TrueBeam Goes Clinical

A Commitment to Safety:
First, Last, and Always

Warp Speed: Accelerating Brachy Dose Calculations with Acuros BV
A Commitment to Safety
Patient safety is Varian’s priority, first, last, and always. Stringent processes are in place to address safety issues, and executives are committed to continuous improvement.

TrueBeam Goes Clinical
Clinicians at the University of Alabama at Birmingham and University Hospital Zurich have become early adopters of Varian’s new TrueBeam™ system for image-guided radiotherapy and radiosurgery.

Guiding Customers into the Future
Varian clinical implementation consulting services help cancer centers transform for the future.

Expanding Treatment Options in Latin America
Cancer patients across Latin America are steadily gaining access to advanced radiotherapy as treatment centers in the region deploy the latest technologies.

Calculating Brachytherapy Dose at Warp Speed
Early research shows that Acuros® BV is enabling clinicians to rapidly calculate doses for brachytherapy treatments with an extremely high level of accuracy.

First Gated RapidArc Treatment
Clinicians at the Istituto Oncologico della Svizzera Italiana have become the first in the world to treat patients with Gated RapidArc® technology.
Patient safety is Varian’s primary consideration, from product design and development to postmarket surveillance. While ASTRO has estimated that radiotherapy treatments are delivered safely and accurately more than 99 percent of the time, we agree with them that even one error is too many. For this reason, Varian has always put patient safety first.

In this issue of Centerline, we’d like to share with you some information about our approach to safety issues. As you’ll read in a more extensive article that starts on page 5, our approach begins with the design and development process. Input from advisory boards, clinical councils, and focus groups is gathered very early in this process. We then utilize a cyclical process of development, testing, seeking feedback and input, and refinement, long before a product is submitted for U.S. FDA clearance and offered to customers.

Varian also engages in an active postmarket surveillance process to spot potential problems as early as possible. For example, we interview early adopters, review product performance with our advisory boards, and search blogs and clinical literature for signs of problems. We use surveys to assess customer satisfaction. And we assign specialists to evaluate and analyze all product improvement requests, complaints, and help desk calls to look for trends or issues that should be addressed. We thoroughly investigate every reported misadministration. And we continually design product improvements on the basis of information gathered from these processes.

In recent years, for example, based on this kind of analysis, we added safety enhancements that include checks designed to verify that essential treatment data are not missing or altered from a plan that has been approved by the authorized clinical staff member. In addition, we’ve made it impossible to proceed with a treatment if the machine instruction sets are not consistent with the particular treatment mode that has been selected. The system requires an authorized person to correct any such discrepancies before a treatment can be delivered.

Nevertheless, perfect patient safety would necessitate perfect products and perfect execution with each and every administration. Our investigations of complaints and accidents have revealed that rare and unusual circumstances—often with multiple, compounding errors—are the most common cause of reportable incidents. In many cases such incidents likely could have been prevented through proper adherence to the clinical quality assurance (QA) process.

An industry-wide call for standardized QA

Because adherence to QA is so important to patient safety, Varian is spearheading a call for a more rigorous and standardized QA process based on the use of mandatory checklists. These checklists would be completed during “time-outs” that would occur at key points during the radiotherapy process. Other medical specialties have used such time-outs successfully to manage and improve safety and the delivery of quality care.

At Varian, we recognize that we have an important role to play in the collaborative effort that has resulted in our industry’s impressive safety record thus far, and will ultimately help us to improve that record even further. For this reason, Varian has taken a leadership position by discussing this issue with a U.S. congressional committee, making presentations to the FDA, and working with the professional societies and other manufacturers to develop plans for further enhancing patient safety. We fully support the efforts being made by our industry associations—AAPM, ASTRO, ASRT, and SROA—to find systematic solutions that can be adopted by all manufacturers and clinicians. The simple objective of radiation therapy is our number one concern: increasing patient survival and minimizing side effects by delivering the right dose to the right place in the right patient. *
Eclipse treatment planning: Gaining speed, enhancing workflow, adding capabilities

In the Eclipse™ release for 2010, customers will find a spectrum of new capabilities and workflow enhancements, starting with the Acuros® XB advanced dose calculation algorithm for external beam treatment planning, which received FDA 510(k) clearance earlier this year.

Acuros XB—Faster external beam treatment planning

The new algorithm enables superior dose calculation at unmatched speed, providing clinicians with a level of dose calculation accuracy previously available only with Monte Carlo calculation techniques, which are slower and more cumbersome to work with.

