varian
A Siemens Healthineers Company

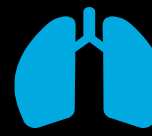
Artificial Inteligence

Ethos and Eclipse developements

Jornadas Inteligencia Artificial Aplicada a la Física Médica
Sociedad Andaluza de Física Médica

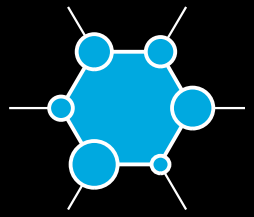
Miguel Rodriguez Checa | Senior Manager, Digital Oncology Sales Europe

Powerful combination with long-term experience in Artificial Intelligence



1,200,000,000

More than **1.2 billion clinical images** as well as **reports, clinical and genomic data**



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

Data on file. Status: November 2021

Ethos treatment therapy

First AI driven linear accelerator

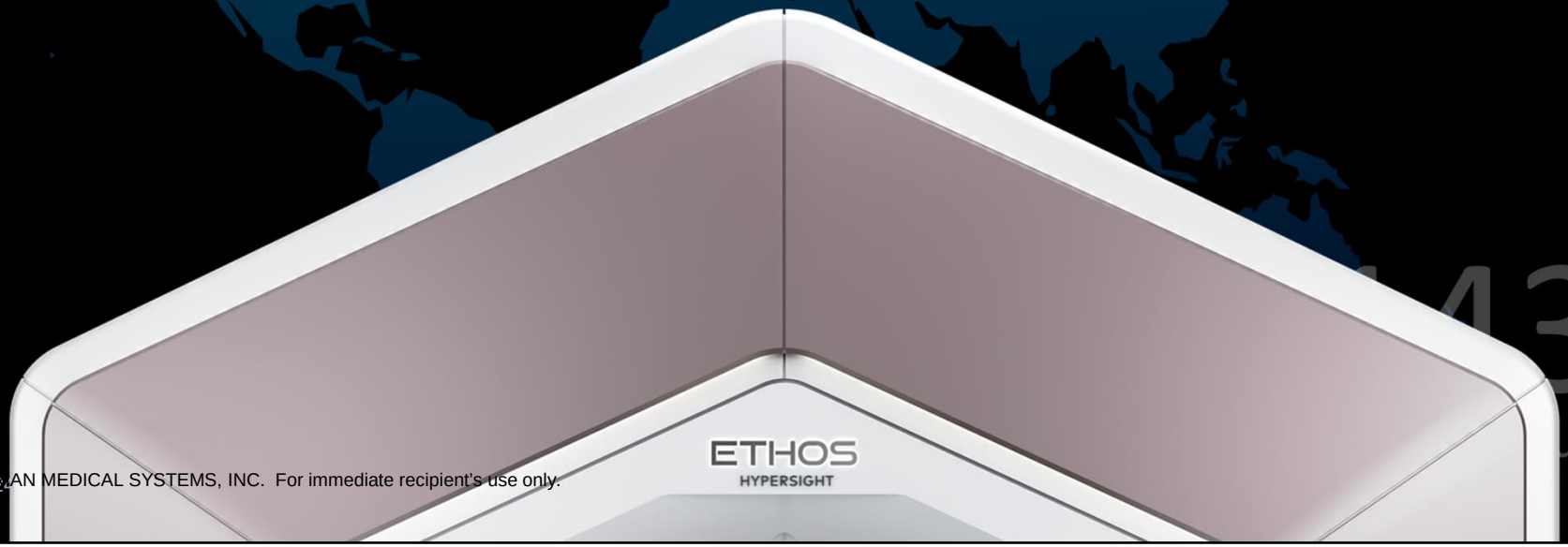
NEW
ETHOS 2.0

(un) conventional

PERSONALIZATION • PERFORMANCE • CONFIDENCE

5k+
Clinics

43+
untries

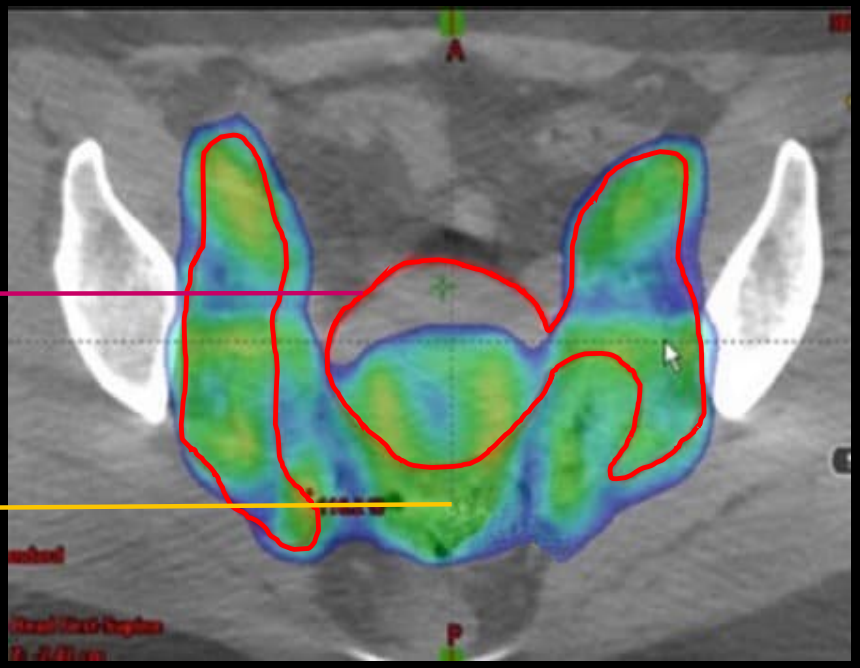


Why do we need to adapt?

What does the treatment look like today with IGRT?

CTV “of the day”

Reference Rx dose on CBCT of the day



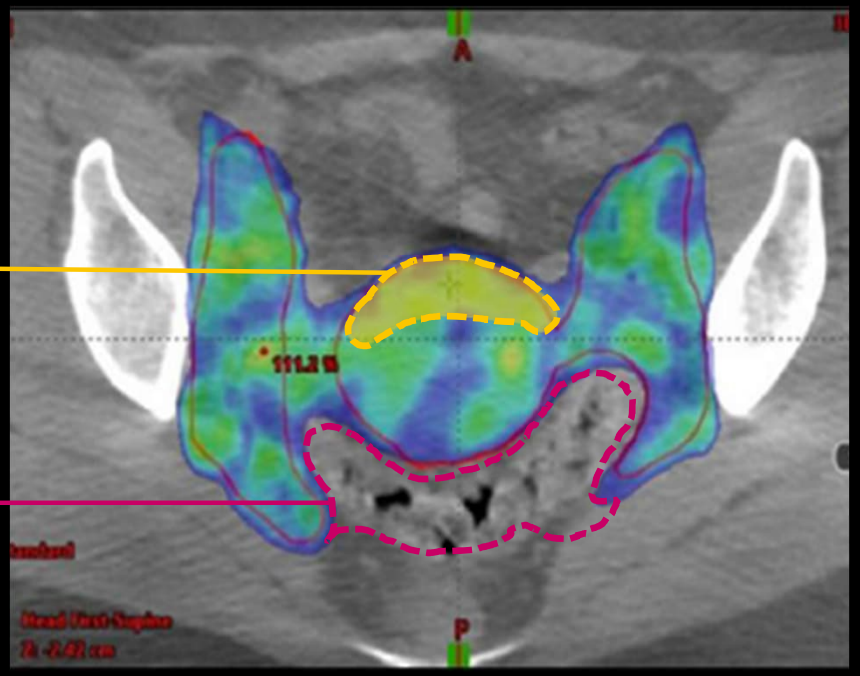
Actual dose delivered by IGRT

Images courtesy of UCSD

Benefits of selecting the adapted plan

Target Coverage
Improved target coverage and more homogeneous dose

Dose Spared
Reduced dose outside of CTV of the day



CBCT-based adapted plan

Images courtesy of UCSD

Ethos therapy solution

NEW ETHOS 2.0

An integrated suite of solutions for the entire adaptive journey

AI-driven Technology & Guided Workflow

For efficient oART – 15-minute adaptive steps *

*Ethos online adaptive steps includes image review, structure review, target review and plan review

Treatment Technique Flexibility

Choose between adaptive radiotherapy or sliding window IMRT/ VMAT

HyperSight CBCT Images and Adaptation

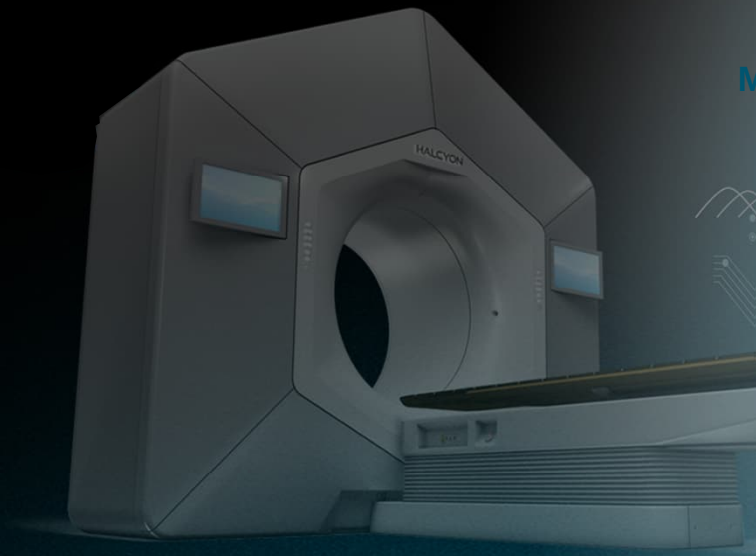
To visualize more and adapt directly on today's anatomy

