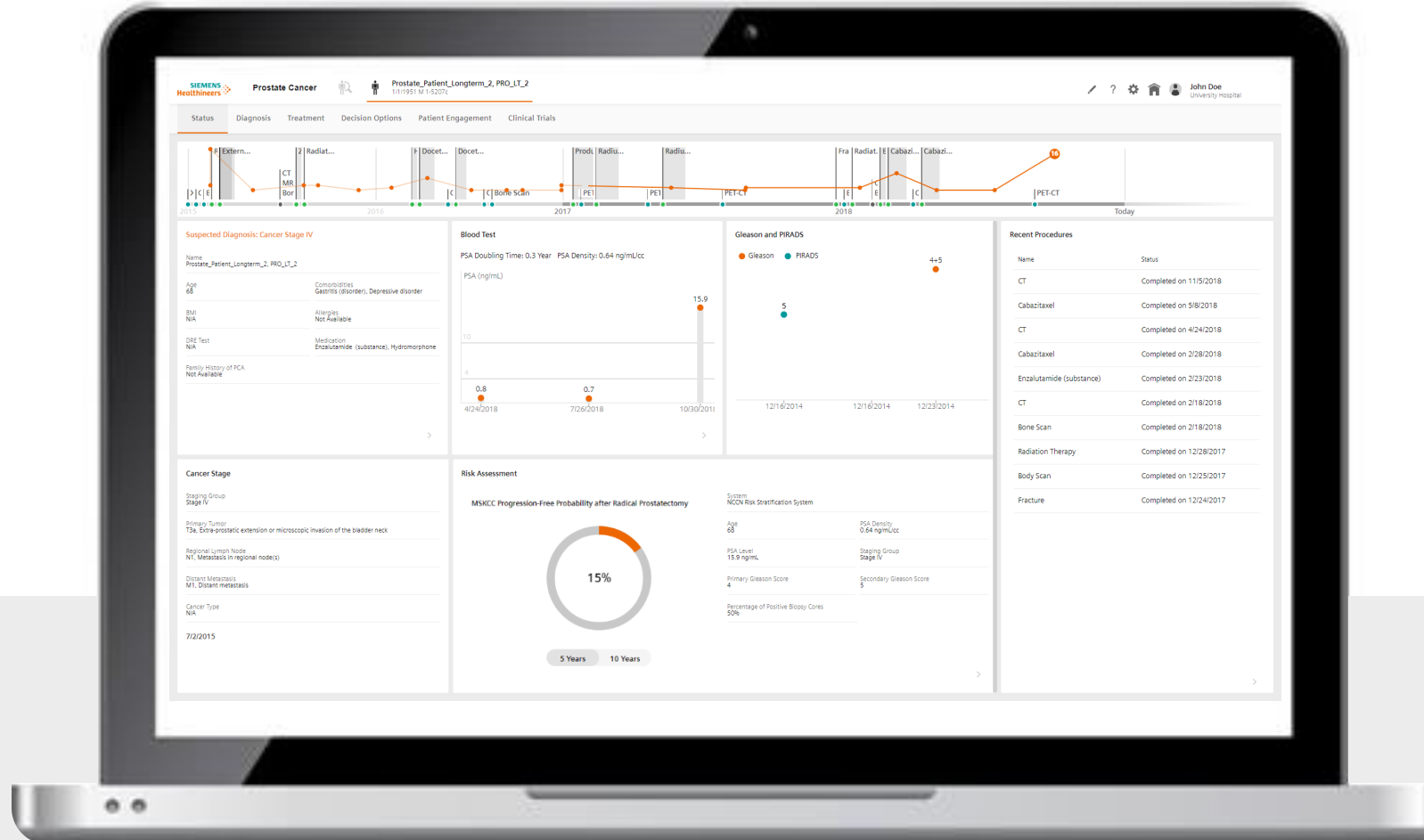
Wir treiben Digitalisierung und KI in einem Stufenmodell

1 — Daten-gewinnung

2 — Daten-interpretation

3 — **Patientenzentrierung**

4 — **Digitaler Zwilling & Patientenkohorten**

Integration, Zugang, Komplexität

GPS – Wo bin ich und was ist der nächste Schritt?

AI Pathway Companion wird "GPS der Medizin"

Prostate Cancer

Prostate_Patient_Longterm_2, PRO_LT_2
1/1/1951 M 1-5207c

John Doe
University Hospital

Status   Diagnosis   Treatment   Decision Options   Patient Engagement   Clinical Trials

Extern...   2 Radiat...   Docet...   Docet...   Prod   Radiu...   Radiu...   Fra Radiat. E Cabazi... Cabazi...   16

CT MR Bor

C Bone Scan   PET   PET   PET-CT   E   C   PET-CT

2016   2017   2018   Today

Suspected Diagnosis: Cancer Stage IV

Name
Prostate_Patient_Longterm_2, PRO_LT_2

Age
68

Comorbidities
Gastritis (disorder), Depressive disorder

BMI
N/A

Allergies
Not Available

DRE Test
N/A

Medication
Enzalutamide (substance), Hydromorphone

Family History of PCA
Not Available

Blood Test

PSA Doubling Time: 0.3 Year   PSA Density: 0.64 ng/mL/cc

PSA (ng/mL)