Varian released a similar algorithm for dose calculations in brachytherapy—Acuros BV—in July of 2009 (see article on page 19). Acuros XB makes the same level of speed and accuracy available for the process of planning external beam radiotherapy treatments.

“Acuros XB has been validated against Monte Carlo approaches and has proven to be highly accurate for a full range of clinical photon beams,” says Anne Razavi, Varian treatment planning product marketing manager. “It gives us the full accuracy of a Monte Carlo calculation, but much, much faster and without the stochastic noise characteristic of Monte Carlo approaches. Medical physicists now have a dose calculation algorithm that can really speed things up when planning treatments involving a large number of fields, which is what you have with RapidArc®. The Acuros XB algorithm is particularly beneficial for planning irregularly shaped tumors near heterogeneous tissues.”

The Acuros XB algorithm is the fastest dose calculation algorithm in Eclipse for RapidArc plans. “A typical RapidArc plan for head and neck takes up to half an hour to calculate on a single machine today,” Razavi says. “That same plan can be calculated in less than 10 minutes using Acuros XB. In combination with a new optimizer that has been developed for RapidArc, these treatment plans can be generated in less than a quarter of the time it takes today.”

RapidArc enhancements

The enhancements to treatment planning for RapidArc radiotherapy are numerous, and include:

- **Planning for up to 10 distinct arcs** for covering large areas with a single treatment plan. “This will make it possible to create multiple-arc plans to cover a large volume, which is what you need for procedures like total marrow irradiation in preparation for a bone marrow transplant,” Razavi says. “Eclipse can now produce a single RapidArc plan with up to 10 isocenters.”

- **A new arc geometry tool** that offers a starting point for RapidArc plans based on clinical information about the patient. “Eclipse will suggest a reasonable field arrangement...
based on the size and location of the targeted tumor,” Razavi says. “That becomes a point of departure for the planner. It’s a ‘leg up’ on the process that reduces the amount of time spent in trial-and-error mode. It also incorporates a simple collision detector.”

- A new PRO3 algorithm, which optimizes RapidArc plans more quickly. “This new algorithm reduces optimization time by a factor of two or more,” says Razavi. “A RapidArc optimization for a head and neck tumor that might have taken 30 to 45 minutes can be completed in 10 to 15 minutes using this new algorithm.”

- A tool for automating how normal tissue dose objectives are specified. “Operators can access and change these parameters at any time during the optimization,” says Razavi, “but they get a solid starting point automatically, based on minimizing dose and avoiding hot spots in healthy tissues that weren’t contoured.”

- Portal dosimetry for RapidArc treatments to enable QA processes that don’t require the use of phantoms or film.

**Tools for rigid and deformable registration**

A new rigid registration workspace allows for better integration of multi-modality imaging into the treatment planning process. Clinicians can work with any combination of MR, CT, PET, and cone-beam CT images. In addition, they can contour directly on PET scans and copy those contours over to the planning CT. “The entire contouring process has been streamlined,” Razavi says. “Instead of contouring PET images slice by slice in a process that took at least 30 minutes, the PET contouring is done automatically in three dimensions within seconds.”

A new SmartAdapt tool allows for deformable registration of structures, as well as editing and structure propagation using CT and cone-beam CT images. “This tool is a big step in the direction of dynamic adaptive radiotherapy, or DART,” Razavi says. “Cone-beam CT imaging reveals changes in anatomy over a course of treatment—tumor regression, for example. With SmartAdapt, clinicians can determine how those anatomical changes affect the dose distribution given the current treatment plan. If the changes are significant enough, the doctor can decide to generate a new treatment plan based on new images.”

The SmartAdapt tool allows for 2D and 3D structure editing and contouring in 3D on CT images. “Recontouring for an adapted plan can be accomplished very quickly,” Razavi says.

**ARIA enhancements: Web-based patient portal and e-prescribing**

Varian’s enhancements to the ARIA® oncology information system in 2010 include important steps toward meeting the EHR certification criteria for helping U.S. clinics qualify for incentive payments under the ARRA/HITECH Act of 2009. Among the latest enhancements are:

- The introduction of Active Patient Portal, developed in conjunction with Cogent Health Solutions, to give patients Web-based access to personal health information contained in their ARIA EMR. “Ensuring that patients have reliable access to their personal health information is a central component of the ARRA/HITECH legislation promoting the adoption and ‘meaningful use’ of healthcare information technology,” says Charmaine Lawrence, product marketing manager.

- E-prescribing for medical oncology.