varian
A Siemens Healthineers Company

HyperSight

Next generation CBCT

HYPERSIGHT



6-second Imaging

Metal Artifact Reduction

High soft tissue contrast

Reduced Imaging Dose

Correct HU values

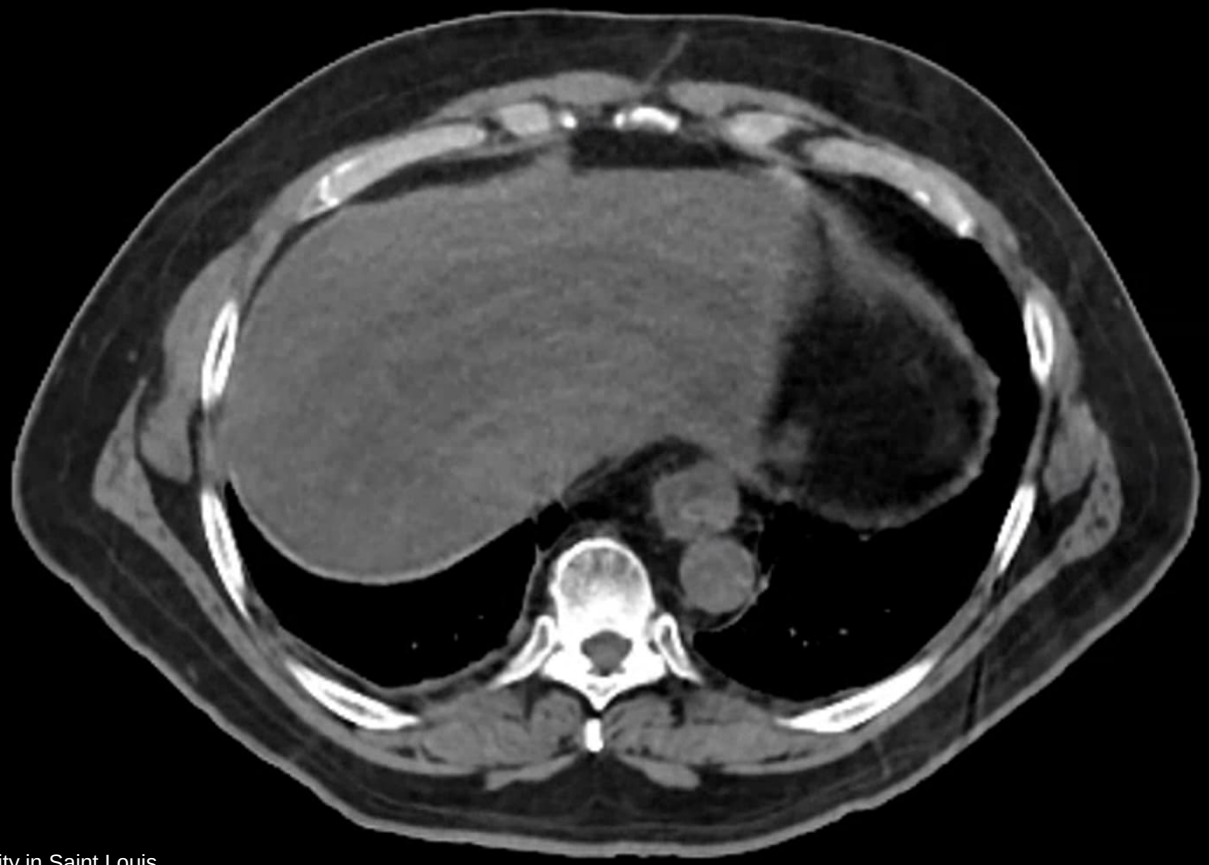
Larger Field Of View

varian
A Siemens Healthineers Company

HyperSight: Image Quality

Going beyond IGRT

HYPERSIGHT



Stomach

Pancreas

Duodenum

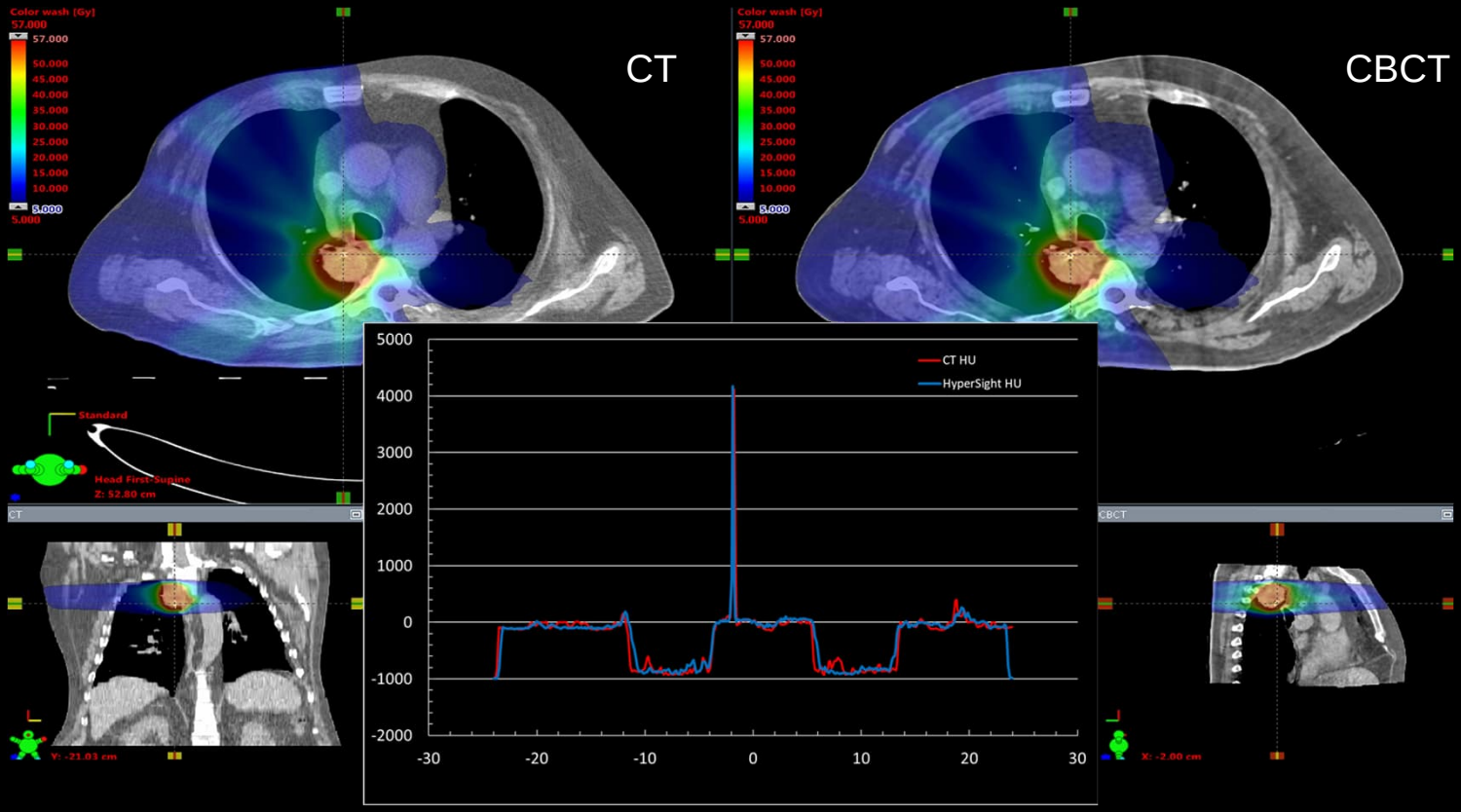
Image courtesy of Washington University in Saint Louis.

varian
A Siemens Healthineers Company

HyperSight: Precision

Images you can plan on

HYPERSIGHT



Images courtesy of Washington University, St Louis.

varian
A Siemens Healthineers Company

PERSONALIZATION

93.0%

Adaptive plan selection frequency

PERFORMANCE

15min

Average duration of adaptive steps*

CONFIDENCE

8.0x

Increase in Pancreas SBRT Adaptive vs. IGRT

* Ethos online adaptive steps includes image review, structure review, target review, and plan review

Analysis based on 174 institutions in EMEA, APJI, and Americas from September 2019 through April 30, 2025

varian
A Siemens Healthineers Company

Ethos workflow

Supported with informed decisions

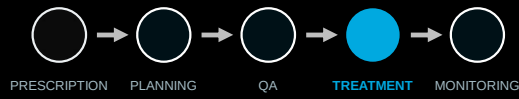


Image Review	**5-10** seconds
Structures Review	**~4.4** minutes
Target Review	**~4.5** minutes
Plan Review	**~4.9** minutes
Total time for Ethos 2.0 Online Adaptive Steps	**15** minutes

NEW ETHOS 2.0

varian
A Siemens Healthineers Company

AI segmentation expansion

For efficient clinical workflow

PRESCRIPTION PLANNING QA TREATMENT MONITORING

NEW ETHOS 2.0

- Designed to remove repetitive and time-consuming tasks
- Head & Neck, Abdomen, Thorax, Bowel, and Pelvis anatomical regions
- Same AI models from initial planning through oART

Head & Neck

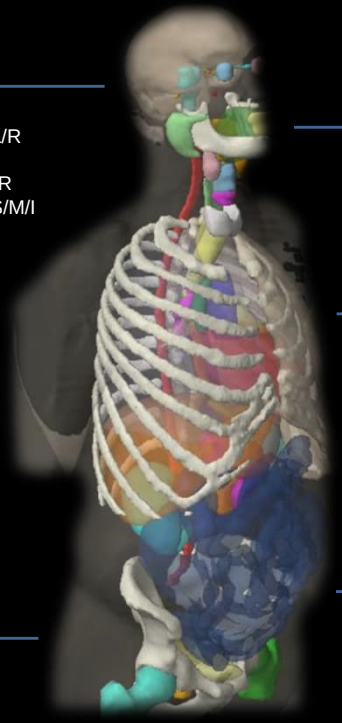
Brain	Parotid_L/R
Brainstem	Glnd_Submand_L/R
Eye_L/R	Larynx_SG
Lens_L/R	Glnd_Lacrimal_L/R
OpticChiasm	Musc_Constrict_S/M/I
OpticNrv_L/R	Cochlea_L/R
Lips	Glnd_Thyroid
Bone_Mandible	Glottis
Cavity_Oral	

Abdomen

Kidney_L/R	Gallbladder
Liver	Pancreas
Spleen	Duodenum
Stomach	

Bowel

Bowel	Colon_Sigmoid
Bowel_Large	Colon
Bowel_Small	SmallBowel-Duo



Other

SpinalCord	External (≈ Body)

Thorax

A_Aorta	V_Venacava_S/I
Breast_L/R	Bronchus
Heart	SpinalCanal
Lung_L/R	Trachea
Ribs_L/R	Chestwall_L/R
Esophagus	GreatVes
A_Pulmonary	

Pelvis

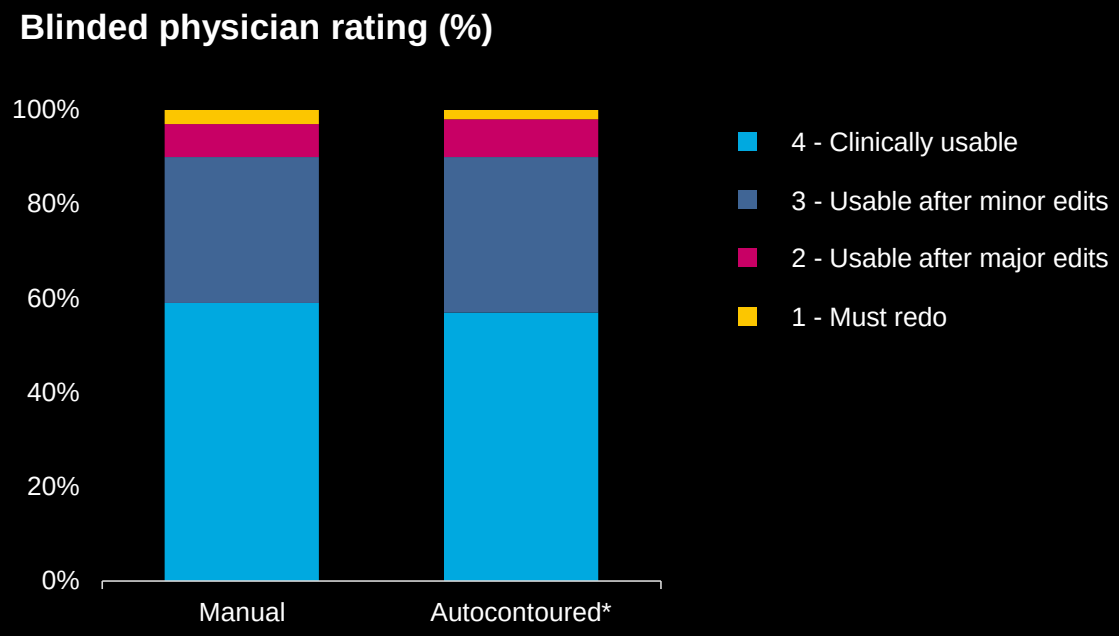
Femur_Head_L/R	Bladder
SeminalVes	PenileBulb
Prostate	Bone_Pelvic
Rectum	Uterus

varian
A Siemens Healthineers Company

Autocontouring integrated in Eclipse

varian
A Siemens Healthineers Company

Blinded evaluation of auto contouring at Universitätsklinikum Erlangen



- *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).