15.9

10

4

0.8   0.7

4/24/2018   7/26/2018   10/30/2018

Gleason and PIRADS

● Gleason   ● PIRADS

4+5

5

12/16/2014   12/16/2014   12/23/2014

Recent Procedures

Name	Status
CT	Completed on 11/5/2018
Cabazitaxel	Completed on 5/8/2018
CT	Completed on 4/24/2018
Cabazitaxel	Completed on 2/28/2018
Enzalutamide (substance)	Completed on 2/23/2018
CT	Completed on 2/18/2018
Bone Scan	Completed on 2/18/2018
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Body Scan	Completed on 12/25/2017
Fracture	Completed on 12/24/2017

Cancer Stage

Staging Group
Stage IV

Risk Assessment

MSKCC Progression-Free Probability after Radical Prostatectomy

System
NCCN Risk Stratification System

SIEMENS
Healthineers

Prostate Cancer

Prostate_Patient_Longterm_2, PRO_LT_2
1/1/1951 M 1-5207c

John Doe
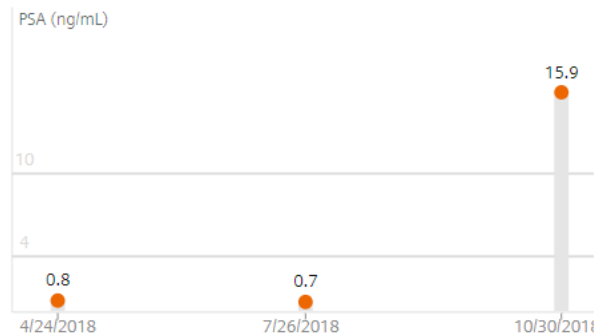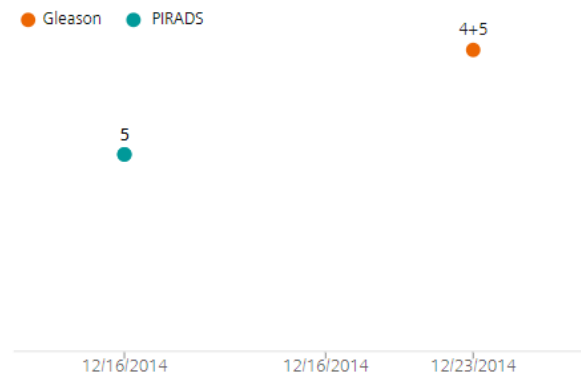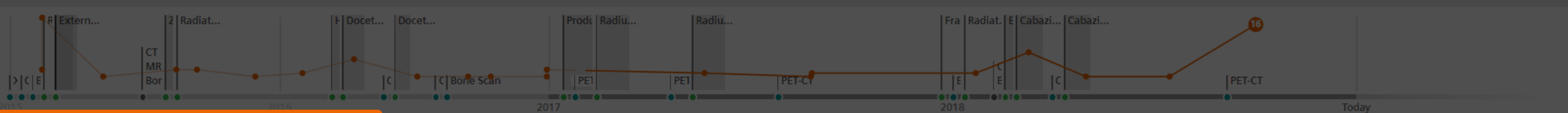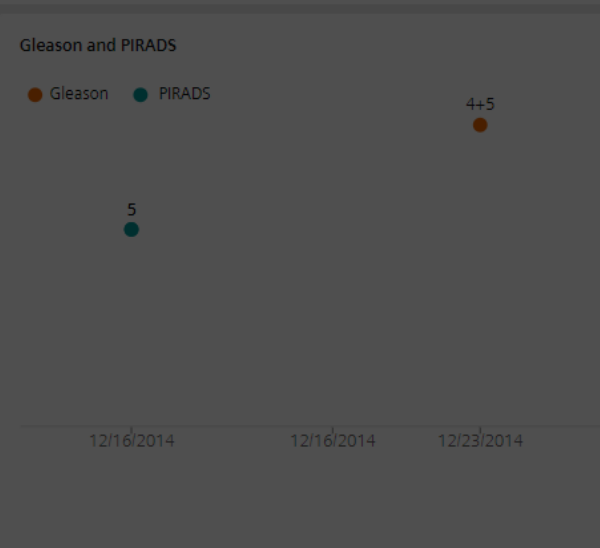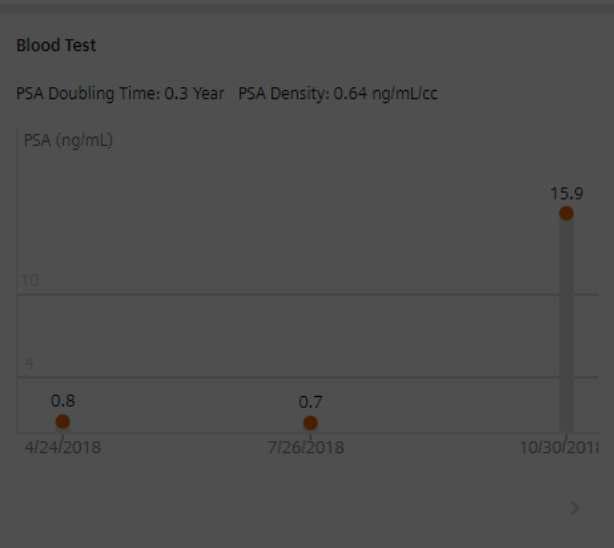University Hospital

Status   Diagnosis   Treatment   Decision Options   Patient Engagement   Clinical Trials

Suspected Diagnosis: Cancer Stage IV

Name
Prostate_Patient_Longterm_2, PRO_LT_2

Age
68

Comorbidities
Gastritis (disorder), Depressive disorder

BMI
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Allergies
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Medication
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Family History of PCA
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7/26/2018