- A new drug database for contraindication checking for radiation oncology.

- A new lab orders workspace and interfaces that allow electronic ordering and tracking of tests and receipt of results.

- New enhancements that allow clinicians to record advanced directives and infectious diseases. “These features enable the clinician to capture information that is not necessarily related to the cancer treatment, but is important for overall patient care,” says Lawrence. “Having this information available to the clinical staff throughout the department can improve the quality of care.”

All of these enhancements support requirements for meaningful use as recently spelled out by the U.S. Centers for Medicare and Medicaid Services (CMS). Varian is working on additional upgrades to the ARIA software products for medical and radiation oncology so they meet all ARRA/HITECH requirements, and plans to seek accreditation for stage 1 meaningful use in 2011 (see related story on page 16).
New radiotherapy training center opens in Mumbai, India

A new education center dedicated to training radiotherapy practitioners on the safe and effective use of Varian technology for advanced cancer treatment was officially opened in Mumbai in August of this year.

Varian’s new center, equipped with 16 planning system workstations and the VERTual training system for radiotherapy treatment simulations, will enable the country’s growing number of radiation therapists and medical physicists to train without having to travel to overseas establishments.

“Radiotherapy use is growing rapidly here, and we want to do whatever we can to equip the increasing number of practitioners with the experience they need locally,” says Michael Sandhu, Varian’s regional head of operations.

“We also want to make the facility available for other people to use for their own training.”

Vivekanand Tathvadkar, Varian’s India country manager, adds, “In the current economic climate, people are not able to travel as extensively as they used to, so a facility here in India gives them the opportunity to get hands-on experience without leaving the country. We also hope to attract trainees from neighboring countries.”

“There are fewer than 400 radiotherapy machines in India and almost half of these are outdated cobalt machines,” adds Michael Sandhu, “but we are seeing a rapid investment in new equipment. Many Indian hospitals are now able to offer the most advanced treatments available in the world, such as image-guided Rapid-Arc® radiotherapy and radiosurgery.”

According to the Cancer Foundation of India, it is estimated that at any given point of time there are 2.0 to 2.5 million cancer cases requiring cancer treatment in India, and this number is increasing by almost a million new cancer cases each year.

The Mumbai project is Varian’s fifth education and training center globally, following similar initiatives in Las Vegas (USA), Beijing (China), Zug (Switzerland), and Buc (France).

As radical as the best minds in cancer treatment.

You save lives. So does innovation. The TrueBeam™ system gives you the precision and power to manage some of the most challenging cases as treatment options are expanded. Performing both radiotherapy and radiosurgery procedures with exceptional ease, speed and accuracy, this technology lets you unlock new innovations in cancer care. Radical minds deserve radical technology.

For more information, visit us online at www.varian.com/TrueBeam.
Recent news reports have put a public spotlight on the issue of patient safety, both in the realms of radiology and in radiation therapy. In early August, U.S. Senators Tom Harkin (D-IA) and Mike Enzi (R-WY) introduced legislation—the Consistency, Accuracy, Responsibility and Excellence (CARE) in Medical Imaging and Radiation Therapy Act—to establish minimum education and credentialing standards for personnel who plan and deliver radiation therapy treatments and medical imaging services.

“The CARE bill will require national education standards for the professionals that perform medical imaging and radiation therapy to ensure that they are properly trained,” said Enzi in a press release announcing his cosponsorship of the bill. “This bill is vital to improving patient safety and health care quality.”

Varian supports the CARE bill or any similar legislation, and company executives also realize that enhancing patient safety is a multifaceted issue. In a statement made earlier this year, the American Association of Physicists in Medicine (AAPM) asserted: “The delivery of radiation therapy has evolved into a technologically sophisticated, computer-driven process that... requires the coordination and participation of teams of human beings interacting with complex technology.” Consequently, safety is a collaborative process, and all stakeholders—manufacturers, regulators, and clinicians—play an important role.

This article offers information about Varian’s commitment to safety, describes the mechanisms and processes currently in place to address safety issues, and details plans for future enhancements. “Constantly improving safety at every point we touch is a major priority at Varian,” emphasizes Karla Donohoe, senior director of marketing at Varian.
Safety designed in

Safety for Varian is a major focus throughout the entire product life cycle, starting with the design and development of new products (see Figure 1). Throughout the development process, Varian collaborates with clinical experts, seeking their input as a new product evolves. In a recent example, when RapidArc® radiotherapy technology was being developed, Varian formed the RapidArc Council of clinicians and researchers from 11 sites around the world. These clinicians worked with Varian developers to improve the initial design to better meet clinical needs. They then evaluated numerous prototypes of the product, and based on their feedback, Varian made improvements. This cyclical process of design review, evaluating, testing, feedback, and refinement continued over a period of three years, with more than 20 iterations of the product prior to commercial release.

