AI-Rad Companion Organs RT

Automation in Contouring with AI state-of-the-art algorithms

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Image courtesy of Radiologische Allianz Hamburg, Germany

Varian Medical Systems

General Treatment Planning Fair Balance Safety Statement

Intended Use Summary

Varian Medical Systems' linear accelerators are intended to provide stereotactic radiosurgery and precision radiotherapy for lesions, tumors, and conditions anywhere in the body where radiation treatment is indicated.

Important Safety Information

Radiation treatments may cause side effects that can vary depending on the part of the body being treated. The most frequent ones are typically temporary and may include, but are not limited to, irritation to the respiratory, digestive, urinary or reproductive systems, fatigue, nausea, skin irritation, and hair loss. In some patients, they can be severe. Treatment sessions may vary in complexity and time. Radiation treatment is not appropriate for all cancers.

Medical Advice Disclaimer

Varian as a medical device manufacturer cannot and does not recommend specific treatment approaches. Individual treatment results may vary.

Not all products or features available for sale in all markets

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Cancer Affects Everyone
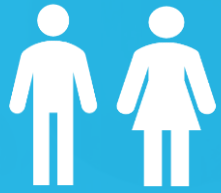
24.6 Million
New Cancer Cases by 2030, >75% increase from 2010

$2 Trillion
Global Economic Burden in 2010

50 - 60%
Cancer Patients Requiring RT

56%
Cancers Diagnosed In High Income Countries

10%
Cancer Patients That Have Access To RT in Low Income Countries

> 20,000*
Linacs needed by 2035; greatest need in low + mid-income countries

*8,700 new machines plus 13,100 replacements = 21,800 additional machines needed Expanding global access to radiotherapy. Lancet Oncol. Vol 16, Sept.2015

We must improve access to cancer care
By 2035, we will need an additional 150,000 skilled RO clinicians

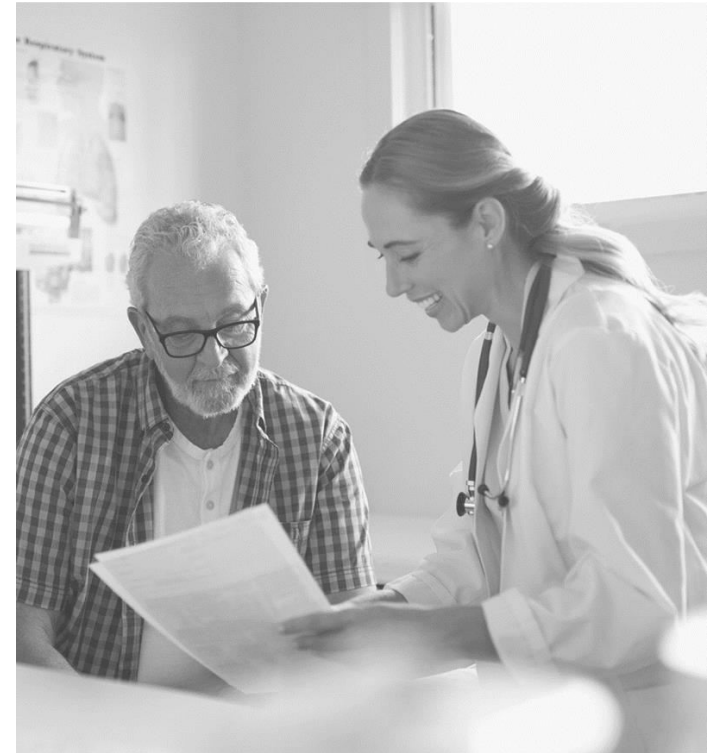| What is Needed		GAP	
Radiation Oncology Centers	7,700	3,200	10,900
Linear Accelerators	13,100	21,800*	21,800
Radiation Oncologists	23,200	22,300	45,500
Medical Physicists	10,000	29,300	39,300
Radiation Technologists	33,300	96,900	130,200

2015 → 2035
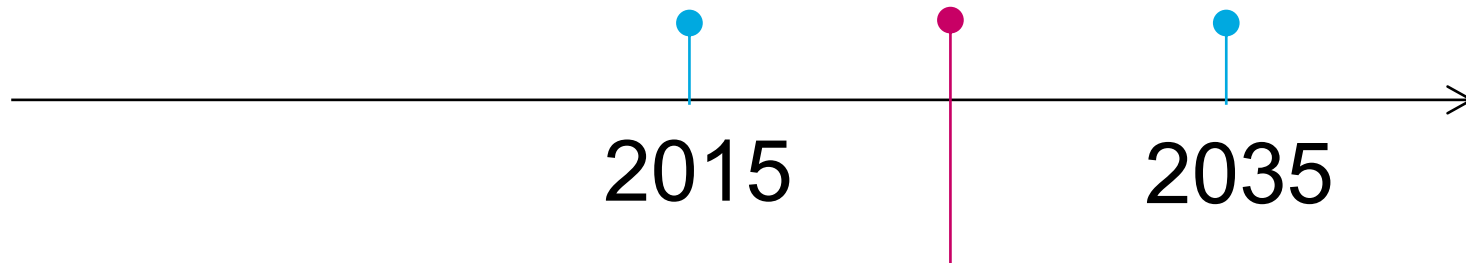
People, AI and data are key to closing the gap

✓ Quality ✓ Efficiency
✓ Simplicity ✓ Automation

Source: Expanding global access to radiotherapy. Lancet Oncol. Vol 16, Sept. 2015
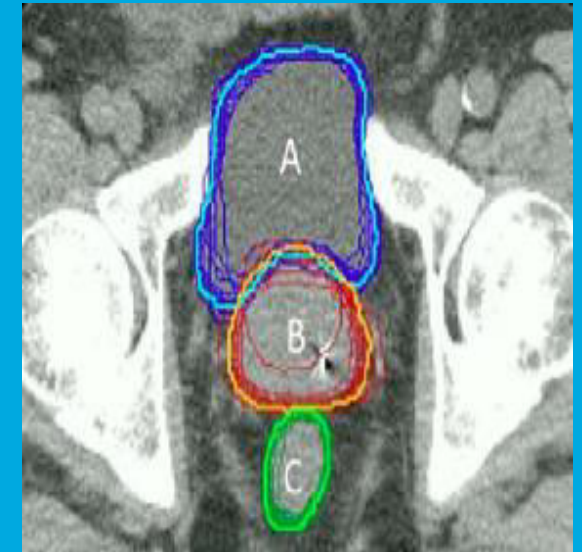* 8,700 new machines + 13,100 replacements = 21,800 machines needed