10/30/2018

Gleason and PIRADS

● Gleason   ● PIRADS

4+5

5

12/16/2014   12/16/2014   12/23/2014

Recent Procedures

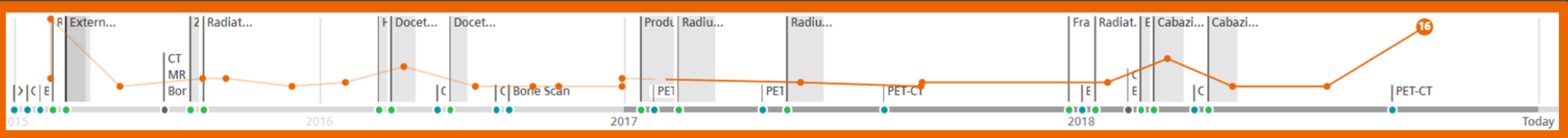| Name	Status
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Enzalutamide (substance)	Completed on 2/23/2018
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Body Scan	Completed on 12/25/2017
Fracture	Completed on 12/24/2017

Cancer Stage

Staging Group
Stage IV

Risk Assessment

MSKCC Progression-Free Probability after Radical Prostatectomy

System
NCCN Risk Stratification System

SIEMENS
Healthineers

Prostate Cancer

Prostate_Patient_Longterm_2, PRO_LT_2
1/1/1951 M 1-5207c

John Doe
University Hospital

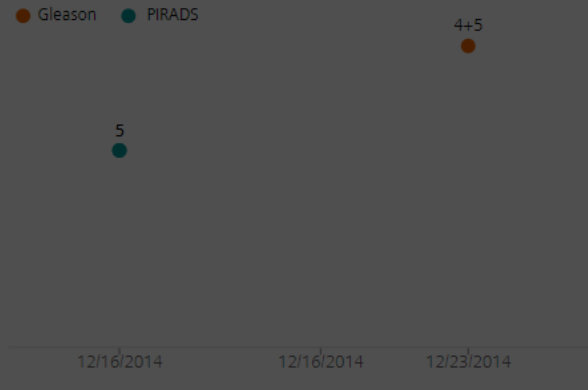Status | Diagnosis | Treatment | Decision Options | Patient Engagement | Clinical Trials

Suspected Diagnosis: Cancer Stage IV

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Blood Test

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0.8   0.7

4/24/2018   7/26/2018   10/30/2018

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Body Scan	Completed on 12/25/2017
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Cancer Stage

Staging Group
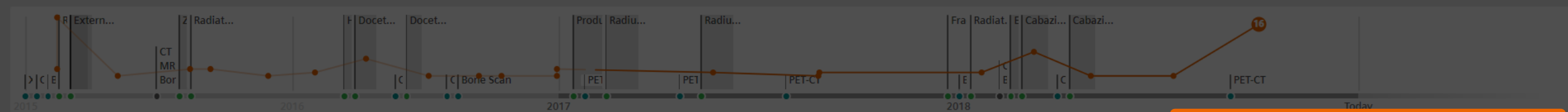Stage IV

Risk Assessment

MSKCC Progression-Free Probability after Radical Prostatectomy
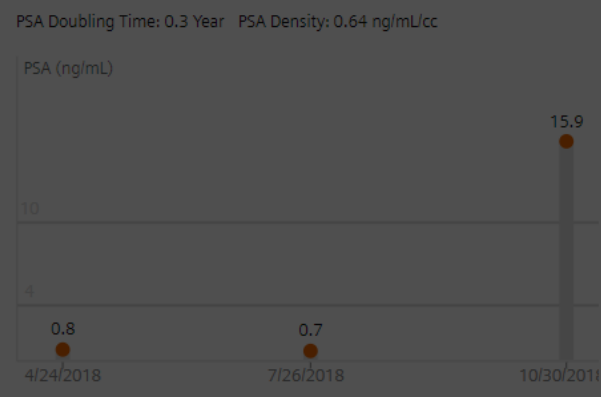
System
NCCN Risk Stratification System

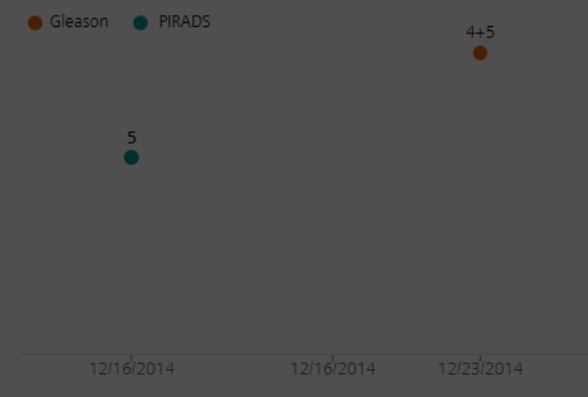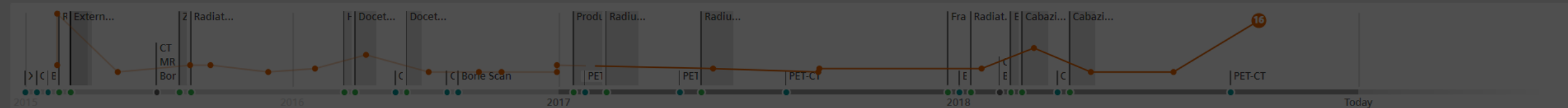Status   Diagnosis   Treatment   Decision Options   Patient Engagement   Clinical Trials

2015   2016   2017   2018   Today

R Extern...   2 Radiat...   F Docet...   Docet...   Produ Radiu...   Radiu...   Fra Radiat. E Cabazi... Cabazi...   16