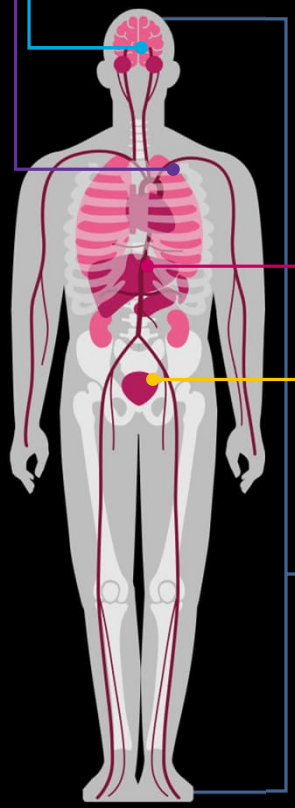
Varian Autocontouring supported anatomical sites

Head & Neck

- Brain
- Brainstem
- Eye globe (L/R)
- Lens (L/R)
- Optic nerve (L/R)
- Optic chiasm
- Cochlea (L/R)
- Parotid gland (L/R)
- Submandibular gland (L/R)
- Oral cavity
- Mandible
- Lips
- Larynx (L/R)
- Glottis
- Supraglottic larynx
- Pharyngeal constrictor muscle (inf/mid/sup)
- Brachial plexus (L/R)
- Thyroid

Breast & Lung

- Female breasts (L/R)
- Lung (L/R)
- Lung lobes (RI, RM, RS, LI, LS)
- Trachea
- Proximal bronchial tree
- Chest wall (L/R)
- Whole heart
- Atrium (L/R)
- Ventricle (L/R)
- Ventricle Left Endocardium
- Left Circumflex
- Right Coronary Artery
- LAD
- Aorta
- V. Cava (inf/sup)
- Pulmonary artery
- Individual ribs (24 ribs)
- Sternum



Abdomen

- Stomach
- Liver
- Spleen
- Kidneys (L/R)
- Pancreas
- Abdominopelvic cavity
- Duodenum
- Bowel (small/large)

Pelvic area

- Bladder
- Prostate
- Penile bulb
- Rectum
- Sigmoid
- Proximal femur (L/R)
- Seminal vesicles
- Uterus

Multi-site

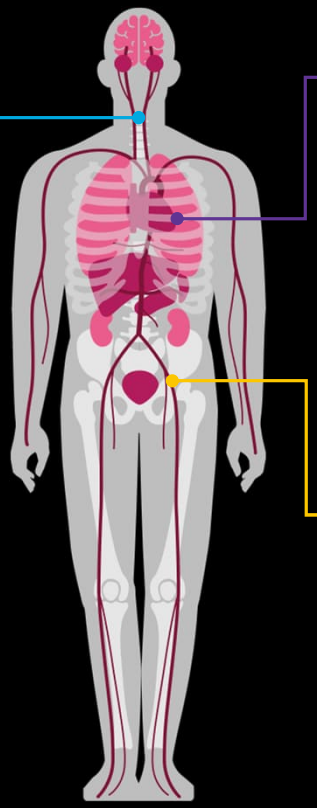
- Body contours
- Spinal cord
- Spinal canal
- Esophagus
- Skeleton

varian
A Siemens Healthineers Company

Varian Autocontouring supported lymph nodes

Head & Neck

- Level Ia: Submental triangle
- Level Ib Submandibular triangle (L/R)
- Level II: Upper jugular nodes (L/R)
- Level III: Middle jugular nodes (L/R)
- Level IVa: Lower jugular group (L/R)
- Level IVb: Medial supraclaicular group (L/R)
- Level V: Posterior triangle group (L/R)
- Level Vc: Lateral supraclavicular group (L/R)
- Level VIa: Anterior jugular nodes
- Level VIb: Prelaryngeal, pretracheal, and paratracheal nodes
- Level VIIa: Retropharyngeal nodes (L/R)
- Level VIIb: Retro-styloid nodes (L/R)
- Level VIII: Parotid group (L/R)
- Level IX: Bucco-facial group (L/R)
- Level Xa: Retroauricular and subauricular nodes (L/R)
- Level Xb: Occipital nodes (L/R)



Breast & Lung

- LN Axilla Level I (L/R)
- LN Axilla Level II (L/R)
- LN Axilla Level III (L/R)
- LN Internal Mammary (L/R)
- LN Supraclavicular (L/R)

Pelvic area

- LN Common Iliac (L/R)
- LN Internal Iliac (L/R)
- LN External Iliac (L/R)
- LN Obturator (L/R)
- LN Presacral

varian
A Siemens Healthineers Company

AI-based autocontouring on MR images for the male pelvis[1]

Organs-at-risk Contouring

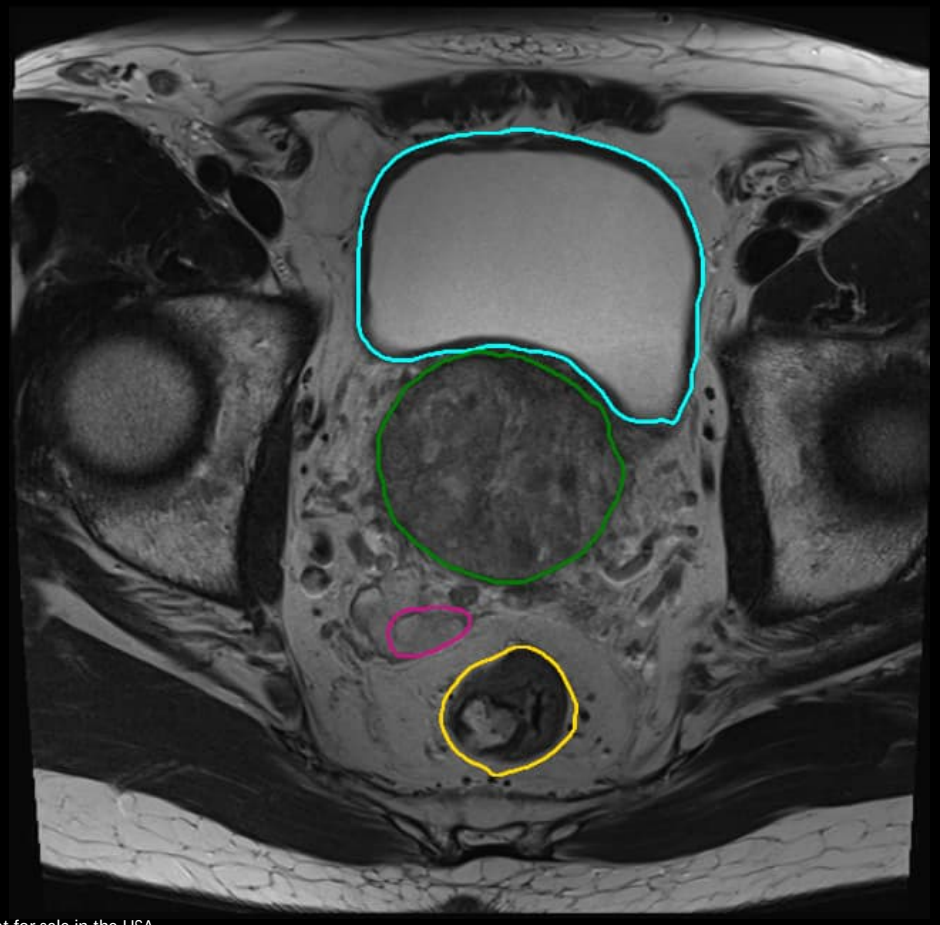
Automatic contouring of 8 structures Anal canal, Penile bulb, Bladder, Prostate, Body, Rectum, Femur left and right, Seminal vesicles

MR-Only workflow

In combination with Synthetic CT created with a dedicated sequence, a complete MR-only workflow can be offered

The base for the future

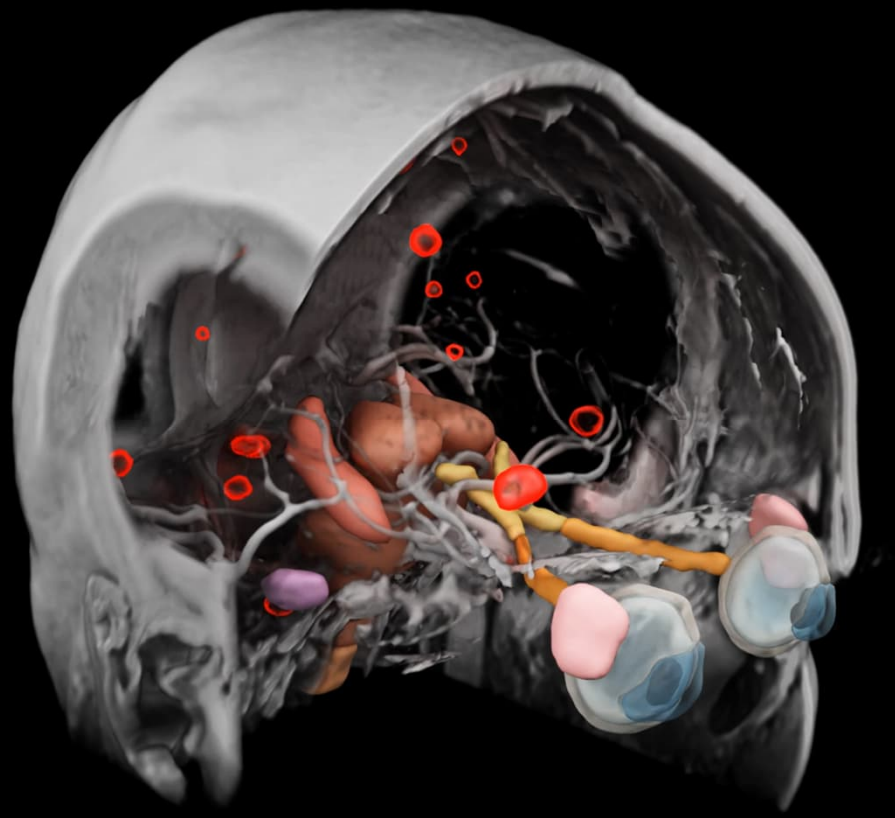
Will the “prostate tsunami”[2] hit the RT departments too?



