

PHILIPS

Radiation Oncology

Personalized therapy planning

Philips Pinnacle Evolution

Pinnacle Evolution is the next generation of treatment planning technology from Philips improving the quality, consistency and efficiency of the radiation therapy planning process.

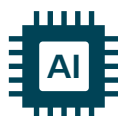
With personalized, patient-specific goals integrated from the start, more advanced automated planning tools and a new way of working, Pinnacle Evolution is ready to take on your planning challenges.



Quality

Personalized planning

Know what goals are feasible for each organ.



Consistency

Automated planning

Advanced planning algorithms help users from novice to expert deliver consistent results.



Efficiency

Newly optimized performance

Fast optimizations and an efficient user interface help you quickly achieve clinically deliverable, personalized therapy plans.

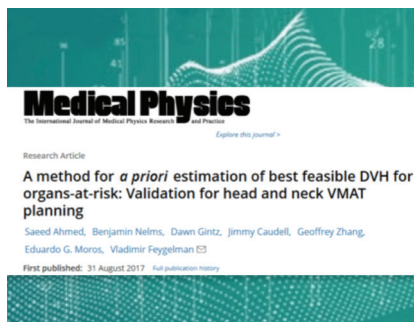


Quality

Personalized planning

Improve the quality of the treatment planning process with personalized, patient-specific goals integrated into the therapy plan from the start.

- Determine feasible goals at the start
- Create patient-specific, personalized therapy plans
- Improve planning workflow by reducing trial and error



Robust algorithm¹

Determine feasible, idealized goals for each individual OAR by comparing dose fall-off from the target.¹

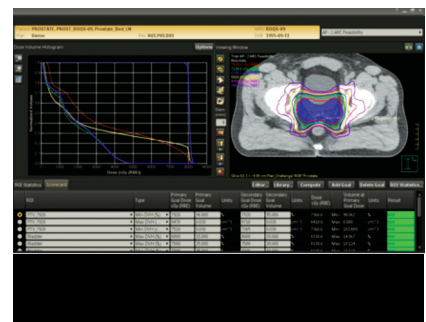
Robust, model-based approach adapts to each unique patient.



Informed decisions

Compare and adjust initial OAR goals with feasible patient-specific, personalized goals.

Make informed clinical decisions on target coverage or OAR sparing, or additional optimization goals to further enhance plan quality.



Complete, clinically deliverable plan

Review and approve plans more collaboratively and more efficiently by knowing the patient's personalized goals at the start.²

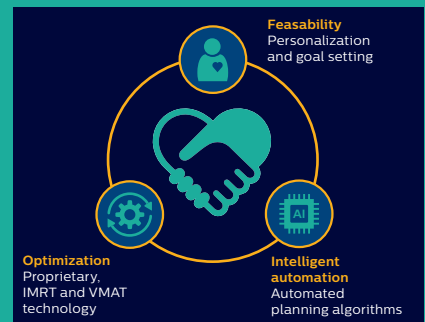
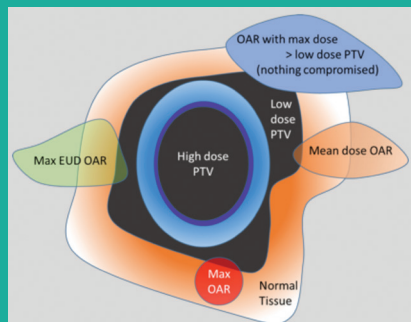
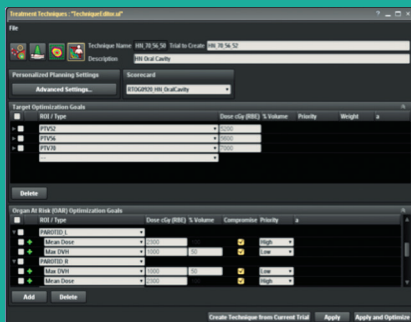
Automation with intelligent algorithms



Demonstrated leadership³ delivering consistent results from novice to expert with advanced automated planning algorithms.

