

ACCURAY®

# CyberKnife® VSI™



V

With the ability to offer a full range of treatment options, from radiosurgery to high precision radiation therapy, the **versatile** CyberKnife® VSI™ System provides the flexibility to optimize treatments for the unique needs of each patient

S

A comprehensive set of tools to manage every aspect of patient treatment, ready integration into existing institution infrastructure and a logical workflow make the use of the CyberKnife VSI System **simple** and convenient in daily clinical practice



Using **intelligent** capabilities to not only enable expert-level treatments with an intuitive planning process, but also to adapt treatment delivery to the distinct characteristics of each patient with continual image guidance, the CyberKnife VSI System instills confidence that the plan created is the plan delivered

I



## 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. 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 process, requiring input from the physicist, the radiation oncologist and the surgeon, among others. Features are present in the MultiPlan System that address the specific needs of each group. Furthermore, the MultiPlan System has the flexibility to accommodate new clinical applications with ease. The MultiPlan System provides new features and enhancements that further improve the planning process for the CyberKnife System.

### Versatility

The MultiPlan System and the CyberKnife System are constantly evolving to accommodate new clinical applications and technologies.<sup>1</sup>

### Treatment Time Reduction

A treatment time reduction tool, which is available at the time of 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 either hypofractionated delivery, or, if desired, a conventionally fractionated course of treatment. The MultiPlan System has primarily been a treatment planning tool for radiosurgery, which is delivered in five or fewer fractions. With the treatment time reduction tool users now have a simple workflow to plan a treatment consisting of greater than five fractions, making it easy to deliver Robotic IMRT™ with the CyberKnife System.





*Advanced Visualization: The user has the ability to load or create custom preset filters. Display of dose, beams and contoured volumes of interest are also user definable.*

## Advanced Visualization

Complex anatomical structures are often difficult to visualize in traditional 2D views, making it difficult to accurately contour certain structures during the treatment planning process. Likewise, it can be difficult to evaluate dose coverage on a 2D view when a structure changes significantly from one slice to the next. The MultiPlan® Treatment Planning System offers Advanced Visualization to address these issues. The quality and flexibility of rendering image data, dose distributions and contoured structures in 3D has been greatly improved. Image data can now be rendered, in 3D, at native CT resolution. The user can apply anatomically specific filters to the rendered data. For example, apply a filter specifically designed to better visualize AVMs. Users may also create and save custom filters. These enhanced 3D views can then be used to better evaluate the quality of contouring and dose coverage.



*Advanced Visualization: AVM case utilizing CT angiography and 3D rotational angiography.*

## Simplicity

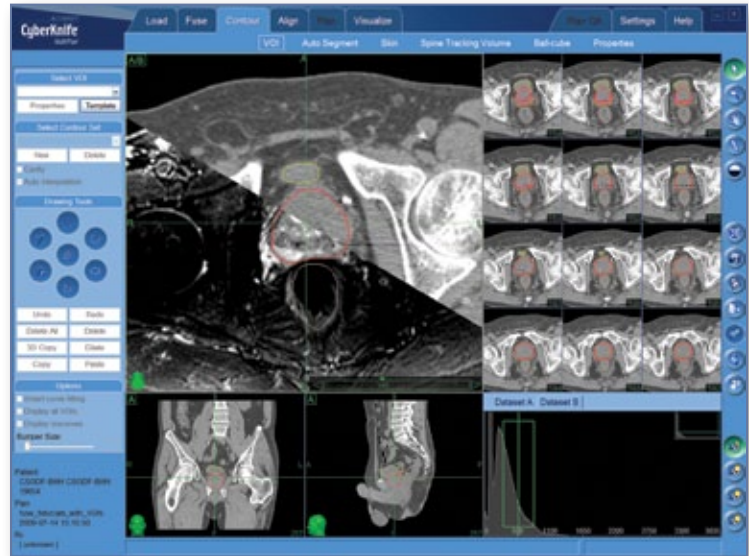
For both robotic radiosurgery and robotic IMRT, high quality treatment plans must be generated in a short period of time with minimal user input. Since the introduction of the **Iris™ Variable Aperture Collimator**<sup>2</sup> and the **Sequential Optimization** algorithm,<sup>3,4</sup> the time needed to create a treatment plan has markedly decreased. Highly conformal plans can be created with fewer total monitor units, so treatment delivery time is also reduced. Sequential Optimization is scriptable. This enables 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 and automatic location of fiducials further reduce the input required on the part of the user. In addition, features such as **AutoSegmentation™** and **QuickPlan™** further automate the planning process and significantly reduce the amount of input required by the user.