1 syngo.via RT Image Suite VC10 is not commercially available in all countries, and its future availability cannot be ensured. Not for sale in the USA.
AI-Rad Companion Organs RT VA60 is not commercially available in all countries, and its future availability cannot be ensured.
2 Source: https://doi.org/10.32074/1591-951-1047

varian
A Siemens Healthineers Company

AI-based autocontouring on brain MRI images[1,2]



Courtesy: Acibadem Atasehir Hospital, Instanbul, Turkey
1 AI-Rad Companion Organs RT VA70 is not commercially available in all countries, and its future availability cannot be ensured. Not for sale in the USA.
2 syngo.via RT Image Suite VC10 is not commercially available in all countries, and its future availability cannot be ensured. Not for sale in the USA.
Rendering not generated in AI-Rad Companion Organs RT VA70 nor syngo.via RT Image Suite VC10

varian
A Siemens Healthineers Company

AI-based contouring on brain MRI images[1,2]
Brain metastasis and Organs at Risk

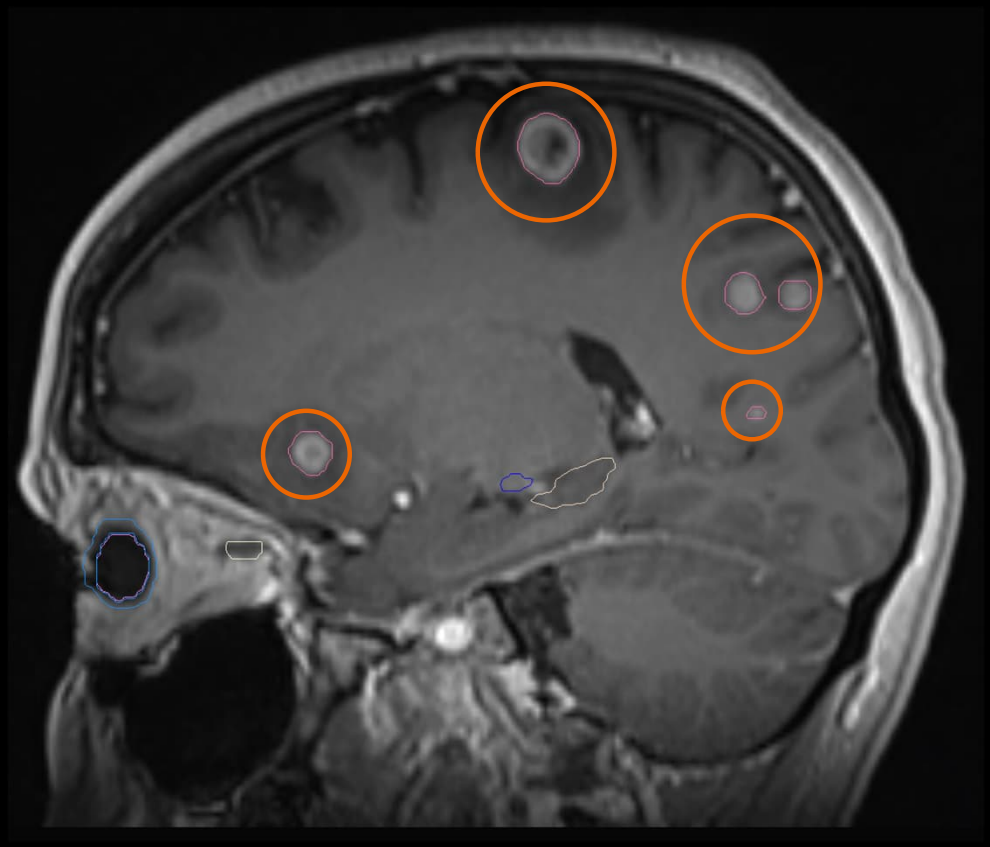
Organs at Risk Contouring

Automatic contouring of 12 structures
Brainstem, Cochlea, Cornea, Eyes, Hippocampus, Lacrimal glands, Lens, Optic Nerves, Optic Chiasm, Pituitary, Retina, Spinal Cord

Brain metastasis as GTV's

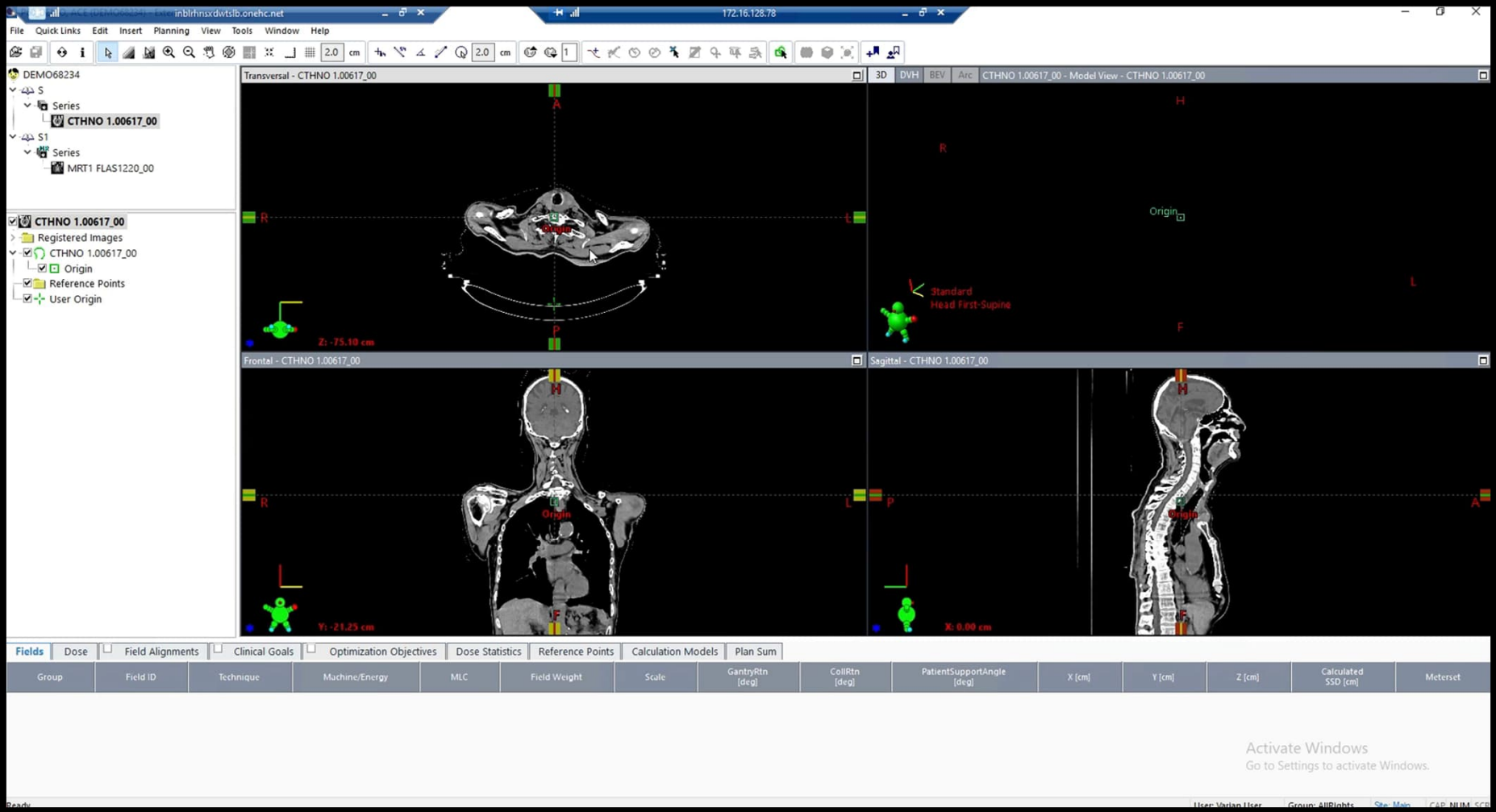
Automatic contouring of intraparenchymal metastases on post-contrast T1 IMPRAGE

The base for radiosurgery
The RT Struct files with all contours can be used for a treatment planning



Courtesy: Acibadem Atasehir Hospital, Instanbul, Turkey
1 AI-Rad Companion Organs RT VA70 is not commercially available in all countries, and its future availability cannot be ensured. Not for sale in the USA.
2 syngo.via RT Image Suite VC10 is not commercially available in all countries, and its future availability cannot be ensured. Not for sale in the USA.

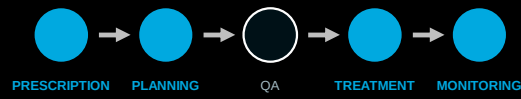
varian
A Siemens Healthineers Company



varian
A Siemens Healthineers Company

Automated Plan Generation

Offers flexibility in Treatment Technique

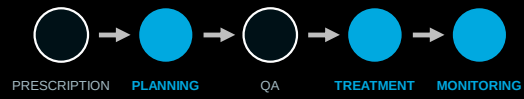


- Ethos delivers flexibility in:
  - Treatment technique – adaptive or IGRT
  - IMRT, VMAT, SBRT
- IMRT and VMAT plans are generated automatically
  - Dose calculations done with the Acuros XB algorithm
  - Optimization and dose calculations powered by GPU

varian
A Siemens Healthineers Company

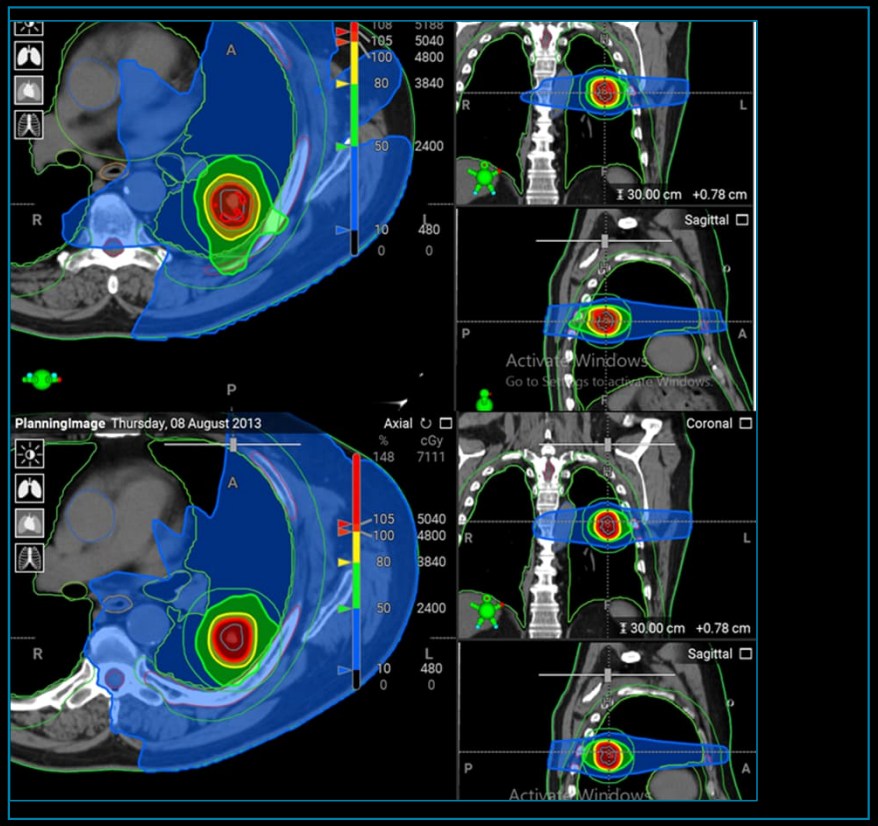
Intelligent Optimization Engine

Enhancements



NEW ETHOS 2.0

- Improved Intelligent Optimization Engine vs. Ethos v.1
  - Improved plan quality
  - Faster treatment delivery
- SBRT planning solution
  - High fidelity dose calculation and optimization for ultimate conformality
  - Availability of dose calculation grids down to 1.25mm



varian
A Siemens Healthineers Company

RapidPlan with Intelligent Optimization Engine

Fast track toward optimal treatment plan

Using RapidPlan to drive the IOE2 offers the potential to enhance:

Speed

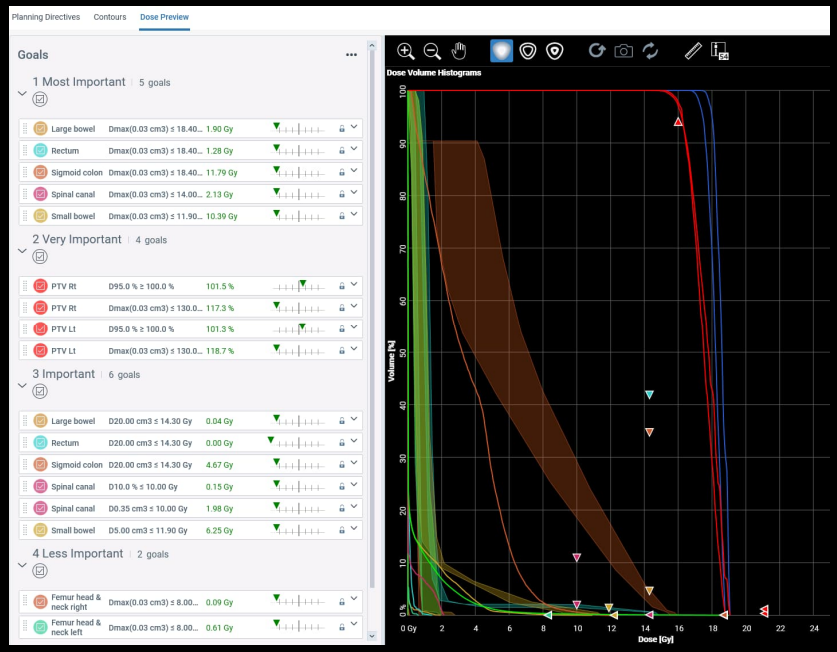
- Reduce optimization time[2]
- Lessen planner interaction[2]
  - Using less user defined goals

Quality

- Improve adaptive plan quality[2]
  - Reduce the dose to the OAR whilst maintaining target coverage[1]

Knowledge sharing

- Unlock the recipe for the optimal plan
- Bridge the gap in Planner experience[2]

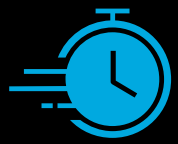


1. Yoganathan SA, Basith A, Rostami A et al. Investigating the impact of RapidPlan on Ethos automated planning . Medical Dosimetry Jul28 2:56 2024
2. Visak J, Liao CY, Zhong X et al. Assessing population-based to personalized planning strategies for head and neck adaptive radiotherapy. Journal of Applied Clinical Medical Physics. 03 December 2024

varian
A Siemens Healthineers Company

IOE2 and RapidPlan Studies

Results



RapidPlan-enabled strategy demonstrated **faster optimization time** than both population-based and AI-guided strategies.[2]

Up to 10% less dose to pelvic OARS.

Mean doses of the bladder, rectum, and peritoneal space were significantly lower by 4%, 8% and 10% respectively.[1]

20Gy → 15Gy

Average contralateral parotid gland mean dose reduction

RapidPlan offers enhanced dosimetric sparing in organs-at-risk (OAR).[2]

The statement by Varian's customer described here is based on results achieved in the customer's unique clinical setting. Because there is no "typical" clinical setting and many variables exist, there is no guarantee that other customers will achieve the same results.

. Yoganathan SA, Basith A, Rostami A et al. Investigating the impact of RapidPlan on Ethos automated planning . Medical Dosimetry Jul28 2:56 2024

2. Visak J, Liao CY, Zhong X et al. Assessing population-based to personalized planning strategies for head and neck adaptive radiotherapy. Journal of Applied Clinical Medical Physics. 03 December https://doi.org/10.1002/acm2.14576

varian
A Siemens Healthineers Company

Machine Learning + Human Intelligence

RapidPlan and MCO

varian
A Siemens Healthineers Company

Reduce up to 40% the interplanner variability[1]

Consistency

Reach up to 95% of overall planning time reduction in RapidPlan Models for several anatomical regions[2]

Efficiency

RapidPlan can significantly improve planning process and produce higher quality plans[3]

Quality

1.Scaggion et al (2018) ***Reducing inter- and intra-planner variability in radiotherapy plan output with a commercial knowledge-based planning solution***. Physica Medica, 86-93, https://doi.org/10.1016/j.ejmp.2018.08.016

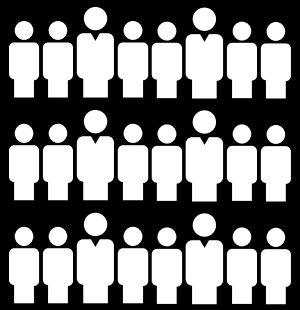
2.K. van Gysen et al. (2020) ***Rolling out RapidPlan: What we've learnt***. Journal of Medical Radiation Sciences, *67 (310-317)* https://doi.org/10.1002/jmrs.420

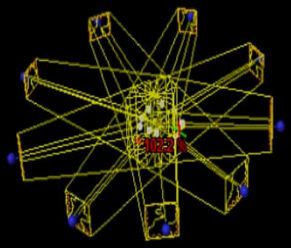
3.Chang et al. (2016) ***Comparison of Planning Quality and Efficiency between conventional and Knowledge-based algorithms in Nasopharyngeal cancer patients using Intensity Modulated Radiation Therapy***, International Journal of Radiation Oncology- Biology- Physics *95(3), 981-990. https://doi.org/10.1016/j.ijrobp.2016.02.017*

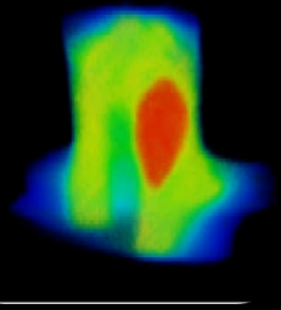
varian
A Siemens Healthineers Company

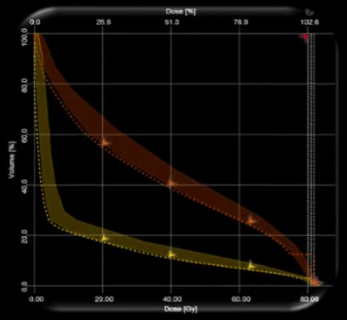
RapidPlan™ knowledge-based planning

Plan Collection | Structure Sets | Treatment Geometries | Dose Distributions | RapidPlan Model