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Challenges with manual contouring

Personnel costs contribute up to 30% of Radiation Therapy Treatment course/patient [1]

Contouring errors are high risk part of the Radiation Oncology Procedure [2]

OAR Delineation is still one of the largest sources of variability [3]
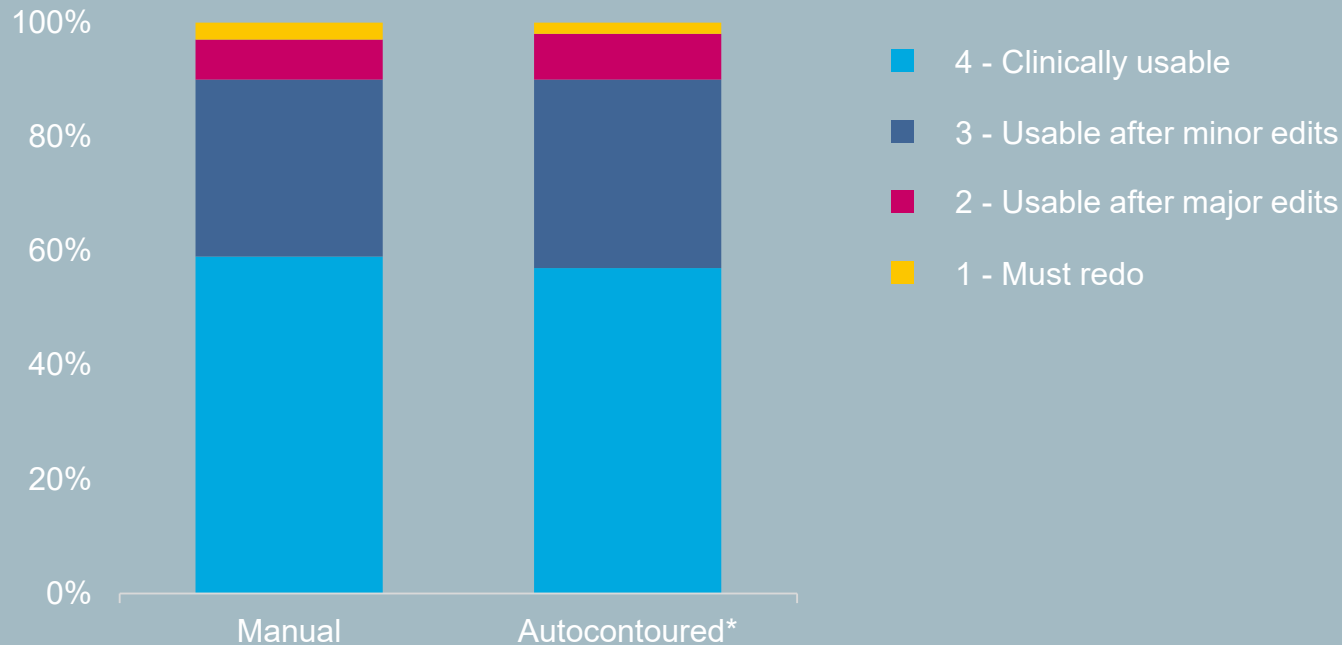
[1] IAEA, *Radiotherapy in Cancer Care: Facing the Global Challenge*, 2017
[2] Radiation Oncology Incident Learning System, *Aggregate Report Patient Safety Work Product,* Q4, 2017
[3] van der Veen J.a,Gulyban A.b,Willems S.c,Maes F.c,Nuyts S. *Interobserver variability in organ at risk delineation in head and neck cancer*, 2021

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Blinded evaluation of auto contouring at Universitätsklinikum Erlangen

Blinded physician rating (%)

- 4 - Clinically usable
- 3 - Usable after minor edits
- 2 - Usable after major edits
- 1 - Must redo

100%
80%
60%
40%
20%
0%

Manual   Autocontoured*

- *The case evaluation was conducted with Organs RT on *syngo*.via RT Image Suite.
- The feedback and the results are from the collaboration performed at UKER
- The statements by Siemens Healthineers' customers described herein are based on results that were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist (e.g., hospital size, case mix, level of IT adoption) there can be no guarantee that other customers will achieve the same results.

"Current **state-of-the art** enables **OAR auto segmentations** that are **on par with human experts**"