These next-generation intelligent algorithms provide consistency to all users.

- Increased consistency of plan quality, regardless of the planner's experience level
- Automated planning results are preferred by physicians
- Significant reductions in dose for many OARs



Automated workflow

Reduce manually and iteratively created dosimetric dose control structures such as rings, hot/cold spots and overlap regions.

Create robust treatment techniques detailing the patient's target, prescription and OAR goals, as well as other optimization parameters.

Enhanced control

Define variable dose levels and voxel weights, dose fall-off rates for better OAR sparing.³

Set dose fall-off rate and margins for greater control of integral dose.

Start, stop, adjust and resume the automated planning algorithms to achieve desired results.

Integrated performance

Intelligently drive OAR sparing, as needed, beyond what was initially required, while minimizing any compromise on target coverage.

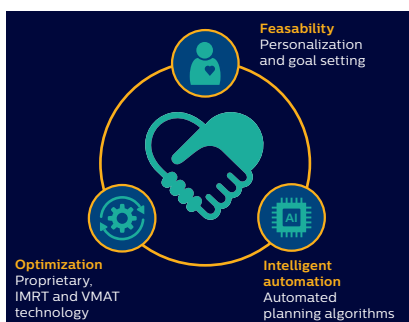
Optimized performance



Efficiency

Quickly achieve clinically deliverable, personalized therapy plans with fast optimizations and an efficient user interface.

The speed of optimization is valuable, yet the benefit is only realized if the user is able to achieve consistent, personalized plan quality. Pinnacle Evolution features proprietary optimization to improve speed performance, as well as integration in IntelliSpace Radiation Oncology to enhance workflow.



Improved performance

Proprietary optimized solutions

State-of-the-art numerical methods, solvers and algorithms reduce complexity and optimization time, while maintaining exceptional quality.

Fast speed performance for all users with CPU horsepower, multi-threaded, multi-core parallel processing.

Integration of automated algorithms

Fast speed performance by embedding automated planning algorithms inside the optimization process itself.

Personalized planning

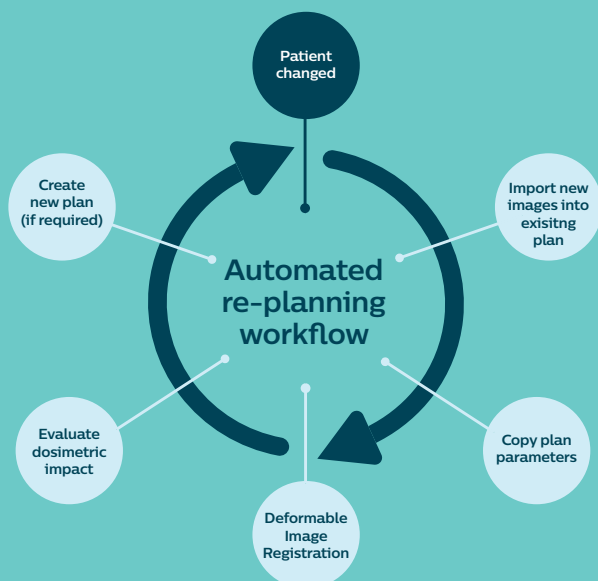
A complete, clinically deliverable plan in less than:

- 15 minutes for IMRT*
- 30 minutes for VMAT*

Conventional planning

A single optimization step in less than:

- 1 minute for IMRT**
- 2 minutes for VMAT**



Leverage Dynamic Planning to adapt patient plans

Knowing when to adapt a patient's plan based on change in anatomy – and having the confidence to know in advance if the plan changes will have the desired clinical impact – can be an uncertain and time-consuming task. Dynamic Planning in Pinnacle allows for greater confidence.

- Quickly adapt therapy plans with assessment and automated re-planning tools
- Easily monitor treatment efficacy
- Efficiently create new plans with limited user intervention

*As measured by PlanIQ quality score. Prostate, 40 iterations, 3 mm dose grid, 7-beam IMRT, 1-arc VMAT. X6 server hardware. Optimization times may vary depending on specific planning needs.