Preparing for FDA submission

Throughout the design and development process, Varian teams conduct detailed risk analyses, as well as verification and validation tests, in order to demonstrate that the product is safe and effective for use and will perform as designed and intended. These activities are meticulously documented in order to meet the requirements for a 510(k) market clearance from the U.S. Food and Drug Administration (FDA).

Risk analysis

Risk analyses are performed using well-established methods for evaluating potential problems and making design changes to mitigate the risks accordingly. Cross-functional teams with clinical, engineering, and regulatory expertise use formal risk analysis processes to identify potential hazards, their causes, and the potential risks to patients and operators. These risk analysis processes include a "bottom-up" approach that assumes hypothetical defects and a "top-down" approach that applies actual use cases. Any identified inadequacies are eliminated or mitigated through design corrections or other forms of mitigation prior to commercialization.

As an example, the bottom-up technique helps for analyzing what may happen if you assume that a component of the linear accelerator control system were to fail to set the appropriate beam energy. The top-down technique is an exemplary method for determining, for example, what hazards may arise from the incorrect use of the energy selection function. Both of these complementary techniques can be used when performing risk analysis for Varian products.
Verification and validation testing

According to the FDA, verification and validation are “associated concepts with very important differences.” Varian pays careful attention to both during the product design and development process. Verification testing enables Varian product developers to make sure that design requirements are being fulfilled, and that the product will operate as intended by producing objective evidence that specified requirements have been fulfilled.

Validation testing follows successful verification testing. The FDA describes validation testing as the “cumulative summation of all efforts to assure that the design will conform to user needs and intended uses.” At Varian, cross-functional teams comprising clinical, engineering, product development, and regulatory personnel conduct extensive validation testing in order to confirm and demonstrate, through objective evidence, that the product performs consistently as it was designed to do. One can think of verification testing as answering the question, “Did we build the thing right?”, while validation testing answers the complementary question, “Did we build the right thing?”

Verification and validation testing are part of the complete cycle of product development. As high-level requirements are refined via interaction with the clinical community, engineers translate these clinical requirements into design specifications guided by risk analysis. When the device is built, it is tested to see if it works as designed (verification) and tested further to see if it works as intended (validation). This closes the loop with the original clinical requirements. For TrueBeam™, Varian submitted more than 400 pages of risk analysis and 1,500 pages of verification and validation test records in connection with its submission for FDA 510(k) clearance. This quantity of material directly reflects the scope of Varian’s risk analysis, verification, and validation testing program.

Postmarket surveillance

The process of enhancing product safety continues long after the product is released to the market. To enhance product safety and performance, Varian monitors a variety of different information sources to collect extensive amounts of product feedback. Product specialists observe and interview the early adopters to learn as much as possible about actual clinical use in order to identify any issues that could affect patient safety or clinical efficacy. They survey customers and monitor professional communication channels such as blogs and list servers addressing the medical physics and radiation therapy communities. They vigorously analyze all product improvement requests, complaints, and help desk calls to spot trends that might reveal product issues that need to be addressed. Finally, they thoroughly investigate every reported misadministration.

The information generated from postmarket surveillance becomes the basis for designing product improvements. For example, such analyses led to system enhancements that prevent treatments from proceeding on a Varian system if necessary data are missing.

Current safety features and systems

A Varian radiotherapy system incorporates multiple safety features designed to assure safe and effective use of the product and the completion of the treatment prescribed by the radiation oncologist. All users are familiar with the most basic safety systems such as emergency shutoffs—large red buttons—that are present on the equipment, operator console, and walls of the treatment room, as well as the hardware interlocks that prevent the systems from being used if a fault is discovered. Not as obvious are the numerous safety features woven into the design and operation of the software components of the integrated treatment management system.
Varian’s current treatment management system comprises three products: Eclipse™ treatment planning, the ARIA® oncology information system, and the 4D Integrated Treatment Console. Eclipse and ARIA share a common database containing patient, treatment plan, and imaging data. The 4D console communicates directly with this database to guide treatment on the delivery device and send records of completed treatments back to the database. The common database eliminates the chance of error that can occur whenever data is imported and exported.