CT MR Bor   C Bone Scan   PE1   PET   PET-CT   E   E   C   PET-CT

Suspected Diagnosis: Cancer Stage IV
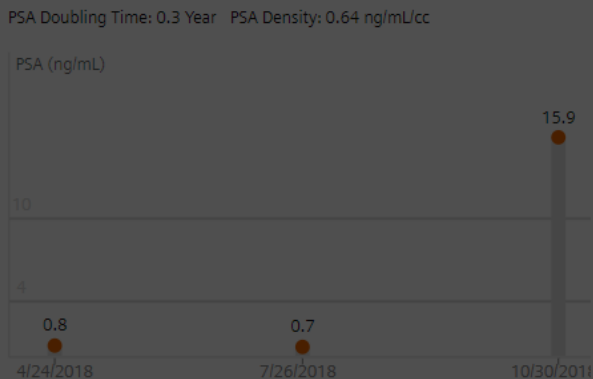
Name
Prostate_Patient_Longterm_2, PRO_LT_2

Age
68

Comorbidities
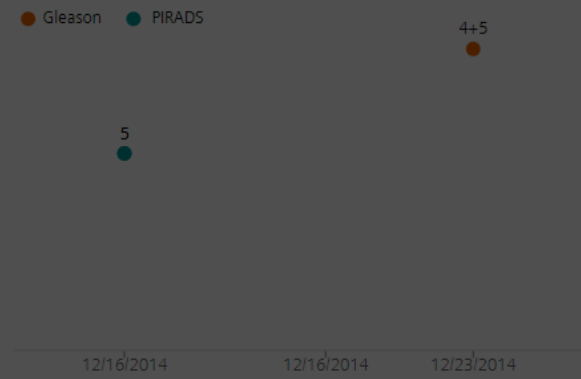Gastritis (disorder), Depressive disorder

BMI
N/A

Allergies
Not Available

DRE Test
N/A

Medication
Enzalutamide (substance), Hydromorphone

Family History of PCA
Not Available

Cancer Stage

Staging Group
Stage IV

Blood Test

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PSA (ng/mL)

15.9

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4/24/2018   7/26/2018   10/30/201

Gleason and PIRADS

● Gleason   ● PIRADS

4+5

5

12/16/2014   12/16/2014   12/23/2014

stem
CN Risk Stratification System

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Risk Assessment

MSKCC Progression-Free Probability after Radical Prostatectomy

15%

5 Years   10 Years

SIEMENS
Healthineers

Prostate Cancer

Prostate_Patient_Longterm_2, PRO_LT_2
1/1/1951 M 1-5207c

John Doe
University Hospital

Status   Diagnosis   Treatment   Decision Options   Patient Engagement   Clinical Trials

2015   2016   2017   2018   Today

Suspected Diagnosis: Cancer Stage IV

Name
Prostate_Patient_Longterm_2, PRO_LT_2

Age   Comorbidities
68   Gastritis (disorder), Depressive disorder

BMI   Allergies
N/A   Not Available

DRE Test   Medication
N/A   Enzalutamide (substance), Hydromorphone

Family History of PCA
Not Available

Blood Test

PSA Doubling Time: 0.3 Year   PSA Density: 0.64 ng/mL/cc

PSA (ng/mL)