**As measured by PlanIQ quality score. Prostate, 3 mm dose grid, 7-beam IMRT, 1-arc VMAT.



Case studies[†]

Adding feasibility to the therapy planning process

University Hospital Cleveland

The clinical team studied the impact of feasibility in cases of complex re-irradiation.

Feasibility provides clear feedback at the onset of treatment planning. The quality of the feasibility plans was equal to, or greater than, manual planning.

Eliminating possible trial and error associated with some manual planning reduced “planning time” an average of approximately 10 hours.^{4*}

“ The time from completing the contouring to a physician-approved plan was shortened as a result of eliminating optimization uncertainties tied to the refinement of dose objectives previously entered manually by the dosimetrist. ”

Seth Duffy, MS, CMD, BSPH
University Hospitals: Cleveland Medical Center SCC

Automated planning to improve quality

Cleveland Clinic Foundation

A major challenge in therapy planning is large variations in plan quality among treatment planners, in part due to varied planning skills and limited planning time.

The clinical team assessed whether Pinnacle automated planning algorithms improve the quality of head and neck (HN) radiotherapy plans, and also the viability of plan quality predictions of this commercial feasibility tool.

Automated planning improves dose coverage of the low-dose planning target volume while dose coverage of the high dose PTV was maintained, reducing dose to critical organs compared to manual plans.

Automated Planning IMRT plans had similar homogeneity indices (HI) and conformity indices (CI); VMAT plans had comparable HI and improved CI to manual plans. Feasibility is a practical solution to improving workflow and plan quality.²



** Planning times were verified via MOSAIQ timestamps from contour completion to final plan review.

† Results are specific to the institution where they were obtained and may not reflect the results achievable at other institutions.

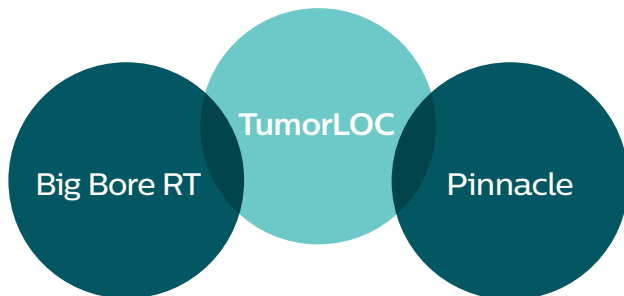
Everything starts with the patient

Pinnacle Evolution is a foundational element in the Philips vision of connecting information in oncology.



Scan and plan with TumorLOC and Pinnacle

TumorLOC allows for workflow integration between the Philips Big Bore RT system and Pinnacle Evolution.

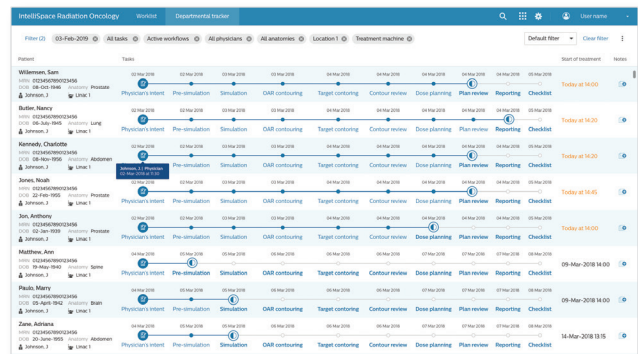


TumorLOC is powered by Pinnacle Evolution.

- Ease of use with a single integrated environment for imaging and simulation
- Create consistent, reproducible set-up from simulation to treatment
- Go directly to treatment with palliative “Sim to Treat” tools
- Eliminate data transfer and repetition of actions by recording planning functions in Pinnacle at the console
- Simulate anywhere and create MIPs, remotely approve, 4D review, create additional IPs and contour ITV's

Integrated workflow with IntelliSpace Radiation Oncology

Philips IntelliSpace Radiation Oncology is an intelligent patient management system, accelerating time from referral of the patient to start of treatment. Pinnacle Evolution, integrated into the foundation of IntelliSpace Radiation Oncology, offers efficient context-sensitive launching into the exact contouring or planning step of the workflow.