Machine Learning

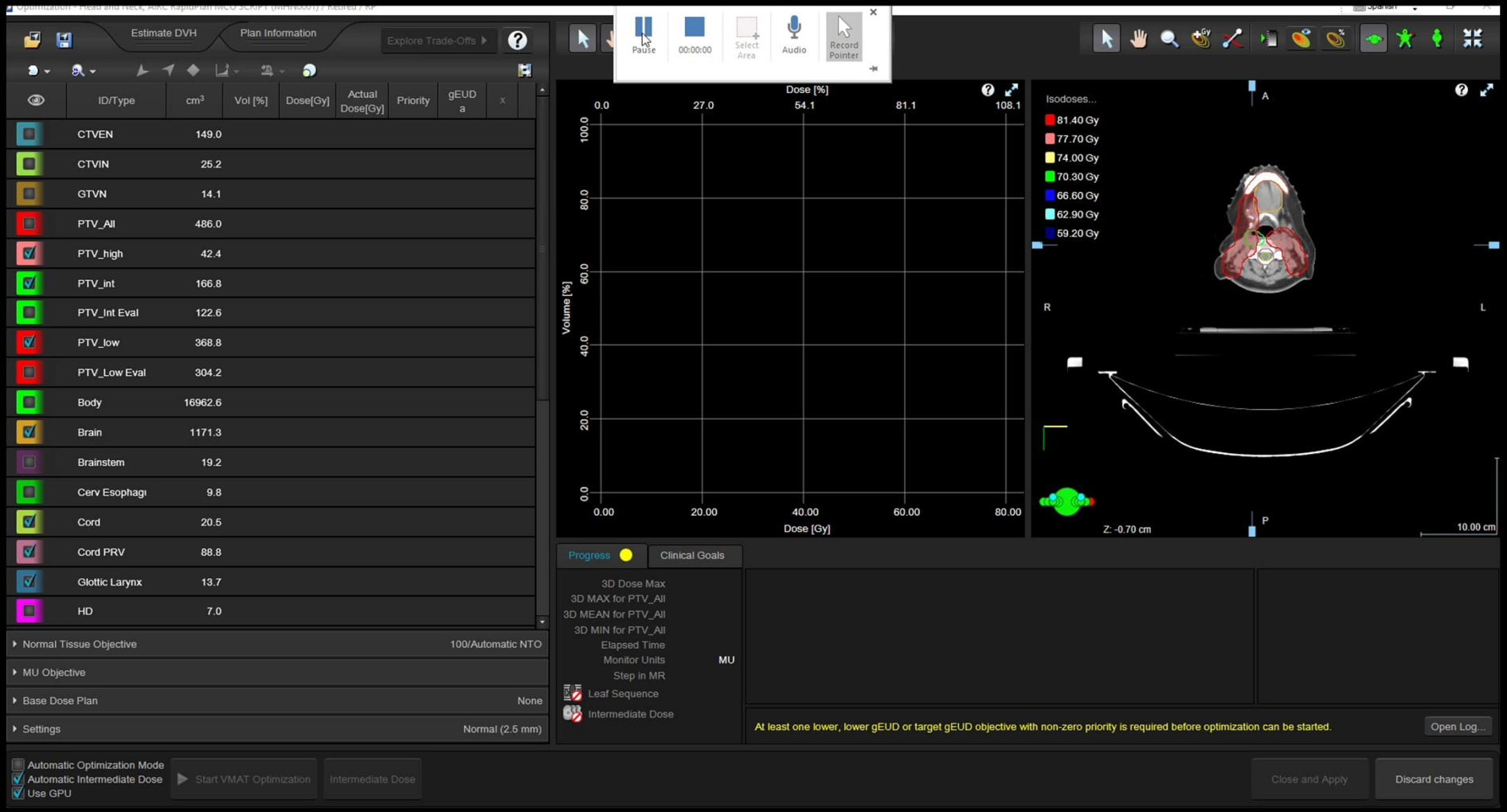
Predict DVH
Generate objectives

varian
A Siemens Healthineers Company

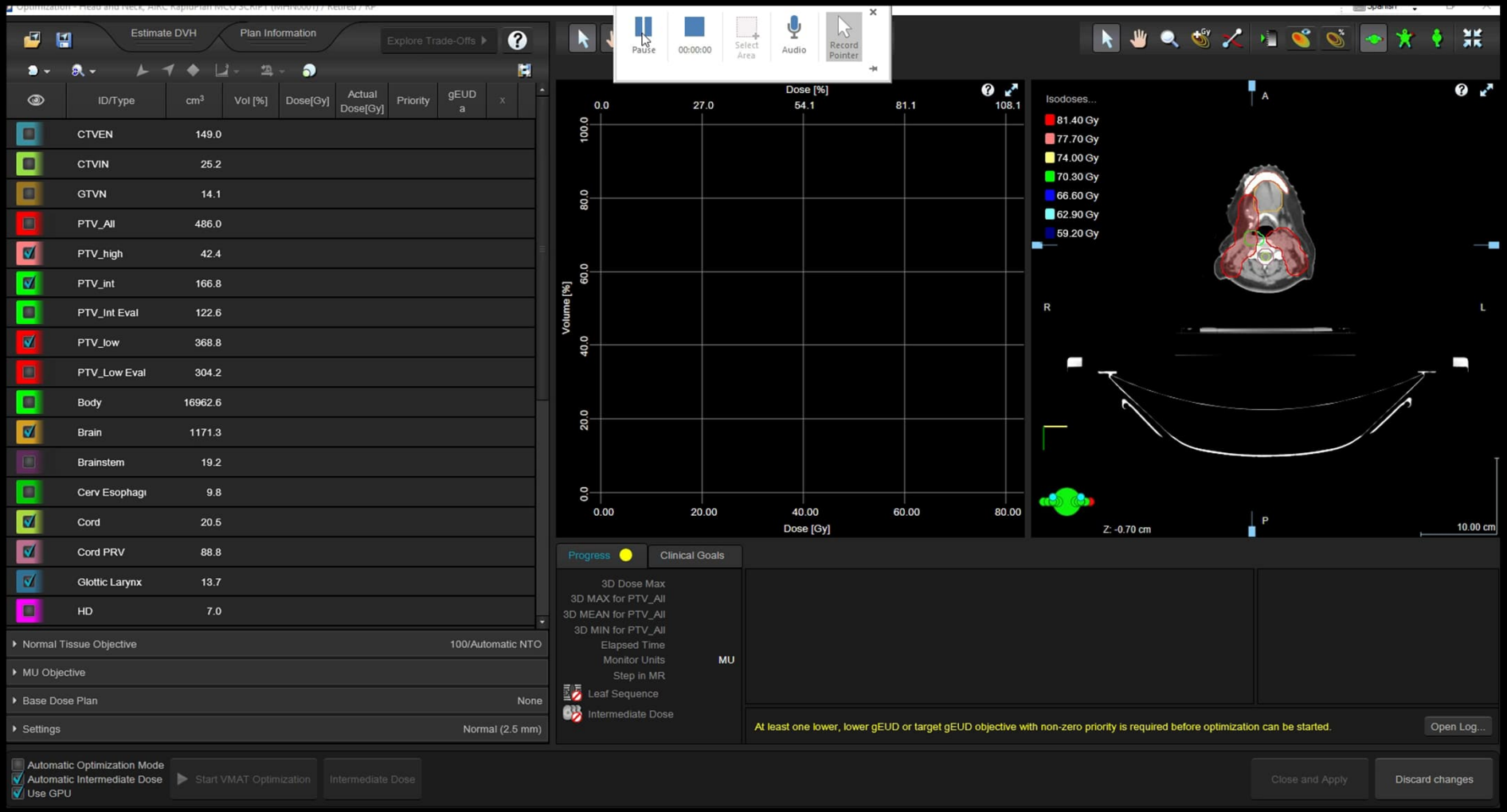
Eclipse Rapidplan

‘We expected the biggest impact on the high dose distributions and NTCP for the patient dosimetry historically will be coming from IMRT or VMAT introduction on the workflow, but the fact is that RapidPlan was the biggest and fastest contribution for the plan quality improvement’

Pedro Gallego Franco
Medical Physicist
Medical Physics and Radioprotection department
Hospital de la Santa Creu i Sant Pau
Barcelona, Spain



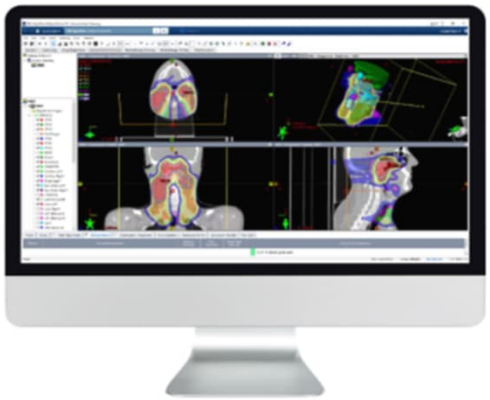
varian
A Siemens Healthineers Company



varian
A Siemens Healthineers Company

varian
A Siemens Healthineers Company

Varian's Eclipse treatment planning system now compatible with IBA Proteus® ONE treatment delivery system



Robust Proton Planning – Leverage Eclipse system's robust proton optimization, powered by the Monte Carlo-based AcurosPT algorithm.

Seamless Interoperability – Enable effortless data exchange between Eclipse and IBA's Proteus ONE, a compact single-room proton system.

Streamlined Workflow – ARIA CORE and Eclipse work together to support end-to-end clinical workflows with automation and patient outcome tracking.

Automated Capabilities – Utilize RapidPlan PT adaptive planning workflows directly through Eclipse to help enhance efficiency.

CONTACT US

Connect with your local Varian sales representative to learn more about Eclipse and Proteus ONE.

Visit us at www.varian.com

varian
A Siemens Healthineers Company

RapidPlan for Proton treatment planning

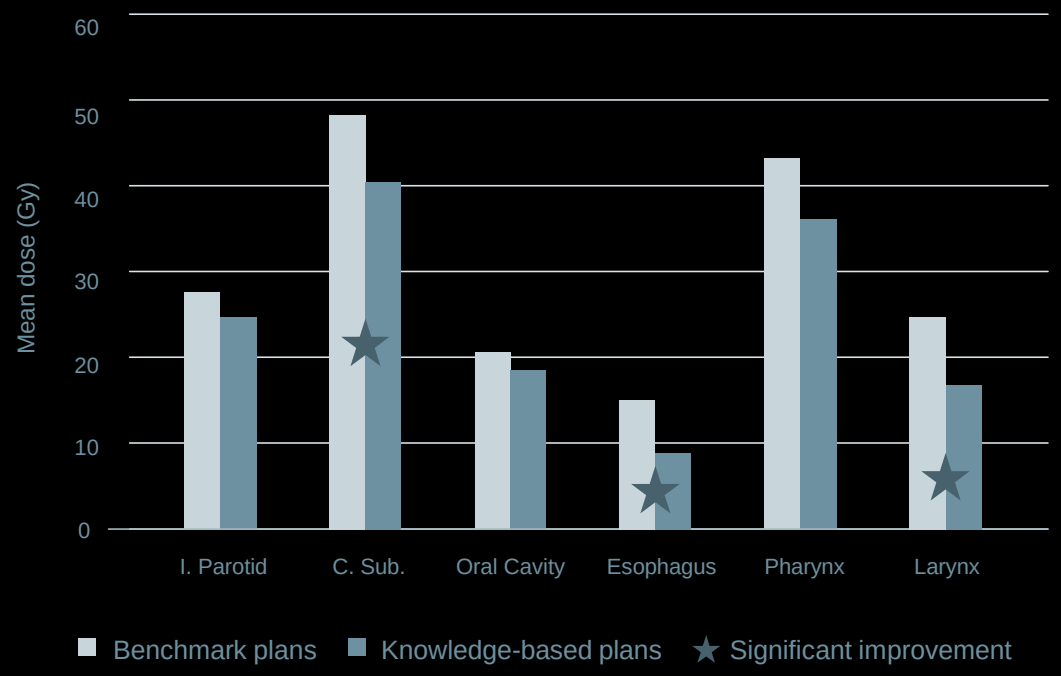
First clinical application of machine learning in proton therapy

<10 mins

RapidPlan for Protons

RapidPlan PT automatically generated plans that were originally created for patients at 4 leading proton centers

Plan quality improvement: Reduced dose to OARs



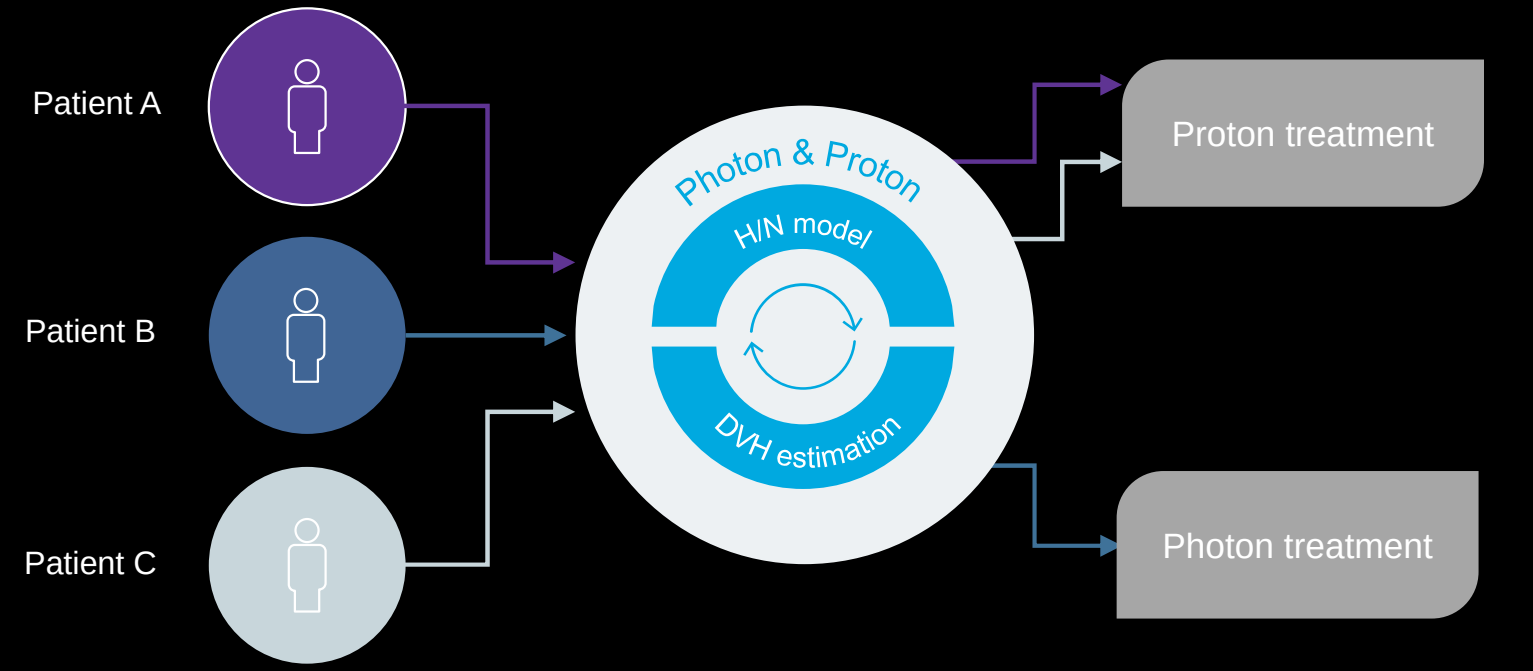
Source: Joint Publication on RapidPlan PT: VUMC, UPENN, PSI, & CCHMC; https://www.mdpi.com/2072-6694/10/11/420/htm

QR700025094

varian
A Siemens Healthineers Company

RapidPlan and Scripting for Proton decision making

Proof of concept: Decision Support Script



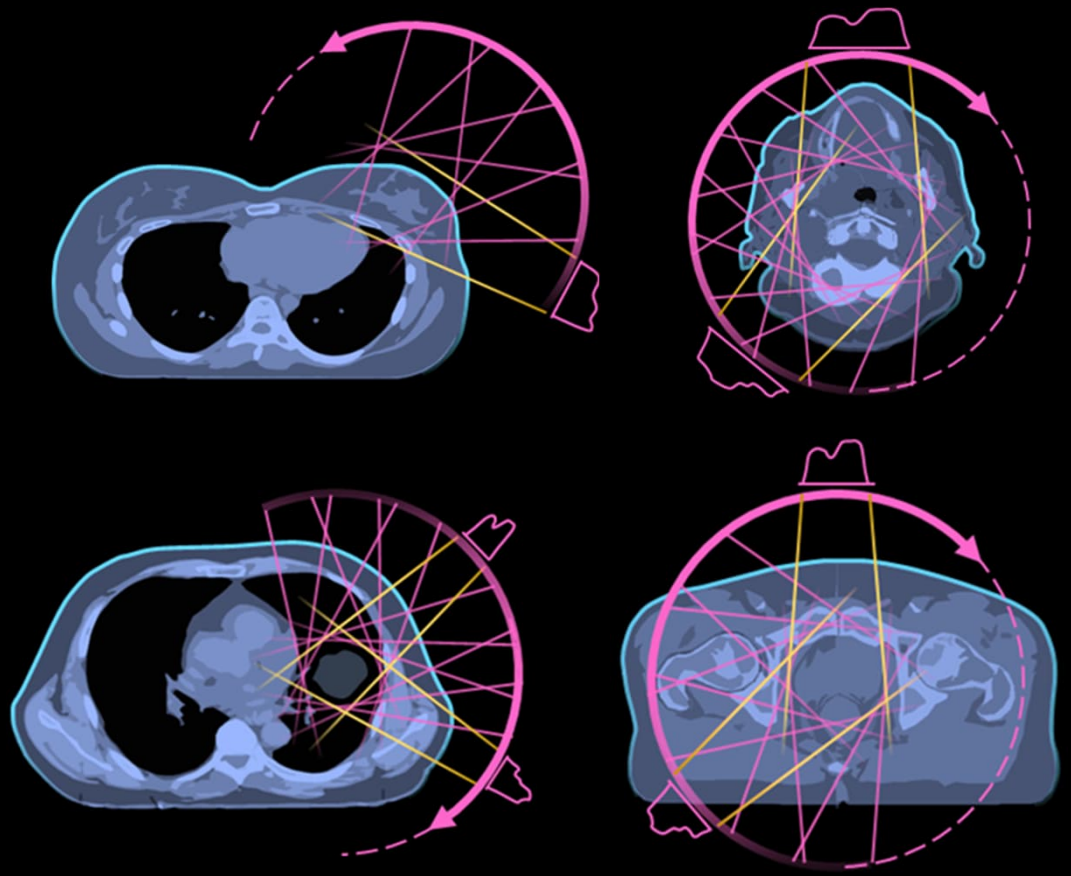
varian
A Siemens Healthineers Company

RapidArc Dynamic

A turning point for arc therapy

Features

Unlocking the power of **modulated ports**, **RapidArc**, and **dynamic collimator rotation** in a single plan, optimization, and delivery