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10

4

0.8   0.7
4/24/2018   7/26/2018   10/30/2018

Gleason and PIRADS

● Gleason   ● PIRADS

4+5

5

12/16/2014   12/16/2014   12/23/2014

Recent Procedures

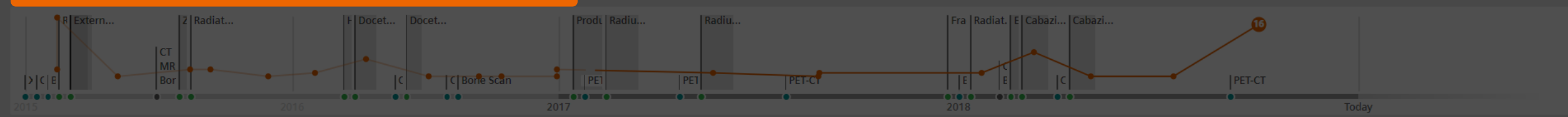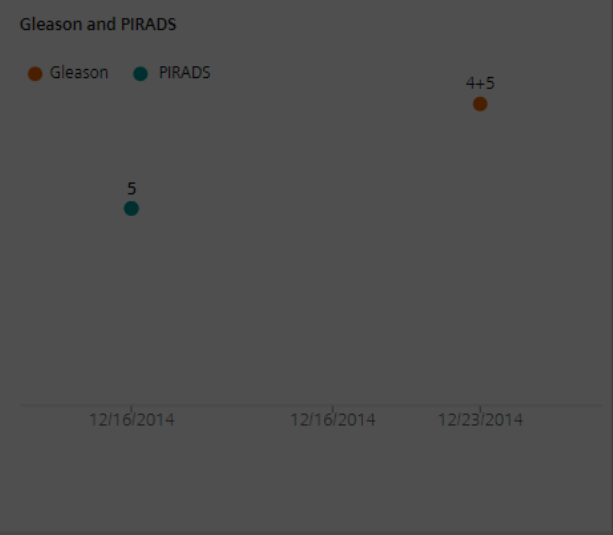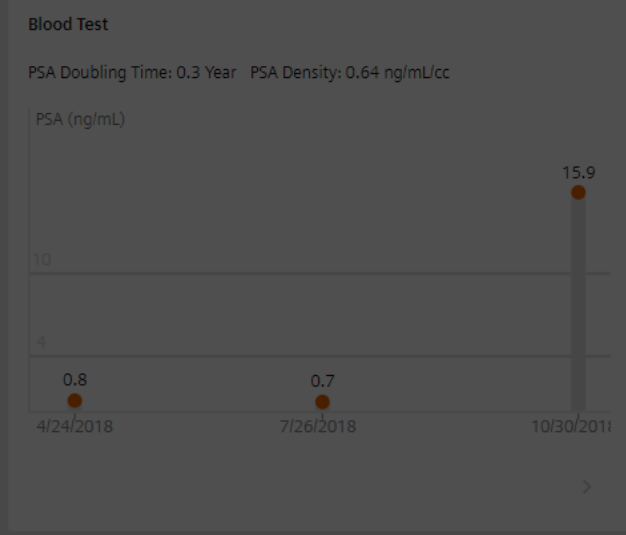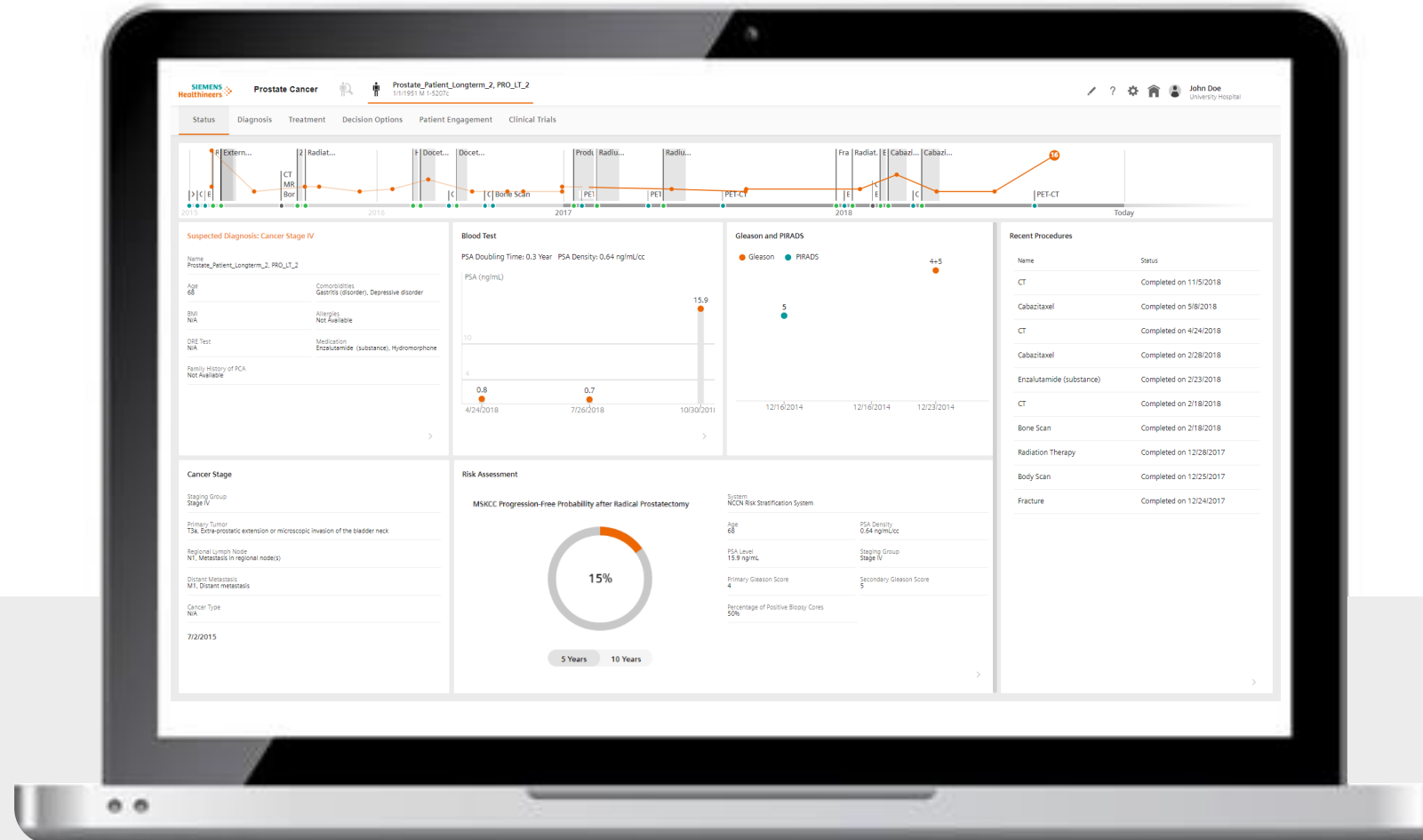| Name	Status
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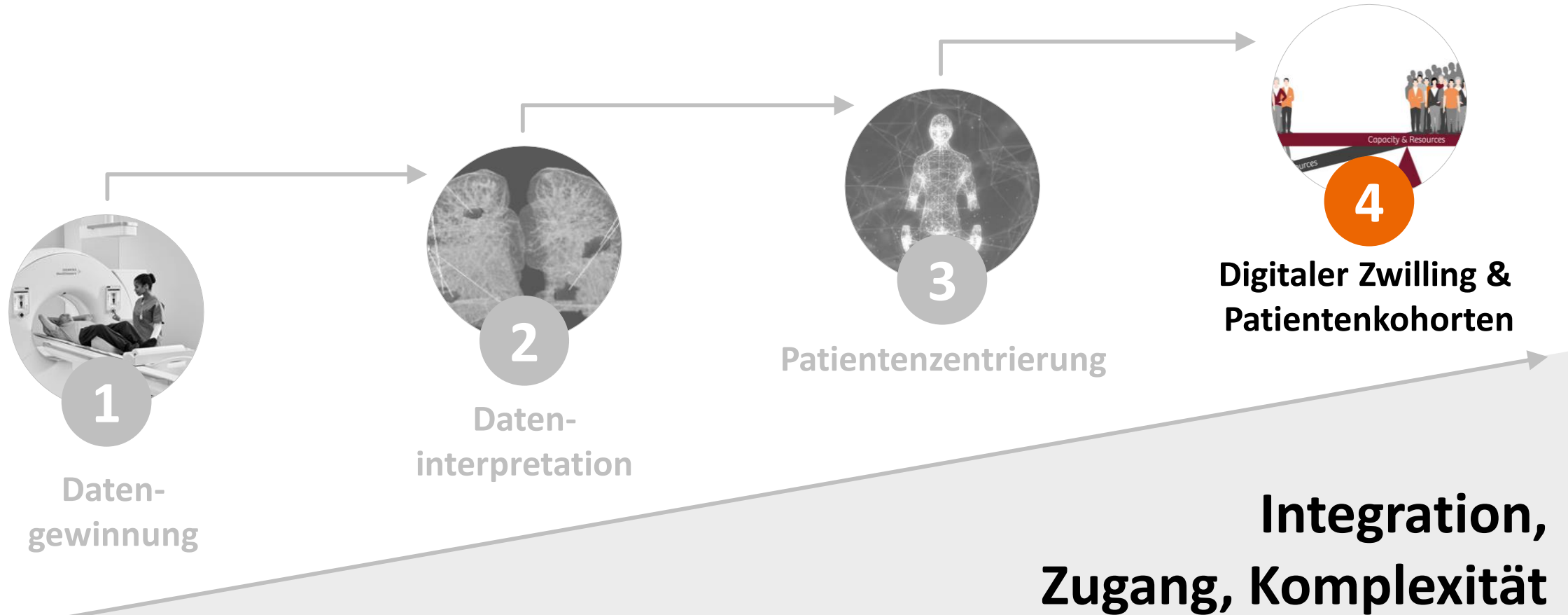## Cancer Stage

