

*CyberKnife*<sup>®</sup>

ACCURAY<sup>®</sup>

# MULTIPLAN<sup>®</sup> TREATMENT PLANNING SYSTEM



# THE MULTIPLAN® TREATMENT PLANNING SYSTEM



The CyberKnife® System is the first and only robotic radiosurgery system to offer highly precise and customizable, non-surgical treatment options for a broad range of tumors anywhere in the body, providing the most flexible treatment options.

## THE MULTIPLAN® TREATMENT PLANNING SYSTEM

The MultiPlan® Treatment Planning System enables medical professionals to generate the highest quality treatment plans for the CyberKnife® Robotic Radiosurgery System. Flexible and individualized treatment plans can be created quickly and intuitively, and result in a fast and accurate treatment delivery.

Treatment planning for the CyberKnife System is a multidisciplinary and collaborative process, requiring input from the physicist, the radiation oncologist and the surgeon, among others. The new features and enhancements in the MultiPlan System address the specific needs of each group and provide the flexibility to accommodate new clinical applications with ease.

## VERSATILITY

The CyberKnife System is constantly evolving to cater to the needs of new clinical applications.<sup>1</sup> The MultiPlan System also adapts to these needs by adding new software tools that support the treatment workflow.



## TREATMENT TIME REDUCTION

A treatment time reduction tool, available during plan optimization, allows the user to iteratively reduce the total number of treatment beams and nodes, while still meeting treatment plan objectives.

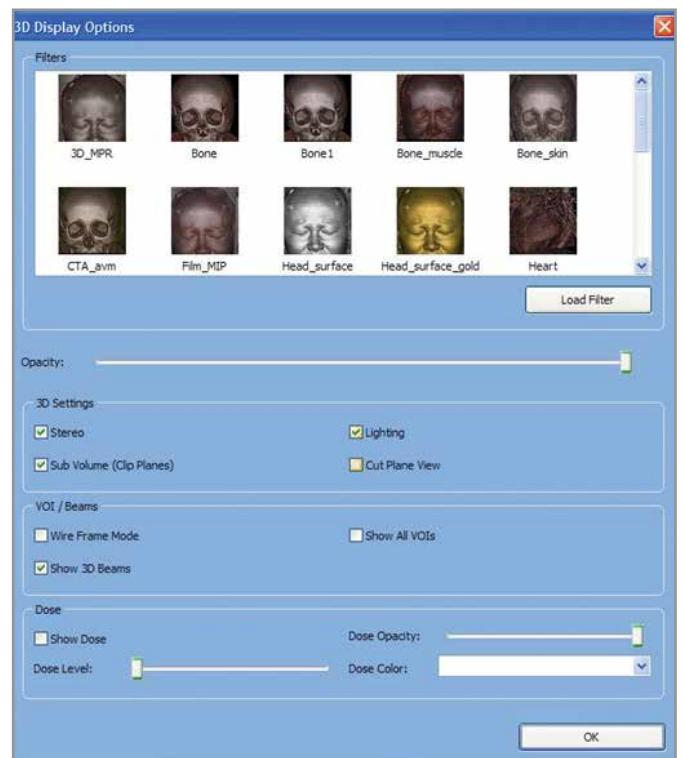
- This tool gives the user the flexibility to plan for SBRT, SRS, or conventionally fractionated courses of treatment.
- Users now have a simple workflow to plan treatments to fit specific time objectives, improving throughput and efficiency

## ADVANCED VISUALIZATION

Reviewing complex anatomical structures and evaluating dose coverage is best performed in three dimensions. The MultiPlan® Treatment Planning System offers Advanced Visualization features, including:

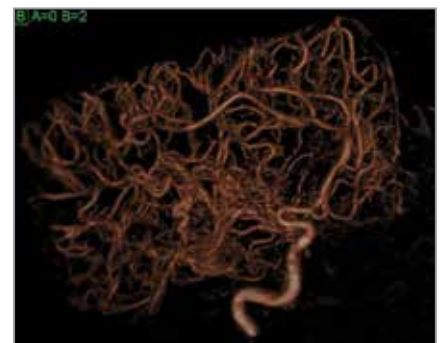
- High quality rendering of image data, dose distributions and contoured structures in 3D.
- The user can apply anatomically-specific filters to the rendered data and can create and save custom filters.

These enhanced 3D views can then be used to better evaluate the quality of contouring and dose coverage.