Manage complexity

Create a harmonized way of working and transparent communications.

Improve efficiency

Deeply integrate applications, maintaining data integrity and automated workflows.

Enable operational excellence

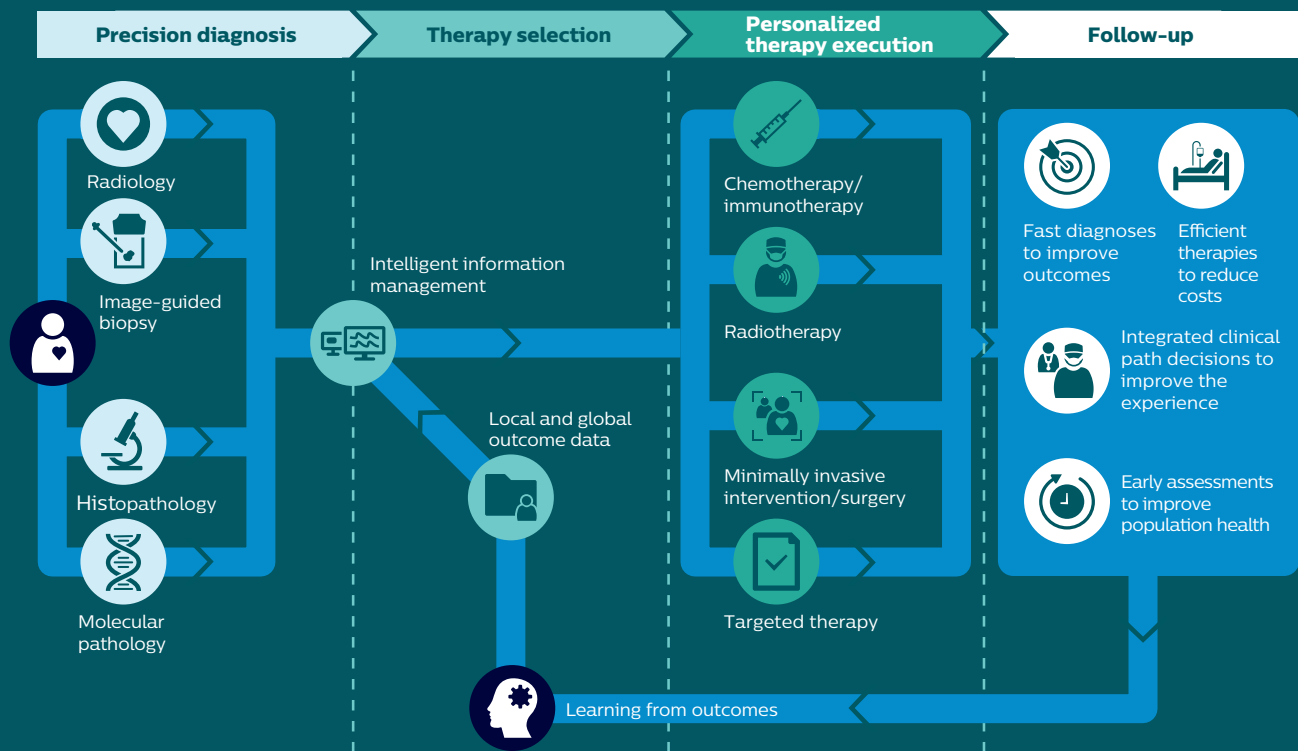
Mitigate risk, document results and discover actionable insights.

Integrated oncology pathways

The Philips vision of connected oncology is to deliver a fully integrated, vendor-agnostic ecosystem to clinicians, enabling them to improve the quality and robustness of oncology care while decreasing inefficiencies and costs.

As a result of this integration and use of patient data from diagnostics to follow-up, clinicians are offered information and tools supporting informed choices and precise decisions.