"Important **prerequisite** to **automate** and **accelerate RT planning workflow** by **multiple orders of magnitude (Adaptive Radiotherapy/plan of the day)**"
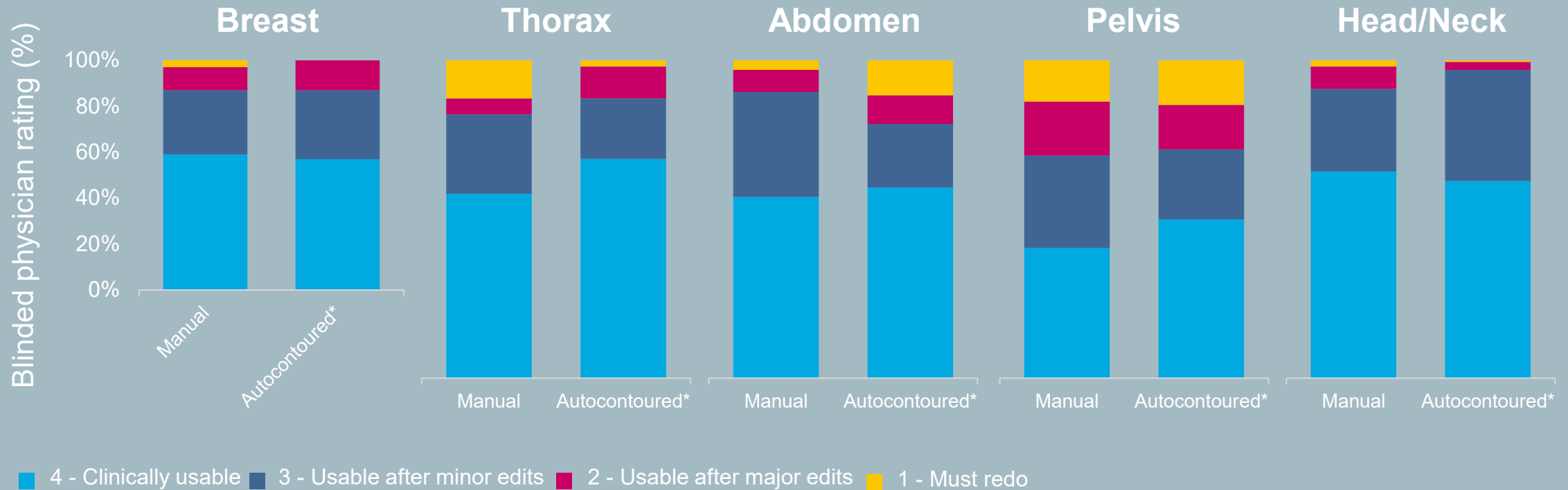
Dr. Florian Putz
Physicist, Radiation Oncology
Universitätsklinikum Erlangen,
Germany

Study details:

Clinical evaluation of 50 CT datasets for 5 sites with each 10 cases.

3 RT physicians (one Senior Physician, two Physicians) rated auto contouring solutions & peers (each other).
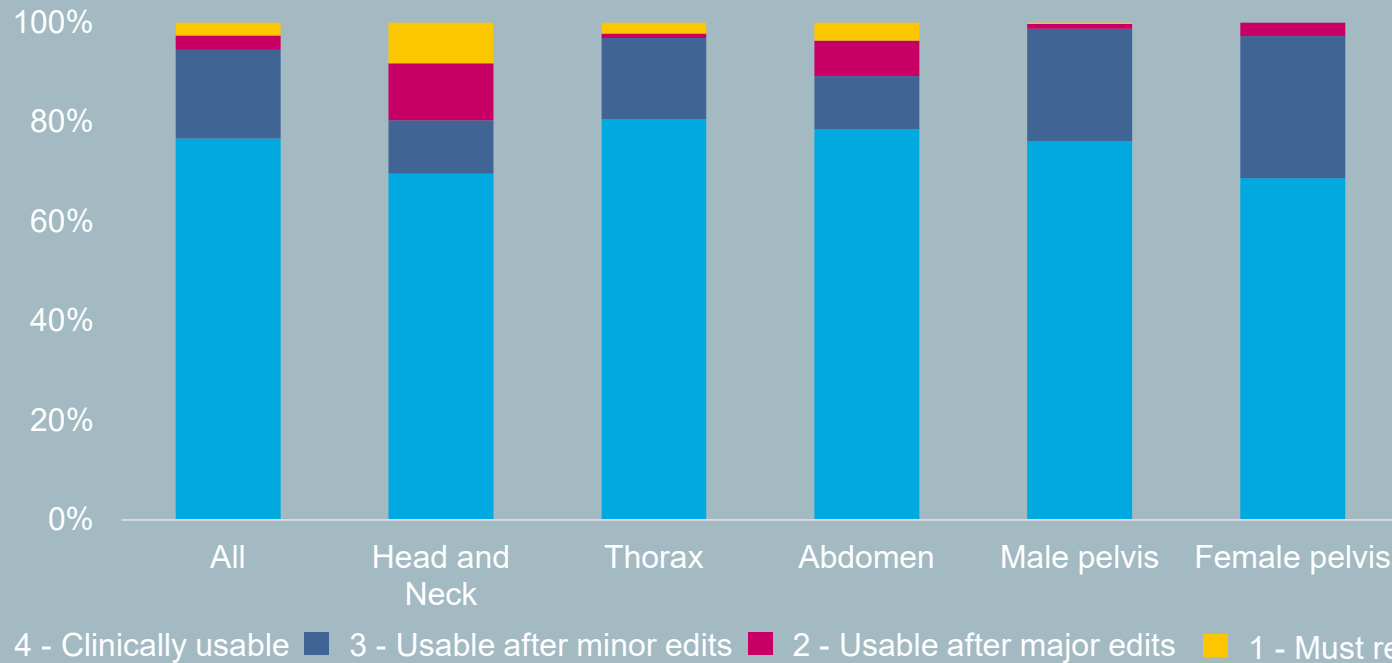
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Blinded evaluation of auto contouring at Universitätsklinikum Erlangen (continued)

Breast, Thorax, Abdomen, Pelvis, Head/Neck — Blinded physician rating (%): Manual vs Autocontoured*

Legend:
- 4 - Clinically usable
- 3 - Usable after minor edits
- 2 - Usable after major edits
- 1 - Must redo

- *The case evaluation was conducted with Organs RT on *syngo*.via RT Image Suite.
- The feedback and the results are from the collaboration performed at UKER.
- The statements by Siemens Healthineers' customers described herein are based on results that were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist (e.g., hospital size, case mix, level of IT adoption) there can be no guarantee that other customers will achieve the same results.