With the Advanced Visualization feature, the user has the ability to load or create custom preset filters. Display of dose, beams and contoured volumes of interest can also be configured by the user.

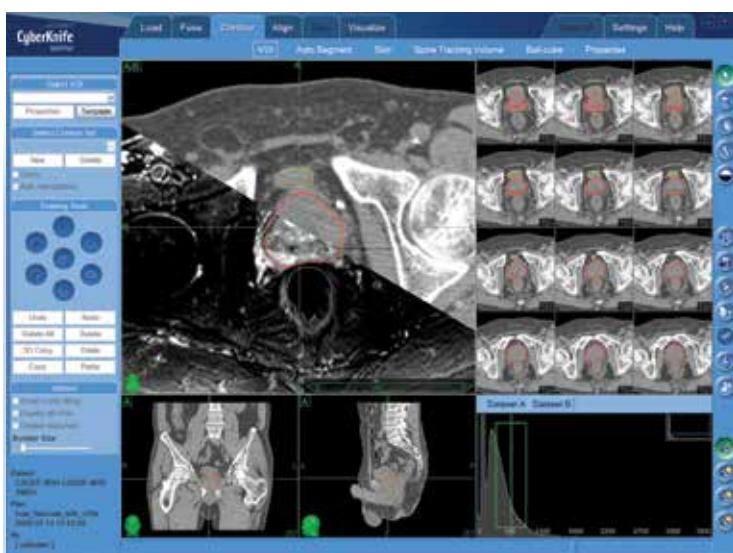
Example of an AVM imaged using 3D rotational angiography



## SIMPLICITY

The MultiPlan® System can create high quality treatment plans quickly and with minimal user input:

- The Iris™ Variable Aperture Collimator<sup>2</sup> and the Sequential Optimization algorithm<sup>3,4</sup> have significantly decreased the time needed to create a treatment plan. Highly conformal plans can be created with fewer total monitor units, so treatment delivery time is also reduced.
- Sequential Optimization can be scripted to enable the user to store planning objectives for use with future similar cases, thereby further reducing treatment planning time.
- Monte Carlo Dose Calculation can be performed in minutes on the MultiPlan System, providing excellent agreement between calculated and delivered dose anywhere in the body.<sup>5</sup>
- Fully-automated fusion, automatic location of fiducials and features such as AutoSegmentation™ and QuickPlan™ further automate the planning process and significantly reduce the need for user input.



The AutoSegmentation option allows automatic contouring of anatomical structures in the male pelvis.

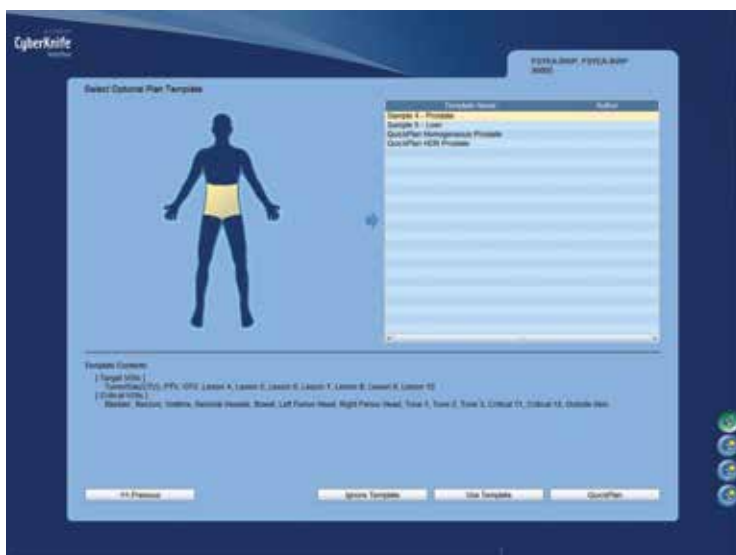
## AUTOSEGMENTATION™

AutoSegmentation is a contouring tool that provides accurate and automatic delineation of targets and critical structures with minimal input from the user. Prostate AutoSegmentation leverages a model-based approach to contour the anatomy of the male pelvis, including the prostate, rectum, seminal vesicles, bladder and femoral heads. Brain AutoSegmentation combines model- and atlas-based segmentation to contour complex three-dimensional intracranial structures in minutes. Both CT and MR data can be used, thus greatly improving clinical workflow.