## AutoSegmentation™

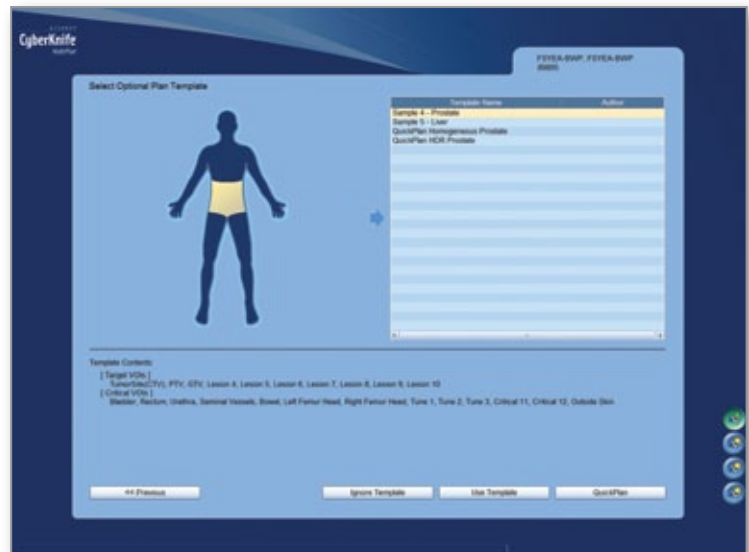
Contouring of structures in the male pelvis is often time consuming, sometimes requiring many edits and iterations before accurate results are obtained. AutoSegmentation™, an automatic contouring tool for the male pelvis, automatically contours prostate, rectum, seminal vesicles, bladder and femoral heads, with minimal input from the user. AutoSegmentation leverages a unique, model-based approach to automated contouring. Both CT and MR data can be used to define the required initialization points, thereby improving the clinical accuracy of the result. Since these structures can now be defined quickly, accurately and with minimal user input, clinical workflow is greatly improved.



*AutoSegmentation: A tool to automatically contour structures in the male pelvis. This is an optional feature in the MultiPlan System.*

## QuickPlan™

A number of features within the MultiPlan® Treatment Planning System lend themselves to automating a large portion of the treatment planning process. The scriptable nature of the Sequential Optimization algorithm, enhanced plan template tools, the ability to automatically contour certain anatomical structures, automatically fuse image series and automatically identify fiducials, all contribute to the creation of the QuickPlan™ feature that is now available in the MultiPlan Treatment Planning System. Since the treatment planning process can now be largely automated, and a completed treatment plan presented to the physician or physicist for their review, CyberKnife® staff can now utilize their time and resources in the clinic more effectively.



*QuickPlan: 1-click screenshot.*



## Intelligence

Continuous development of new features and enhancements for the MultiPlan® Treatment Planning System allow increased automation of the planning process and production of the highest quality plans. The MultiPlan System integrates seamlessly with all aspects of tracking and treatment delivery using the CyberKnife® System.

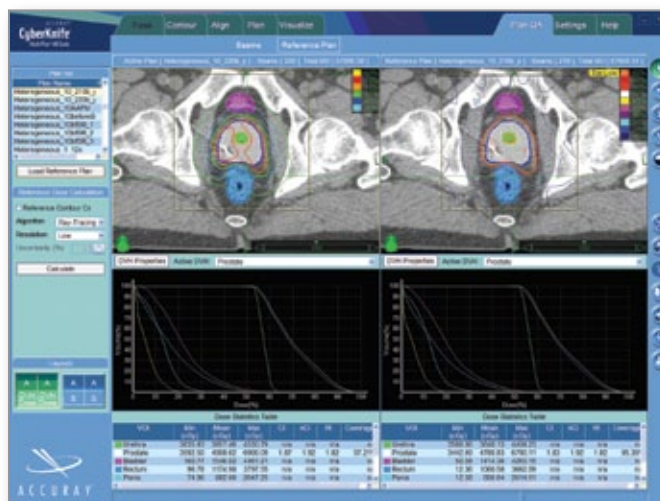
Monte Carlo Dose Calculation, widely accepted to be the gold standard for dose calculation, is now available in the MultiPlan System for use with both fixed collimators and the Iris™ Variable Aperture Collimator.