Evaluation of autocontouring at Centre de Cancérologie du Grand Montpellier

Blinded physician rating (%)

4 - Clinically usable ■ **3 - Usable after minor edits** ■ **2 - Usable after major edits** ■ **1 - Must redo**

77% of contours are **clinically usable without requiring any edits.**

95% of the contours can be used with or without minor edits.
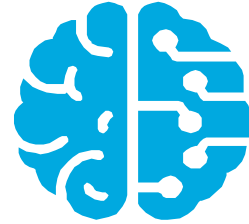
Study details:

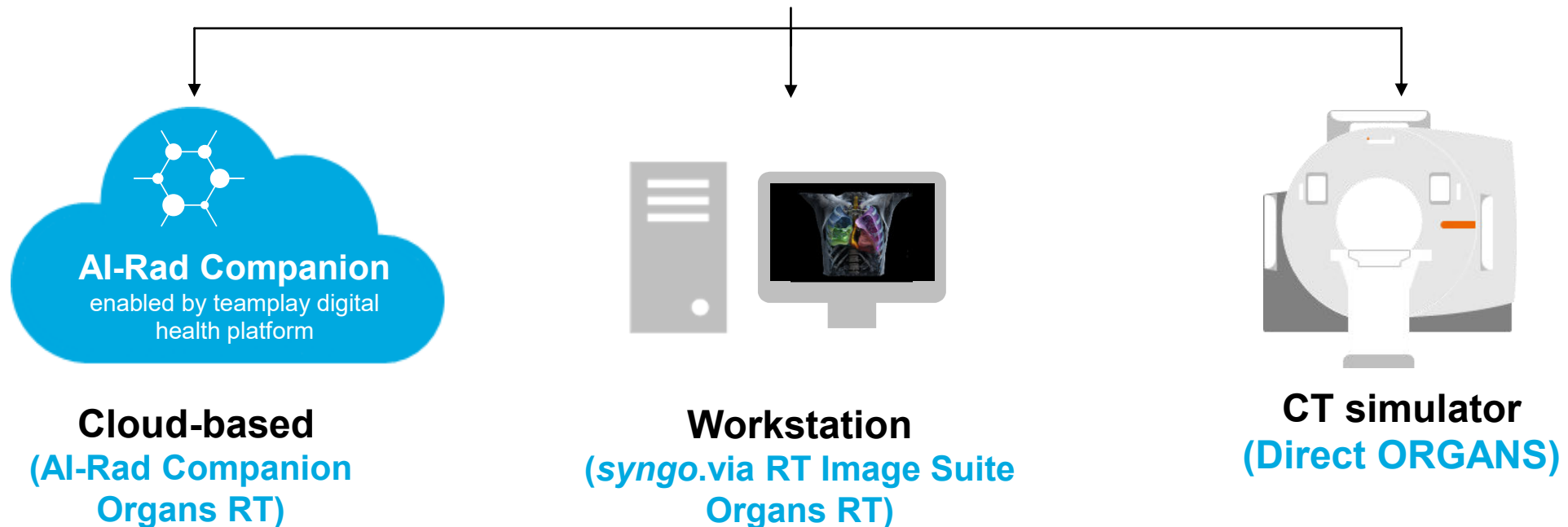55 CT datasets[1] of contours automatically generated by AI-Rad Companion Organs RT

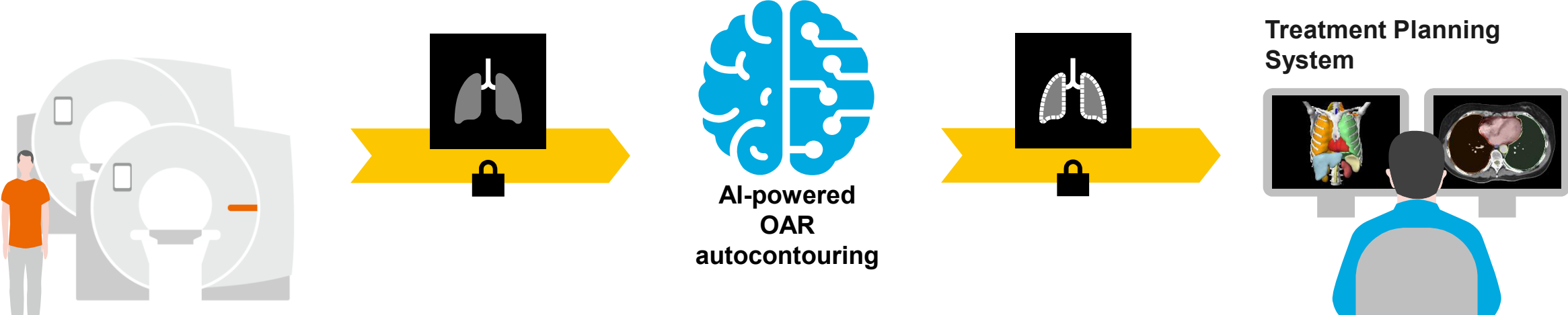Contour quality evaluated by 2 board certified clinicians (a physician and a physicist)

- 1) Head & Neck (6 datasets), Thorax (25 datasets), Abdomen (2 datasets), Male Pelvis (17 datasets) and Female Pelvis (5 datasets).
- The feedback and the results are from the collaboration performed at CCGM.
- The statements by Siemens Healthineers' customers described herein are based on results that were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist (e.g., hospital size, case mix, level of IT adoption) there can be no guarantee that other customers will achieve the same results.

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AI-powered auto contouring deployment

A solution for every customer

**AI-powered
OAR auto-segmentation**

Cloud-based
**(AI-Rad Companion
Organs RT)**

Workstation
**(*syngo*.via RT Image Suite
Organs RT)**

CT simulator
(Direct ORGANS)

Fully automated, streamlined workflow

AI-powered OAR autocontouring

Treatment Planning System

Designed to Achieve

Efficiency   **Consistency**   **Accessibility**
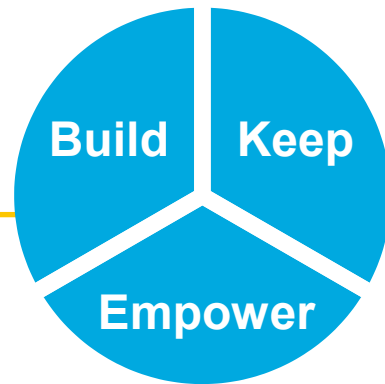
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Security and Data Privacy