## QUICKPLAN™

A number of features within the MultiPlan Treatment Planning System lend themselves to automating a large portion of the treatment planning process. The QuickPlan feature available in the MultiPlan Treatment Planning System provides:

- A scriptable Sequential Optimization algorithm
- Enhanced plan template tools for certain anatomical sites
- Automatic image fusion and identification of fiducials



QuickPlan features a one-click plan template.



## INTELLIGENCE

Continuous development of new features and enhancements for the MultiPlan® Treatment Planning System has resulted in increased automation of the planning process. The MultiPlan System integrates seamlessly with all aspects of tracking and treatment delivery using the CyberKnife® System.

- The Monte Carlo Dose Calculation feature is now available in the MultiPlan System for use with both fixed collimators and the Iris™ Variable Aperture Collimator.
- The treatment time reduction tool reduces the total number of beams and nodes while still meeting specified planning objectives, and provides the flexibility to treat with either conventionally fractionated or hypofractionated delivery.
- The MultiPlan System can be accessed from a remote location via the Accuray Treatment Planning Remote Access tool. Plans can be run or reviewed at any time, from any location.
- The MultiPlan MD Suite (physician review station) also allows remote contouring, fusion, treatment plan review or alteration of planning parameters. Because it networks directly to the CyberKnife Data Management System (CDMS), any changes made in MD Suite are immediately updated in the central database.
- The PlanTouch™ software solution extends the reach of the MultiPlan Treatment Planning System's review and approval functions through an iPad. With the flexibility to download and share plans, collaboration within the CyberKnife center is greatly enhanced.



*The MultiPlan MD Suite allows remote physician review, contouring, fusion and adjustment of planning parameters.*

### Benefits

- Quality treatment plans can be generated quickly and intuitively
- Intelligent automation improves clinical workflow
- Treatment plans can be created for a variety of clinical applications, for either radiosurgical or conventionally fractionated delivery

### REFERENCES

1. Fuller DB, Naitoh J, Lee C, et al. Virtual HDR CyberKnife treatment for localized prostatic carcinoma: dosimetry comparison with HDR brachytherapy and preliminary clinical observations. *Int J Radiat Oncol Biol Phys* 2008;70:1588-1597.
2. Echner GG, Kilby W, Lee M, et al. The design, physical properties and clinical utility of an iris collimator for robotic radiosurgery. *Phys Med Biol* 2009;54:5359-5380.
3. Lee C. Sequential Optimization and Iris™ Variable Aperture Collimator: Plan Comparisons, Treatment Planning Time and Ease of Use. European Society of Therapeutic Radiation Oncology. Maastricht, Netherlands; 2009.
4. Schlaefler A, Schweikard A. Stepwise multi-criteria optimization for robotic radiosurgery. *Med Phys* 2008;35:2094-2103.
5. Deng J, Guerrero T, Ma CM, et al. Modelling 6 MV photon beams of a stereotactic radiosurgery system for Monte Carlo treatment planning. *Phys Med Biol* 2004;49:1689-1704.

## RADIOSURGERY DICOM INTERFACE\*

### CENTRALIZED DIGITAL PATIENT RECORD

In a typical oncology department there are many individual systems that each contain specialized pieces of information about a patient. Centralization of the patient's oncology treatment record into a single digital record provides clinical benefits that can be realized immediately.

### TREATMENT CHARTING

The CyberKnife® Data Management System provides the Radiosurgery DICOM Interface to export a patient's CyberKnife treatment plan to the Oncology Information System (OIS) for charting and scheduling, query the OIS for the next scheduled treatment session and export the treatment results following delivery.

Specifically, two DICOM objects that describe the CyberKnife treatment are exported from the Data Management System to the OIS and stored in the digital record. Export of each of these DICOM objects is integrated into existing clinical workflows, providing maximum convenience for the clinician.

1. The CyberKnife treatment plan is sent using the DICOM RT Plan Export function. The treatment plan includes the physician's prescription as well as detailed information about the planned fractions and paths.
2. The CyberKnife treatment delivery record is sent using the DICOM RT Beams Treatment Record Export function. The treatment delivery record includes the total monitor units delivered during treatment as well as detailed information about the delivered fractions and paths.