Benefits

Clinical: Designed to improve plan quality, meet target objectives and spare OARs without sacrificing throughput

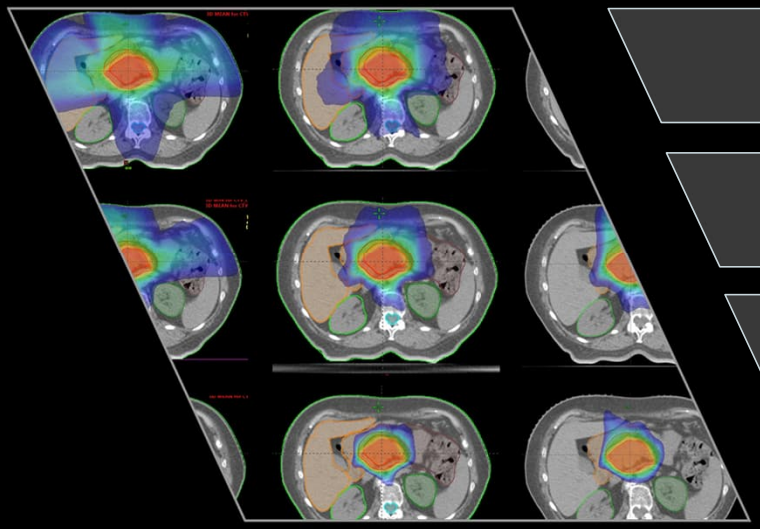
Operational: Powered by **new GPU-enabled algorithms,** designed to complete plan optimization in seconds

varian
A Siemens Healthineers Company

QR700012412

CE Marked. 510(k) pending. Not available for sale in the U.S. or all markets and no guarantee of commercialization or feature availability.

RapidArc Dynamic



Dose	Better
Planning	Faster
Delivery	Simpler

QR700012412

CE Marked. 510(k) pending. Not available for sale in the U.S. or all markets and no guarantee of commercialization or feature availability.

varian
A Siemens Healthineers Company

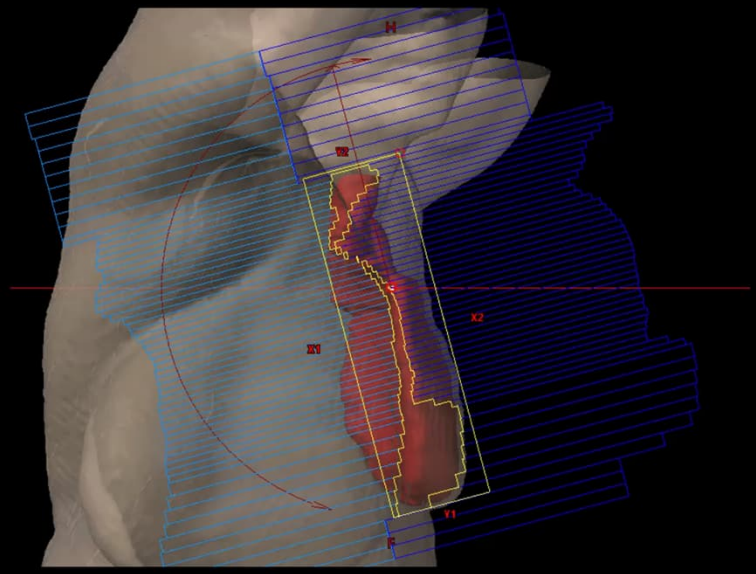
RapidArc Dynamic

A turning point for arc therapy

New generation of optimization algorithms

Modulated ports during an arc delivery

Dynamic collimator rotation delivery



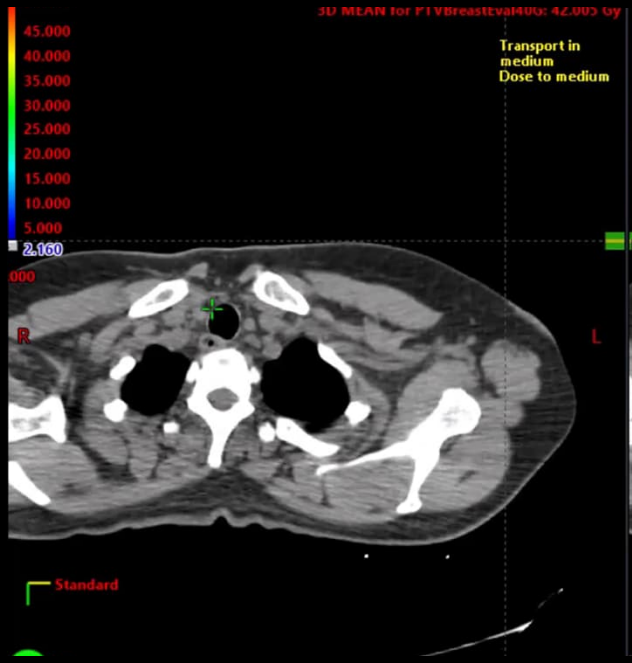
QR700012412

CE Marked. 510(k) pending. Not available for sale in the U.S. or all markets and no guarantee of commercialization or feature availability.

RapidArc Dynamic

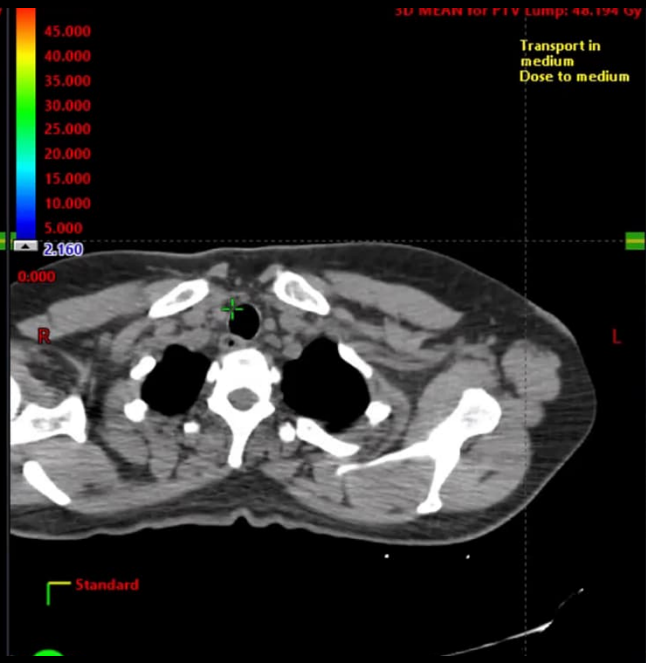
Plan comparisons – Breast SIB

RapidArc Dynamic



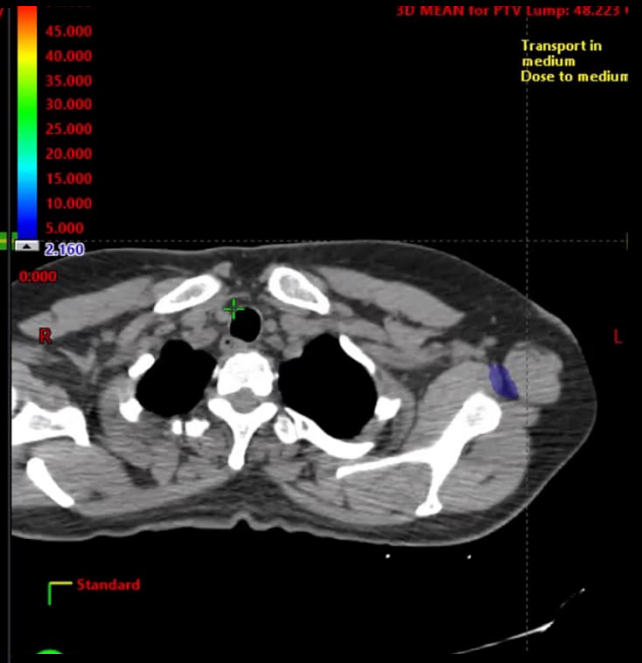
1 arc (4 static ports)

IMRT



5 flds

RapidArc



2 arcs

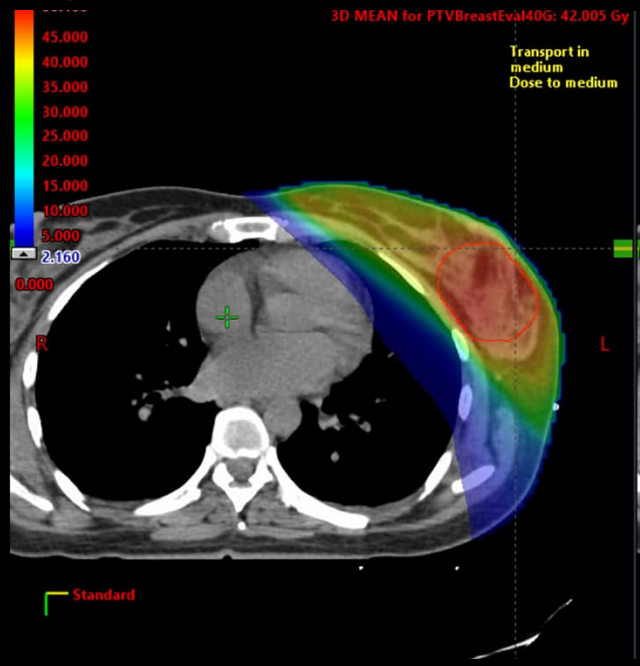
varian
A Siemens Healthineers Company

CE Marked. 510(k) pending. Not available for sale in the U.S. or all markets and no guarantee of commercialization or feature availability.