We develop solutions according to the **"Privacy by design and by default"** principle to ensure built-in data protection

We keep your data protected with **centrally managed service operations** for up-to-date software

Build | **Keep**

Empower

We empower you to protect your data by **setting your data preferences accordingly**

Important for IT customers

EuroPriSe[1] seal (GDPR)

ISO27001[2] certified

**HIPAA** compliance support

[1] teamplay with its core apps Dose, Usage, Protocols, and Images/Images Research has been awarded by EuroPriSe (https://www.european-privacy-seal.eu/EPS-en/siemens-healthcare-teamplay)

[2] The teamplay performance management applications & platform are developed and operated in accordance with an Information Security Management System that was certified for ISO 27001
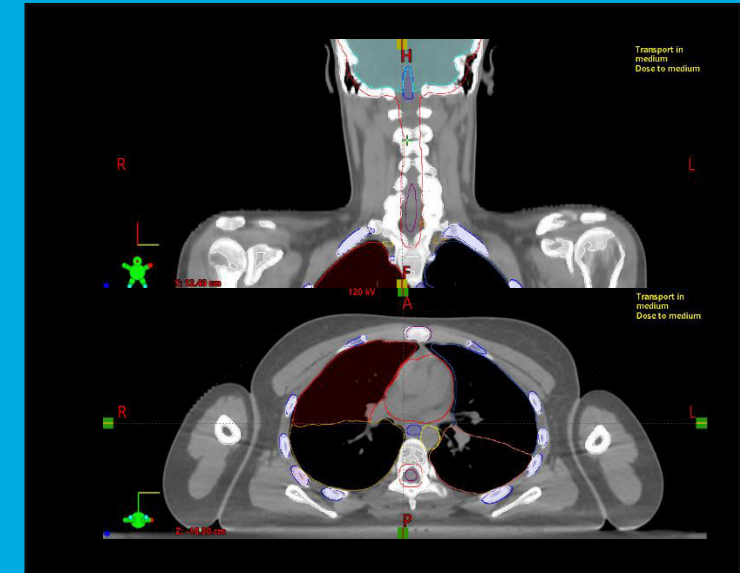
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Value of AI-based autocontouring solutions
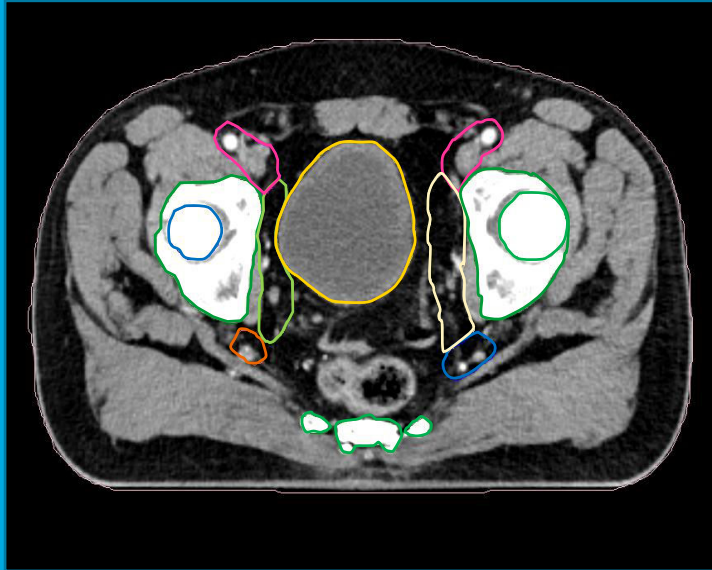
Deep learning-trained OAR
contouring designed
to increase efficiency and
consistency