Staging Group
Stage IV

Risk Assessment

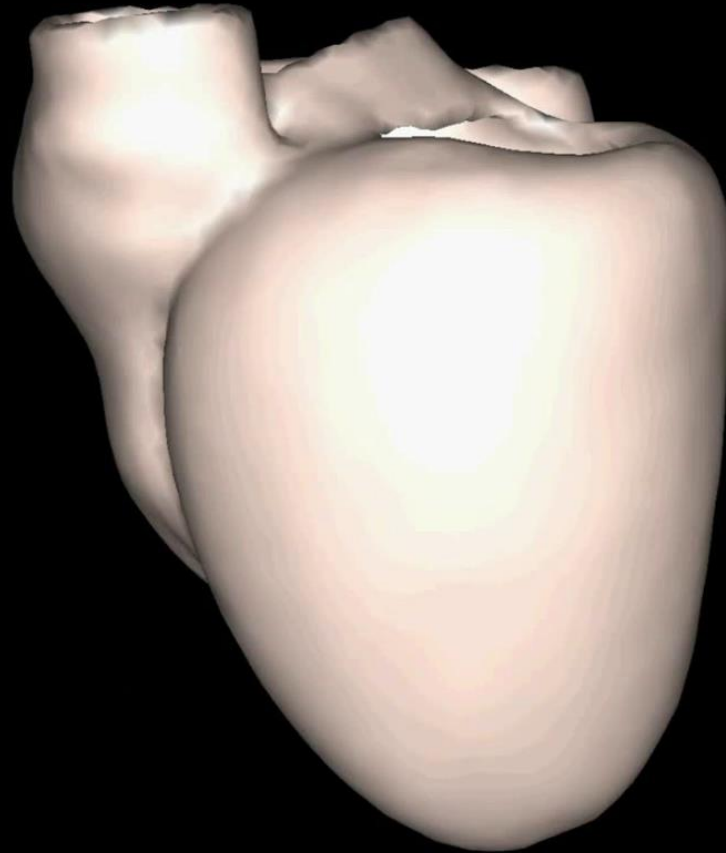MSKCC Progression-Free Probability after Radical Prostatectomy

System
NCCN Risk Stratification System

AI Pathway Companion wird "GPS der Medizin"

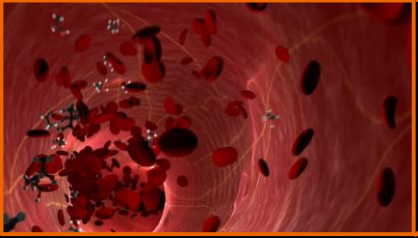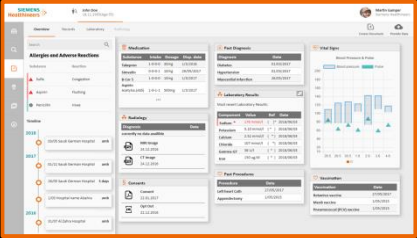# Wir treiben Digitalisierung und KI in einem Stufenmodell