RapidArc Dynamic

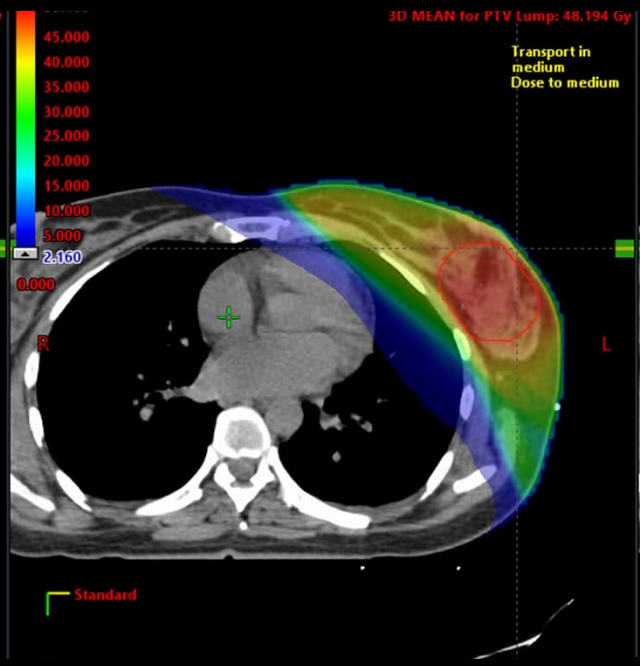
Plan comparisons – Breast SIB

RapidArc Dynamic



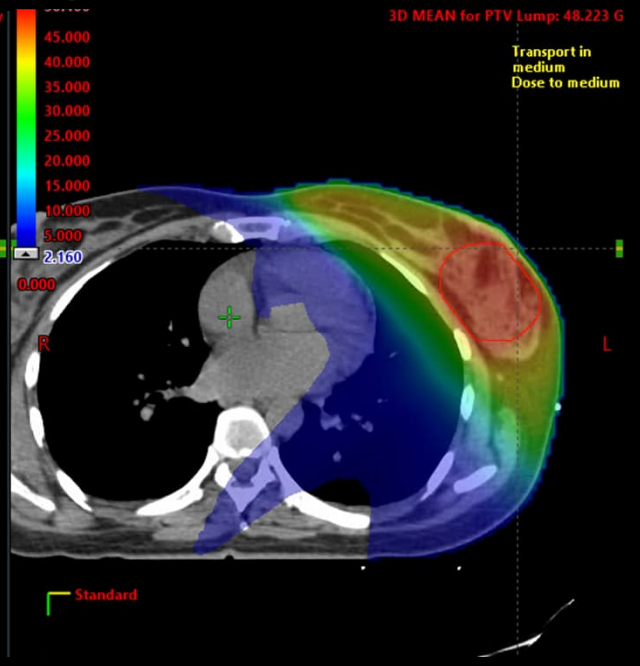
1 arc (4 static ports)

IMRT



5 flds

RapidArc



2 arcs

varian
A Siemens Healthineers Company

CE Marked. 510(k) pending. Not available for sale in the U.S. or all markets and no guarantee of commercialization or feature availability.

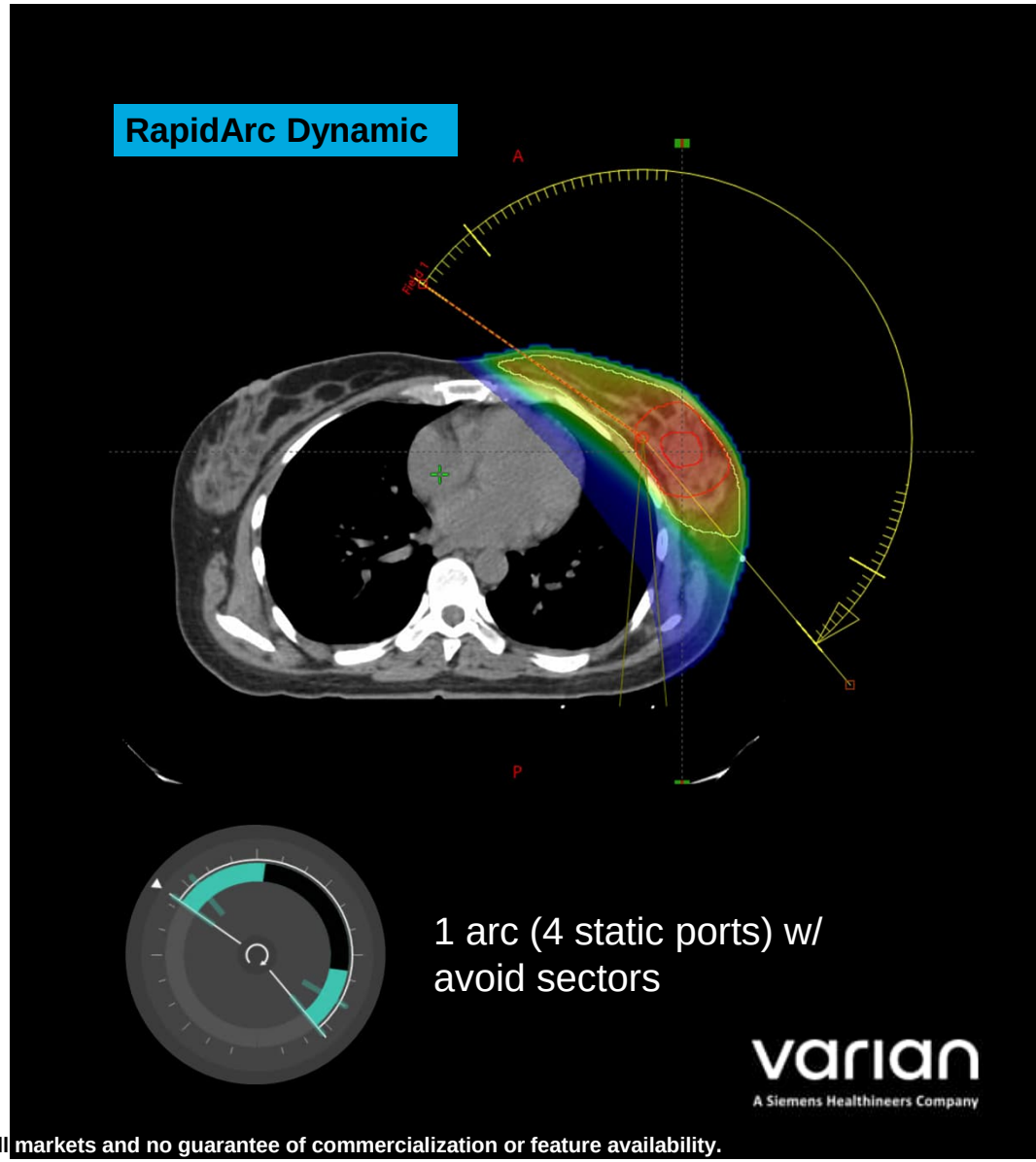
RapidArc Dynamic

Plan comparisons – Breast SIB

Clinical Goals – Contralateral Breast and Lung, Heart and Ipsilateral Lung

Clinical goals: All Plans — Evaluate Goals for All Plans

Plan			■ RAD	▲ IMRT	● VMAT
Total Dose			48.000 Gy	48.000 Gy	48.000 Gy
Clinical Goal Summary			0 0 15	1 0 14	2 0 13
PTVLumpEval	P1	Dmax ≤ 55.00 Gy	50.42 Gy	51.02 Gy	50.93 Gy
	P1	V 52.80 Gy ≤ 5.0 %	0.00 %	0.00 %	0.00 %
	P1	V 45.60 Gy ≥ 95.0 %	99.25 %	99.06 %	99.57 %
CONTRA_BRE...	P2	Dmean ≤ 1.00 Gy	0.14 Gy	0.20 Gy	0.61 Gy
	P2	Dmax ≤ 2.40 Gy	0.91 Gy	3.71 Gy	3.68 Gy
CONTRA_LUNG	P2	V 4.00 Gy ≤ 10.0 %	0.00 %	0.00 %	2.72 %
HEART	P2	V 8.00 Gy ≤ 10.0 %	1.78 %	3.04 %	4.96 %
	P2	Dmean ≤ 2.00 Gy	1.26 Gy	1.69 Gy	3.00 Gy
IPSILATERAL_...	P2	V 4.00 Gy ≤ 50.0 %	11.58 %	24.34 %	43.84 %
	P2	V 8.00 Gy ≤ 35.0 %	6.47 %	12.10 %	21.51 %
	P2	V 16.00 Gy ≤ 15.0 %	3.58 %	6.93 %	10.11 %
PTV Breast - P...	P1	Dmax ≤ 46.00 Gy	45.18 Gy	45.39 Gy	45.33 Gy
PTVBreastEval...	P1	D 50.0 % ≤ 43.20 Gy	41.11 Gy	40.67 Gy	40.96 Gy
	P1	V 48.00 Gy ≤ 30.0 %	7.50 %	11.34 %	13.23 %
	P1	V 38.00 Gy ≥ 95.0 %	97.16 %	97.81 %	98.20 %



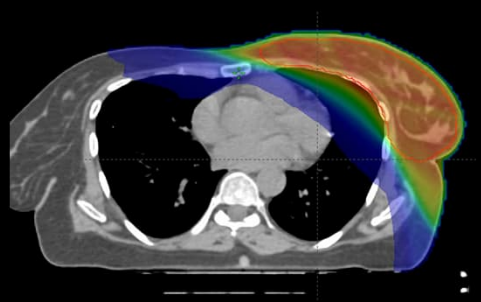
CE Marked. 510(k) pending. Not available for sale in the U.S. or all markets and no guarantee of commercialization or feature availability.

Every Gray Matters – Breast

Minimizing dose to reduce heart toxicity

Predictive Factors

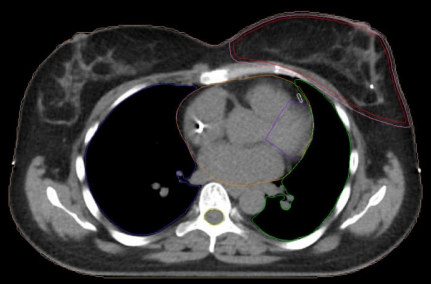
1.56 x



1.56 x greater risk of cardiac disease death in left-sided breast patients[2, 3]

Dose Management

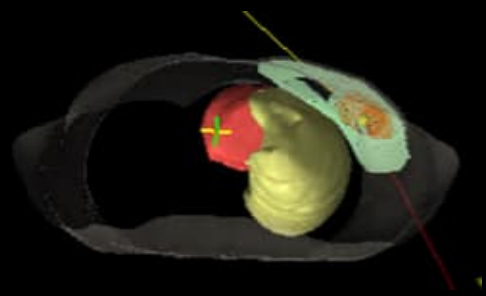
4-5 Gy



Most frequently reported mean heart dose[1,4]

Impact of Gy

~16.3 %



Major coronary events increase by **16.3% per Gy** in the first 0-4 years post-radiation

1. Konstantinou E et al. Radiation Dose to critical structures from 3D CRT, IMRT & VMAT techniques for left sides Breast cancer. J Pers Med. 2024 Jan, 14(1): 63
2. DarbyS.C., Ewertz M., McGale P., Bennet A.M., Blom-Goldman U., Brønnum D., Correa C., Cutter D., Gagliardi G., Gigante B., et al. Risk of Ischemic Heart Disease in Women after Radiotherapy for Breast Cancer. *N. Engl. J. Med.* 2013;368:987–998. doi: 10.1056/NEJMoa1209825.
3. Bouillon K, Haddy N, Delaloge S, Garbay JR, et al. Long-term cardiovascular mortality after radiotherapy for breast cancer. J Am Coll Cardiol 2011 Jan 25,57(4) :445-52.
4. Chirillia et al Organ-sparing techniques and dose-volume constrains used in breast cancer radiation therapy – Results from European and Latin American surveys; Clin Transl Radiat Oncol. 2024 May; 46: 100752.

varian
A Siemens Healthineers Company

CE Marked. 510(k) pending. Not available for sale in the U.S. or all markets and no guarantee of commercialization or feature availability.

(Thank you)

miguel.rodriguez@varian.com

varian
A Siemens Healthineers Company