Integrated solution approaches along clinical pathways



Pinnacle Evolution

The Pinnacle Base License enables an efficient workflow from simulation to 3D treatment planning, including the following capabilities:

- Image review, manual and automatic rigid fusion registration
- Target and OAR contouring and segmentation
- Simulation and beam placement
- Stereotactic planning
- 3D conformal dose computation
- Dynamic planning
- DICOM support for send, receive, and storage of:
 - CT, NM, MR, and PET images, RT plan, structure, and dose objects

Please refer to the DICOM Conformance Statement for more detail.

Personalized planning

The Pinnacle Evolution personalized planning workflow defines feasible, personalized patient goals at the start of the planning process and then creates a treatment plan with automated planning algorithms and optimization in one integrated, easy-to-use interface.

- Integration with functionality found in the Pinnacle Base License
- Select a predefined or user-defined treatment technique for each patient with standard OAR goals
- Review feasibility assessment for determination of a patient's personalized optimization goals based on the patient's unique anatomy and relationship of the target volume to OARs
- Drive proprietary automated planning algorithms with feasible goals to create VMAT or IMRT therapy plans
 - Undo/redo for manually added goal parameters
 - Normal tissue dose control
 - Target dose transitions to either other targets or proximal OARs
 - Progressive algorithms that utilize integrated goal tuning
- Adjust manually, individual goals if needed, in a completed personalized plan to further refine plan quality (warm start)
- Review results with a scorecard of predefined, customized benchmarks or with sample scorecards based on select radiation therapy oncology group (RTOG) protocols
- Includes conventional planning workflow for VMAT or IMRT delivery
 - Manual setting or user defined protocols
 - Selectable prescription to be optimized, dose from additional prescriptions are considered as background dose
 - Iterative review and manual changes to dose plan after each optimization
 - Undo/redo for manually added objective parameters
 - Manual creation of ring, hot/cold spot and other tuning structures

- Investigate plan quality with advanced evaluation tools integrated within the same planning interface
 - DVH zoom tools
 - Point and click to return DVH statistics
 - Side-by-side isodose distribution and DVH comparison
 - Navigate with one click to maximum or minimum point of target or OAR
 - Cine display of control points

IMRT and VMAT treatment optimization

- Philips proprietary IMRT optimization
 - Beam and segment weight-based optimization algorithms
 - General equivalent uniform dose (gEUD)-based biological optimization
 - Dose or dose volume-based treatment objectives
 - Direct optimization of MLC leaf position
 - Combine forward and inverse plans to form a composite plan of the entire patient treatment
 - Define minimum MU, minimum segment area, length and width of control point and number of control points
 - Compute dose at specified depth for QA check of optimized plan
 - Electronic portal imaging device (EPID) QA plan creation capabilities
- User-defined parameters for IMRT or VMAT planning
 - Use either relative or absolute patient set-up information
 - Link individual CT scanner to specific CT density tables

Minimum specifications

Pinnacle Evolution requires the following hardware:

- X5 or X6 Professional or Pinnacle SmartEnterprise server, or
- HealthSuite on Premises (HSOP)

A server or PC is also required for the feasibility calculations, with the following minimum specifications:

- Operating systems: Windows 7 (32- or 64-bit), Windows 8.1 (32- or 64-bit), Windows 10, and Windows Server 2008, 2008 R2 and 2012, or newer
- CPU: 2.4 GHz, multi-core processor (4 cores, 8 threads)
- Hard drive space: software components fully installed require only ~20 MB, but storage requirements for voluminous patient data and archives are much larger and will vary from one clinic to another; a minimum 900 GB hard drive is suggested with larger drives for DICOM archives
- Memory (RAM): 2 GB x number of cores (for example, 8+ GB for 4 cores)
- Display resolution of 1920 x 1080 screen resolution, 24- or 32-bit color depth

References

- 1 Ahmed, et al. Medical Physics 2017.
- 2 Ouyang, et al. J Applied Clin Med Phys. 2019.
- 3 Pinnacle Auto-Planning clinical proof statements. Data on file.
- 4 Duffy, et al. AAMD 2019. Poster.