1

Daten-
gewinnung

2

Daten-
interpretation

3

Patientenzentrierung

4

**Digitaler Zwilling &
Patientenkohorten**

Integration,
Zugang, Komplexität

Der Digitale Zwilling hilft, das Herz neu zu begreifen

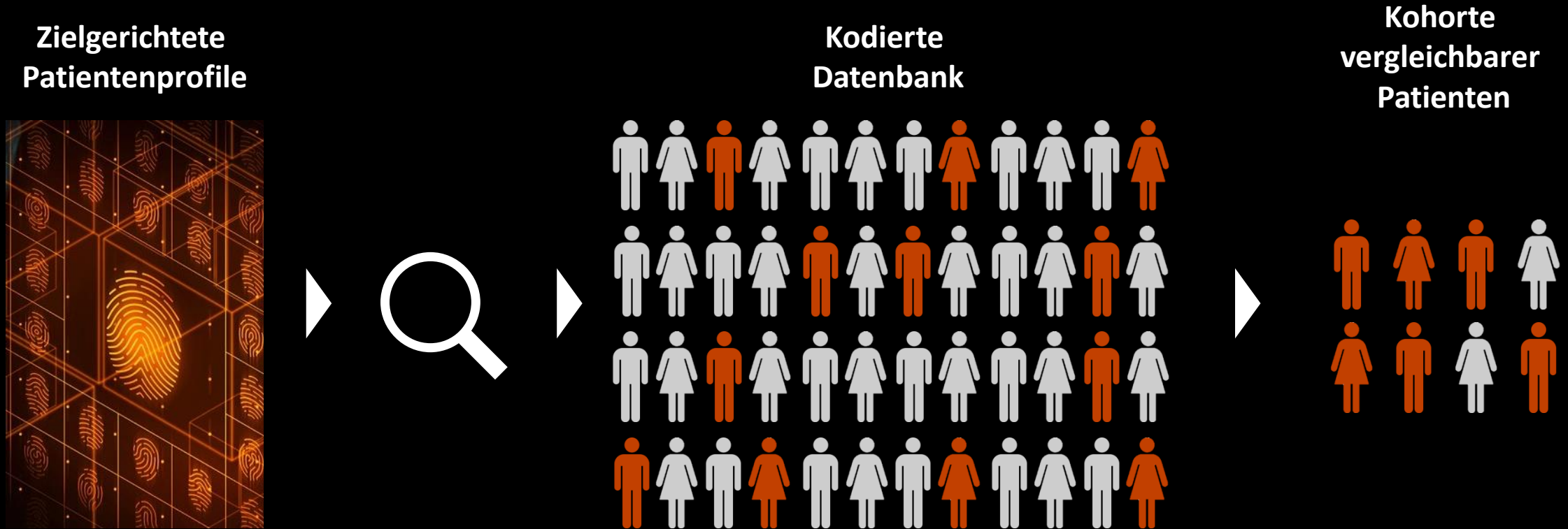|	
QRS duration = 129 ms	QRS duration = –
QT duration = 400 ms	QT duration = –
Electrical axis = -6 deg	Electrical axis = –
LVTAT = 129 ms	LVTAT = –
RVTAT = 96,4 ms	RVTAT = –
VEU = 16 ms	VEU = –

The concept is currently under development and is not for sale. Its future availability cannot be guaranteed

Digitaler Zwilling

DeepReasoner fasst Patienten mit ähnlichen Symptomen in Behandlungskohorten zusammen

Zielgerichtete Patientenprofile

Kodierte Datenbank

Kohorte vergleichbarer Patienten

Wir treiben Digitalisierung und KI in einem Stufenmodell

1 Daten-
gewinnung

2 Daten-
interpretation

3 Patientenzentrierung

4 Digitaler Zwilling &
Patientenkohorten

**Integration,
Zugang, Komplexität**
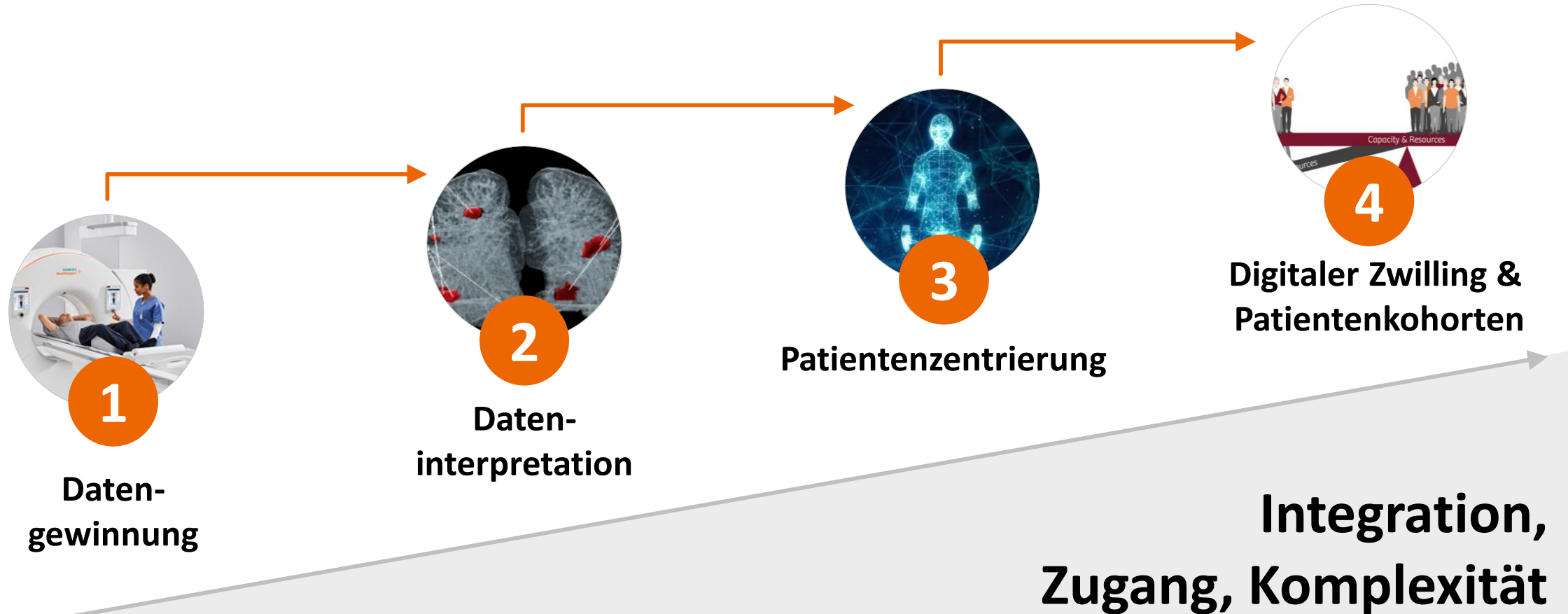
Unsere Chance: Deutschland als Vorreiter für ein modernes, digitales Gesundheitssystem