### BENEFITS

- Eliminates manual data entry of CyberKnife treatment planning and delivery information into the OIS
- Provides an 'up to the moment' record of the delivered treatment, doing away with the need to search multiple systems for information
- Includes CyberKnife treatment planning and delivery information in automated OIS workflows such as scheduling and charge capture
- Enables clinical sites to be one step closer to a 'paper-free' clinical environment

*Note: The correct revision of the Oncology Information System is required for this interface. Contact Accuray or your Oncology Information System vendor for version information.*

# CYBERKNIFE® VSI™ SYSTEM



## HARDWARE



**Robotic Manipulator and Linear Accelerator** – The compact 1000 MU/min 6 MV X-band linear accelerator is capable of being positioned in virtually any direction by a high-precision robotic manipulator with repeatable sub-millimeter accuracy.



**Imaging System** – The low-energy X-ray sources and the flush-mounted detectors create high-resolution anatomical images throughout the treatment. These images are continually compared to previously generated, digitally reconstructed radiographs (DRRs) to determine real-time target location.



**Iris™ Variable Aperture Collimator** – Rapidly manipulates beam geometry to deliver up to 12 beam diameters from each linac position with characteristics virtually identical to those of fixed circular collimators.



**RoboCouch® Patient Positioning System** – Robotically aligns patients precisely with six degrees of freedom, enabling faster patient setup. The Seated Load feature enables simple and comfortable loading of mobility-limited patients.\*



**Xchange® Robotic Collimator Changer** – Automatically exchanges collimators, allowing for greater treatment efficiency.



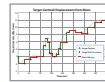
**Synchrony® Respiratory Tracking System** – Continuously synchronizes beam delivery to the motion of the tumor, allowing clinicians to significantly reduce margins while eliminating the need for gating or breath-holding techniques.



**Xsight® Lung Tracking System** – Directly tracks lung tumors without the need of implanted fiducials while maintaining precision, reliability, and self-adjusting accuracy.†



**Xsight Spine Tracking System and Xsight Spine Prone Tracking System** – Eliminates the need for surgical implantation of fiducials by using the bony anatomy of the spine to automatically locate and track tumors. Allowing treatments in either the prone or supine position, spine treatments are more precise and less invasive for a broad range of patients.



**InTempo™ Adaptive Imaging System** – Intelligent, adaptive imaging system designed from the ground up specifically to address the unique challenges of tracking random and excessive target motion.



**Lung Optimized Treatment** – Makes non-invasive lung treatments an option for all lung SBRT patients and offers the optimal accuracy and steep dose fall off required to treat tumors anywhere in the lung, even those close to critical structures. Simulation and comparison workflows, combined with unique tracking modes, allow the clinician to select from multiple non-invasive options.

† Limited to specific tumor size and location

## DATA MANAGEMENT



**CyberKnife® Data Management System** – Provides comprehensive storage and processing of the patient data that is generated during the CyberKnife planning and treatment workflow.



**Report Administration** – Gives easy access to patient and system utilization data, along with a variety of departmental reports. Remote viewing is also enabled via the Report Administration web application.\*



**Radiosurgery DICOM Interface** – This interface utilizes the industry-standard DICOM protocol to export patient treatment plan and delivery information to an Oncology Information System.\*



**Storage Vault** – Hardware for long-term storage of patient records, provides approximately 10 TB of space for up to 5000 patient records. Includes automated storage of patient records based on user specified configurations.\*

\* optional product

For more information on the CyberKnife Robotic Radiosurgery System, please contact Accuray Incorporated.

[www accuray.com](http://www accuray.com)

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The CyberKnife System and CyberKnife options may not be available in some countries. Specifications, features and functionality subject to change without prior notification. For a complete list of CyberKnife Systems and options available, please contact Accuray at [sales@accuray.com](mailto:sales@accuray.com).

## TREATMENT PLANNING



**Monte Carlo Dose Calculation** – Often considered the gold standard for dose calculation, the CyberKnife System's Monte Carlo Dose Calculation produces highly accurate dose calculations in minutes.



**Sequential Optimization** – An intuitive and intelligent plan optimization algorithm for rapidly developing customized treatment plans for the unique clinical objectives of each patient.



**AutoSegmentation™** – Automatically generate accurate contours for intracranial and male pelvic anatomy using both model-based and atlas-based delineation methods. Results can be generated using both CT and MR image information, requiring minimal user input.



**QuickPlan™** – A complete treatment plan is generated and presented to the user for review. The entire planning process is automated based on clinical objectives set by the user, including plan parameters, optimization and dose calculation.

# CyberKnife®



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