Improved workflow efficiency
which frees up resources for
other planning tasks

Seamless integration into the
daily treatment planning
workflow

- Courtesy of University Hospital Erlangen, Germany (left image). Eclipse version 17.0 was used to display the auto contouring results (right image).
- Courtesy of Radiologische Allianz Hamburg, Germany (Rendering). Rendering is based on research results that are not commercially available. Future availability cannot be guaranteed.
- The term autocontouring in the context of this presentation means automated contouring of organs-at-risk structures.
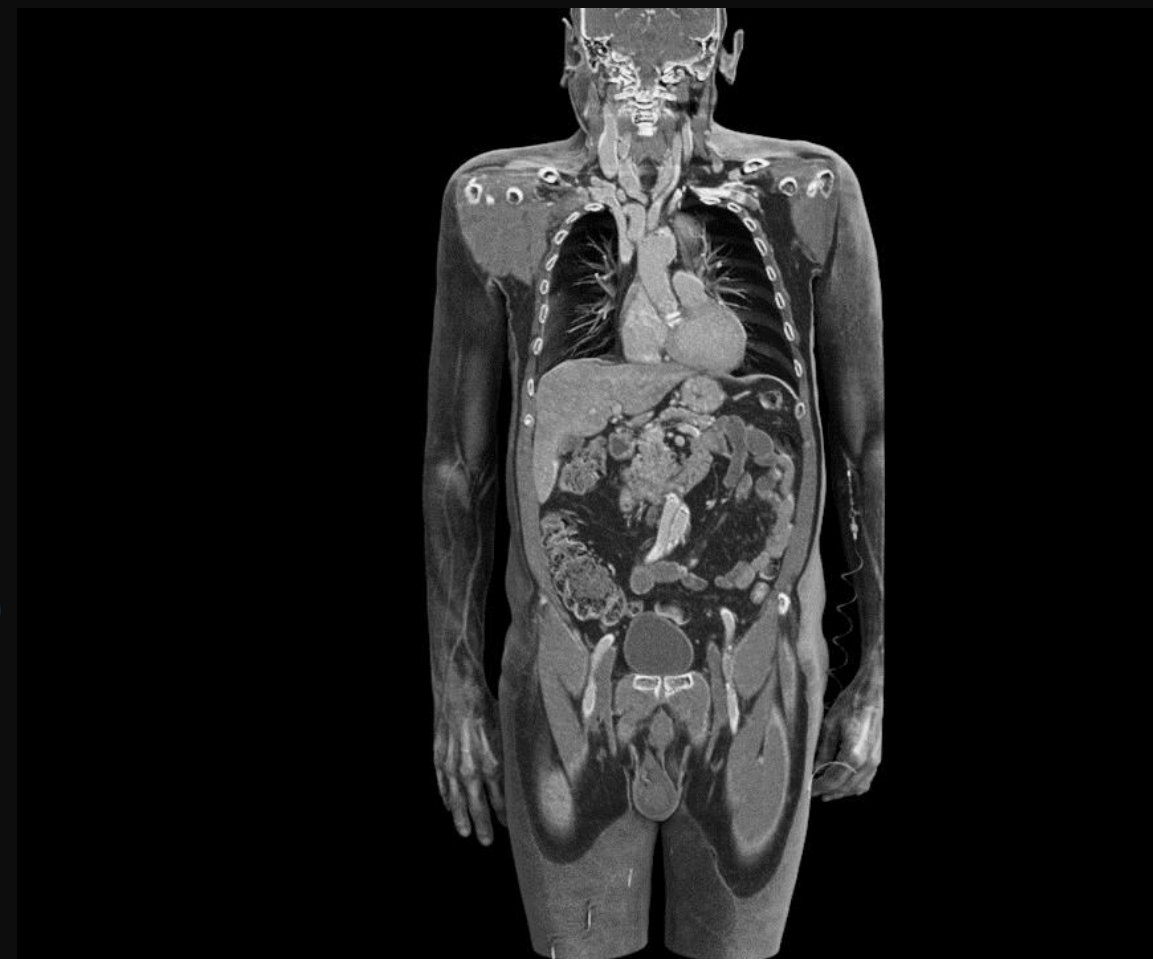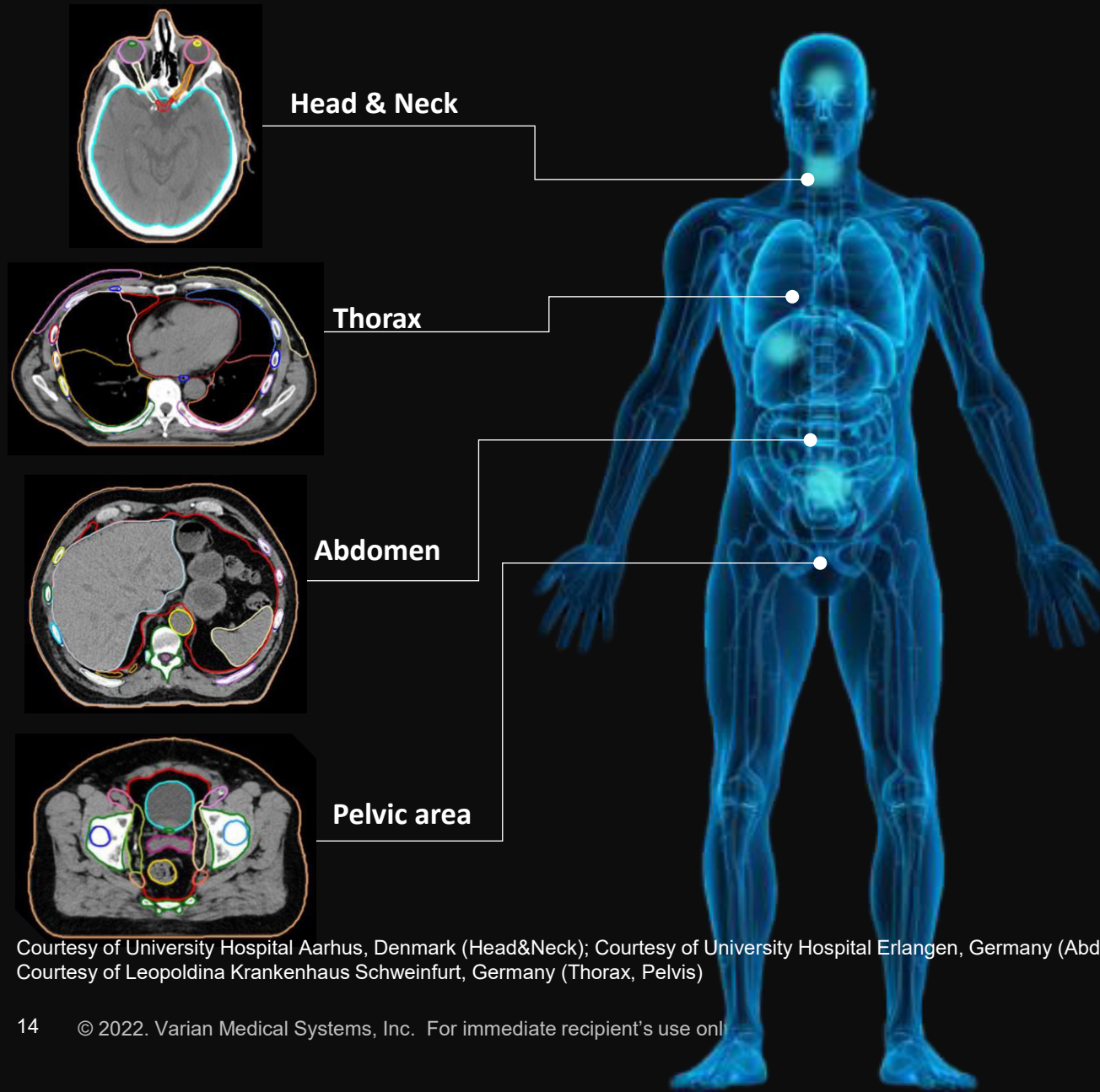
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OAR auto contouring supported anatomical sites

Head & Neck

Thorax

Abdomen

Pelvic area

Courtesy of University Hospital Aarhus, Denmark (Head&Neck); Courtesy of University Hospital Erlangen, Germany (Abdomen, 3D Rendering);
Courtesy of Leopoldina Krankenhaus Schweinfurt, Germany (Thorax, Pelvis)