17,0%

Anteil am Arbeitsmarkt der Gesamtwirtschaft

12,1%

Anteil an der Bruttowertschöpfung der Gesamtwirtschaft

8,4%

Anteil an den gesamten Exporten der Gesamtwirtschaft
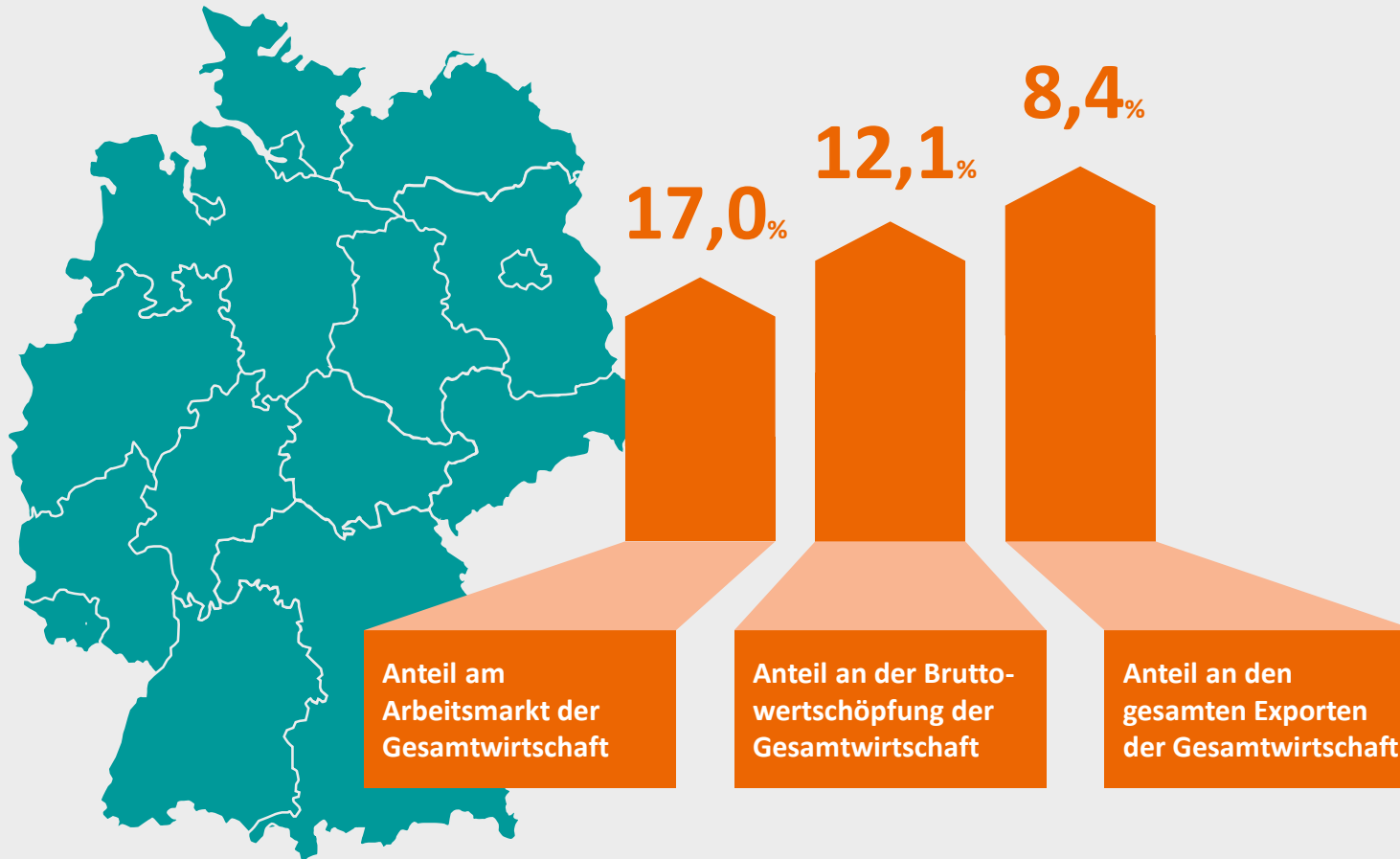
7,6 Mio.
Erwerbstätige

369,8 Mrd. €
Bruttowertschöpfung

131,1 Mrd. €
Exporte

Source: Gesundheitswirtschaft, Fakten& Zahlen, Ausgabe 2018. Ergebnisseder Gesundheitswirtschaftlichen Gesamtrechnung Bundesministerium für Wirtschaft und Energie, März2019.