Highly accurate, fast dose calculation and full **4D Planning** capability ensure excellent agreement between calculated and delivered dose anywhere in the body.

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 Services** tool. This allows plans to be run or reviewed at any time, from any location, at the convenience of the physician or physicist.

The **MultiPlan MD Suite** (physician review station) also allows remote contouring, fusion, treatment plan review or alteration of planning parameters from a remote location. The MultiPlan MD Suite networks directly to the CyberKnife Data Management System (CDMS). Therefore, any changes made in MD Suite are immediately updated on the central database.



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

## Benefits

- The highest quality treatment plans can be generated quickly and intuitively
- Intelligent automation improves clinical workflow
- Versatility to create treatment plans for a variety of clinical applications
- Plans can be generated for radiosurgical or conventionally fractionated delivery

## References

1. Fuller DB, Maitoh 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. Schlaefer 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.



## CyberKnife® VSI™ System



**Robotic Manipulator and Linear Accelerator** – The compact, 1000 MU/min 6MV 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, which are continually compared to previously generated DRR's to determine real-time patient positioning and target location.



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



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



**Xchange® Robotic Collimator Changer** – Automatically exchanges collimators robotically, enabling highly conformal treatments delivered with greater efficiency.



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



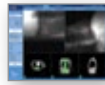
**Report Administration** – The ability to review stored patient and usage data is simple and straightforward with the easy availability of a variety of departmental reports.



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



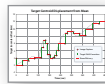
**Synchrony® Respiratory Tracking System** – Continuously synchronizes beam delivery to the motion of the tumor, allowing clinicians to significantly reduce margins while eliminating the need for gating or breath-holding techniques.



**Xsight® Lung Tracking System** – Directly tracks the movement of lung tumors without fiducials while maintaining precision, reliability and self-adjusting repeatability.\*



**Xsight Spine Tracking System** – Eliminates the need for surgical implantation of fiducials by using the bony anatomy of the spine to automatically locate and track tumors, making radiosurgery more precise and less invasive.



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



**Monte Carlo Dose Calculation** – Often considered the gold standard when treating lung tumors, the CyberKnife System's Monte Carlo Dose Calculation produces results in minutes compared to what commonly requires hours or days with other systems.



**Sequential Optimization** – An intuitive and intelligent plan optimization algorithm for rapidly developing custom tailored treatment plans specific to the unique clinical objectives for each patient.



**AutoSegmentation™** – Automatically generate accurate contours for prostate, rectum, bladder, seminal vesicles and femoral heads. Results can be generated using both CT and MR image information, and require minimal user input.



**QuickPlan™** – A complete treatment plan is generated automatically, and the results presented to the user for review. The entire planning process, including the setting of planning parameters, optimization, and dose calculation, is automated. Plans are generated using the clinical objectives predefined by the user.

\* Limited to specific tumor size and location

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

[www accuray.com](http://www accuray.com)  
[sales@accuray.com](mailto:sales@accuray.com)

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).



*Our Business Begins with Patients™*

**Accuray Worldwide Headquarters**

1310 Chesapeake Terrace  
Sunnyvale, CA 94089 USA  
Tel: +1.408.716.4600  
Toll Free: 1.888.522.3740, ext 4337  
Fax: +1.408.716.4601  
Email: sales@accuray.com

**Accuray Europe**

Tour Atlantique 25<sup>e</sup>  
1 Place de la Pyramide  
92911 Paris La Défense Cedex  
France  
Tel: +33.1.55.23.20.20  
Fax: +33.1.55.23.20.39

**Accuray Asia Ltd.**

Suites 1702-1704, Tower 6  
The Gateway, Harbour City  
9 Canton Road, T.S.T.  
Hong Kong  
Tel: +852.2247.8688  
Fax: +852.2175.5799

**Accuray Japan K.K.**

Daini Tekko Building 6F  
1-8-2 Marunouchi, Chiyoda-ku  
Tokyo 100-0005  
Japan  
Tel: +81.3.6269.9556  
Fax: +81.3.3217.0337