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OAR auto contouring supported anatomical sites

Deep-learning based autocontouring

Head & Neck

- Brain
- Brainstem
- Eye globe (L/R)
- Lens (L/R)
- Optic nerve (L/R)
- Optic chiasm
- Parotid gland (L/R)
- Submandibular gland (L/R)
- Oral cavity
- Mandible
- Lips
- Larynx
- Glottis
- Supraglottic larynx (L/R)
- Brachial plexus (L/R)
- LN H&N 510K pending

Thorax

- Female breasts (L/R)
- Lung (L/R)
- Lung lobes (RI, RM, RS, LI, LS)
- Whole heart
- Heart chambers (LL, UL, LR, MR)[1]
- Endocardium[1]
- Aorta
- Individual ribs (24 ribs)
- Sternum

Abdomen

- Liver
- Spleen
- Kidneys (L/R)
- Abdominopelvic cavity

Pelvic area

- Bladder
- Prostate
- Rectum
- Proximal femur (L/R)
- Seminal vesicles
- LN common iliac (L/R)
- LN internal iliac (L/R)
- LN external iliac (L/R)
- LN obturator (L/R)
- LN presacral

Multi-site

- Body contours
- Spinal cord
- Esophagus
- Skeleton

Courtesy of University Hospital Aarhus, Denmark (Head&Neck); Courtesy of University Hospital Erlangen, Germany (Abdomen, 3D Rendering);
Courtesy of Leopoldina Krankenhaus Schweinfurt, Germany (Thorax, Pelvis)
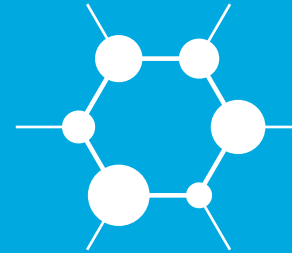1) Heart chambers and endocardium are model-based and not available with AI-Rad Companion Organs RT.

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Advantages of AI-Rad Companion Organs RT

Powerful platform combined with long-term experience in Artificial Intelligence

More than **1.1 billion clinical images** as well as **reports, clinical and genomic data**
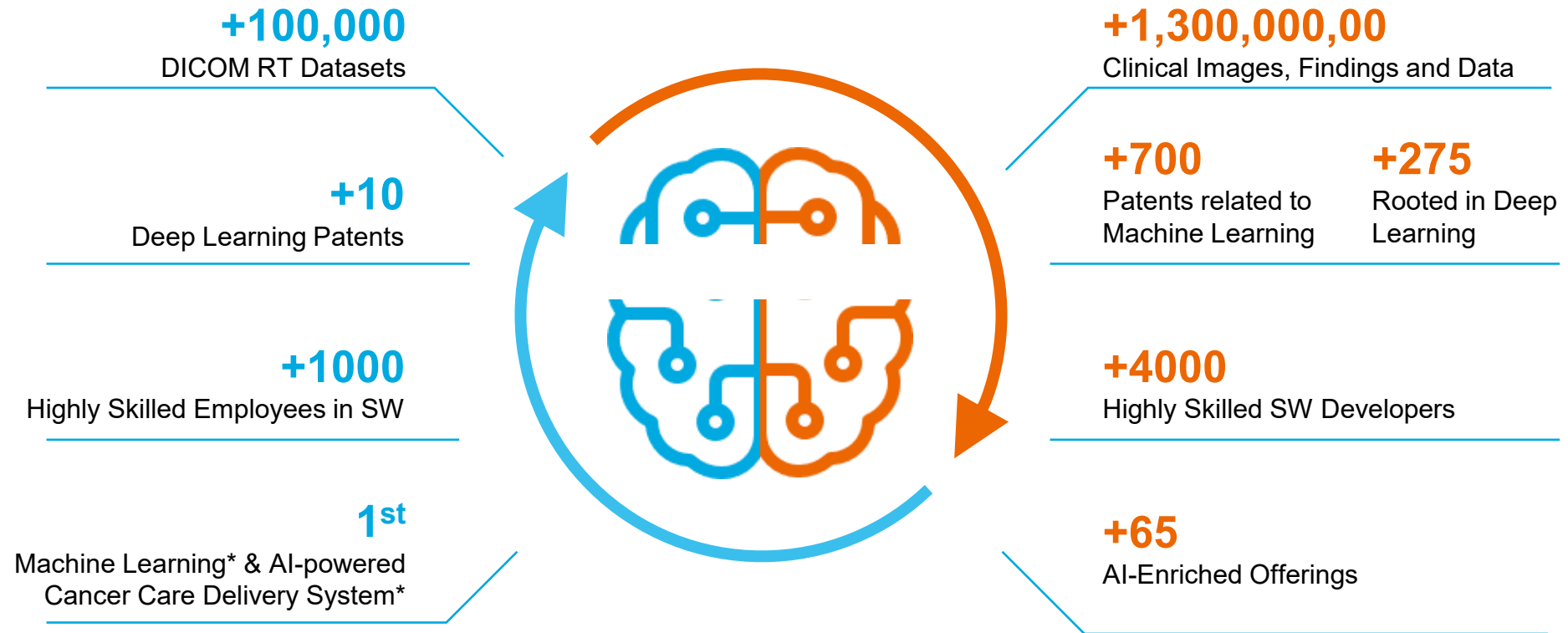
1,100,000,000

Worldwide super-computing infrastructure with **700 AI experiments per day**

More than 650 patent families related to machine learning and **more than 250 patent families** related to deep learning

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Together we are stronger!

A World Without Fear Of Cancer

+100,000
DICOM RT Datasets

+10
Deep Learning Patents

+1000
Highly Skilled Employees in SW

1st
Machine Learning* & AI-powered
Cancer Care Delivery System*

+1,300,000,00
Clinical Images, Findings and Data

+700
Patents related to
Machine Learning

+275
Rooted in Deep
Learning

+4000
Highly Skilled SW Developers

+65
AI-Enriched Offerings

Data on file Varian Medical Systems, Inc 07/2021

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Eclipse

Velocity · **AI-Rad Companion Organs RT** · **Scripting API** · **RapidPlan** · **MCO** · **GPU** · **ePeer Review** · **HyperArc**

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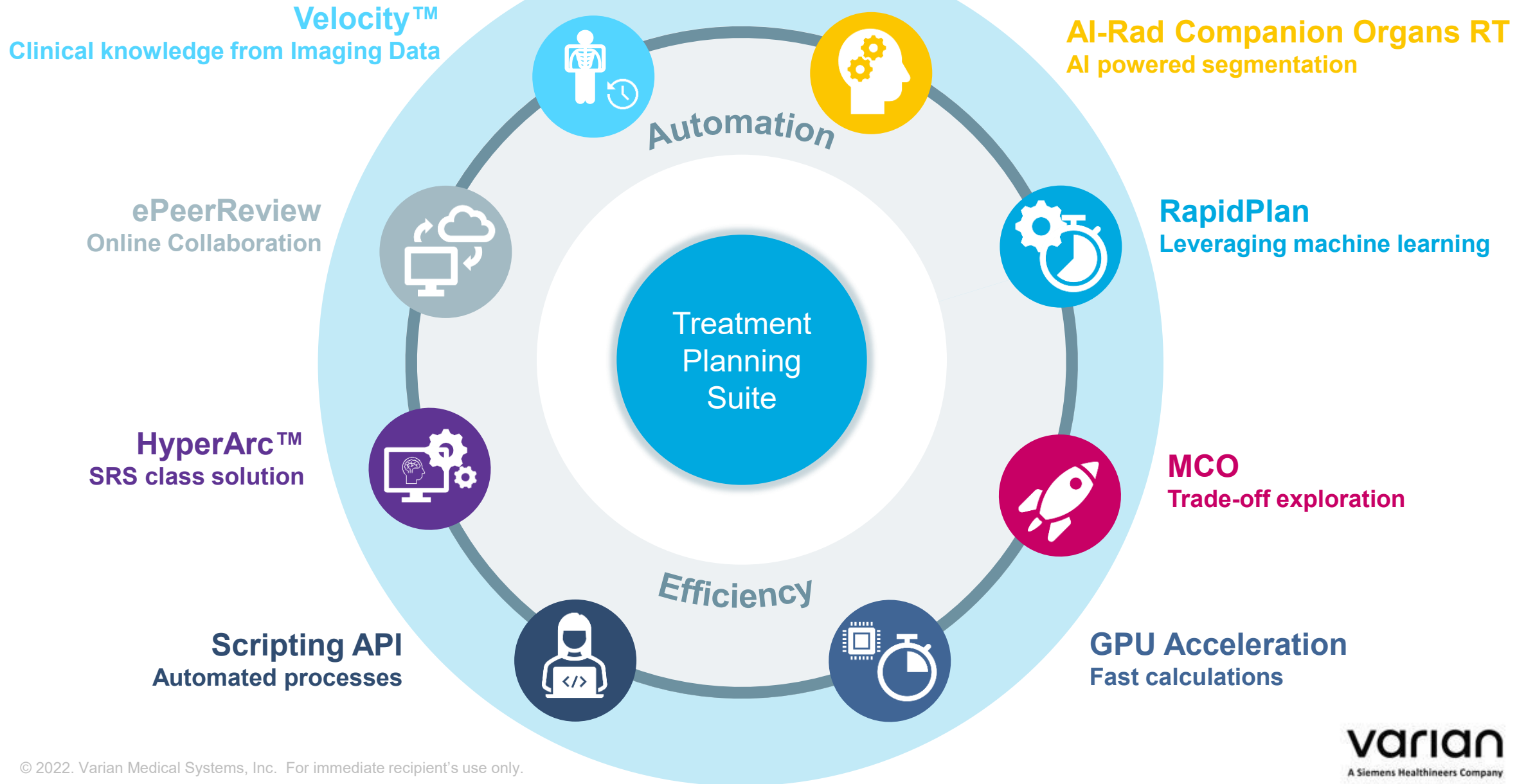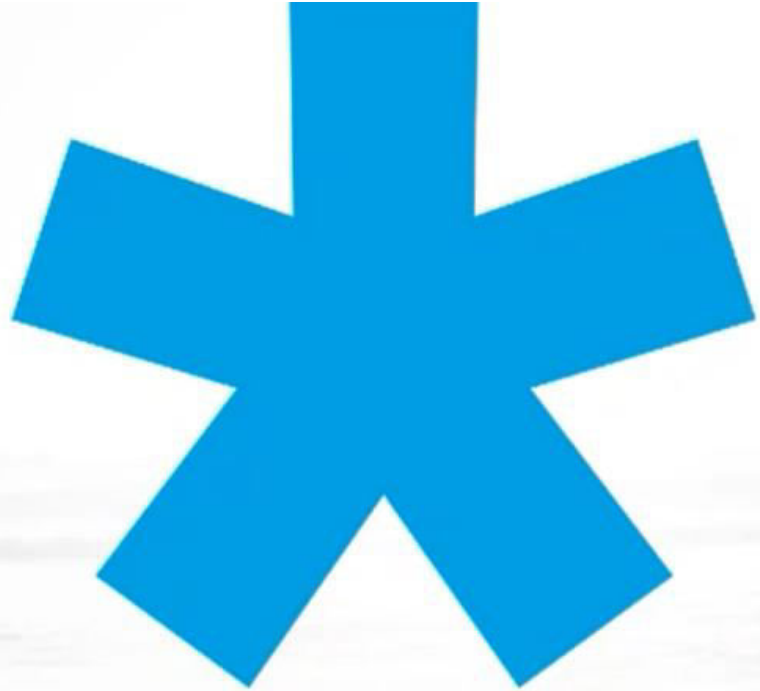
A World Without
Fear of Cancer

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