Varian systems also include user rights management features that allow only authorized users to perform certain functions during the treatment process such as approving and making changes to treatment plans. At several points in the radiotherapy process, Varian systems provide critical data for quality assurance checks that are performed by the medical physics staff prior to treatment.

Patient treatment plan parameters are automatically sent from the ARIA system to the linear accelerator console, eliminating any opportunity for introducing a human error during the transfer. At numerous points along the way, the treatment management system performs continuous consistency and integrity checks of the data that flow through the system during a multistep radiotherapy treatment process. These checks occur to verify that all critical pieces of data are present before a treatment is allowed to proceed. The system also checks to make sure that the particular patient’s treatment plan matches with the requirements and capabilities of the treatment machine and prevents the start of treatment if there is a discrepancy. Beam modifying accessories and other key parameters of the actual treatment are automatically checked against the original treatment plan, and treatments cannot proceed if any mismatch is detected. Only an authorized user can override these locks using their unique username and password combination.

Varian systems incorporate additional redundant safety features to ensure that key components of the devices are operating correctly. Varian’s linear accelerators have two independent dose monitoring systems that monitor the intensity and uniformity of the treatment beam. An interlock stops the treatment if any beam parameter falls outside predetermined limits.

Finally, Varian systems record and retain key data during the actual treatment so that, in the event of a premature shut-down, the radiation oncologist and medical physicist can precisely reconstruct the treatment and complete it accurately. Critical aspects of the treatment are displayed on a treatment console to be monitored by the radiation therapist during a treatment. These are just a few of the numerous safety features in treatment delivery software and hardware systems from Varian.

Training and education

In addition to taking a constant-improvement approach to the company’s products, Varian is fully committed to providing clinicians with comprehensive training programs in the safe and effective use of Varian technology. Varian takes a “blended learning” approach, utilizing classroom training, on-site clinical support, and remote learning options including webinars with clinical experts from around the world. Varian operates education centers in Las Vegas, Nevada; Beijing, China; Zug, Switzerland; Buc, France; and, as of this year, Mumbai, India.

“Our training, education, and help desk teams comprise more than 210 clinically experienced personnel—people who speak more than 15 languages—to facilitate the transfer of knowledge for safe and effective use of our systems.”

Kolleen Kennedy, vice president of Varian Customer Support Services

Varian Customer Support Services vice president Kolleen Kennedy meets with guests at the opening of Varian’s new education center in Mumbai.
“Our training, education, and help desk teams comprise more than 210 clinically experienced personnel—people who speak more than 15 languages—to facilitate the transfer of knowledge for safe and effective use of our systems,” says Kolleen Kennedy, vice president of Varian Customer Support Services. “They are careful to address safety issues throughout our training programs and also through our clinical consulting services with sites deploying Varian technology.”

Looking toward the future

Varian has been working with other manufacturers and with industry associations to develop a plan for further improving patient safety. For example, Varian is actively collaborating with the Advanced Medical Technology Association (AdvaMed) and Medical Imaging & Technology Alliance (MITA) on an initiative to implement additional safety features on an industry-wide basis. It seeks to add three checkpoints to help ensure proper treatment:

• First, radiation therapy pretreatment quality assurance verification and approval would block treatment from proceeding if QA approval for the initial or modified treatment plan has not occurred.
• Second, verification of beam modifying accessories would block treatment from proceeding if the proper placement of beam modifying accessories has not been verified.
• Third, patient positioning confirmation would require that the operator compare an image of the patient in the correct treatment position with the actual patient at the time of treatment.

Varian has already implemented important aspects of the initiative. For example, the treatment plan must be approved in the treatment management system for RT to proceed. Also, all of Varian’s devices require verification of proper placement of beam modifying accessories. Operators have the option of including an image of the patient in the proper treatment position.

Additionally, Varian is working as part of the Clinical Council on Patient Safety to investigate the viability of mandatory checklists, “time-outs” (or “pause points”), and other methods of improving patient safety. Time-outs are used successfully in other complex systems subject to human error, such as surgery and aviation. A recent article in the *New England Journal of Medicine* reports the use of a mandatory checklist in the surgical arena significantly decreased both the rate of death and the rate of postsurgical complications.

“Varian supports the idea of RT checklists that enforce the execution of specific QA tasks to complement existing QA procedures and help increase process compliance,” says Corey Zankowski, senior director of product management. “These checklists would be implemented manually at first; however, we are planning to integrate them into our RT software products in the future.”

“Varian is proud of the accomplishments we have achieved in improving patient safety over the years, but we have no intention of resting on our laurels. We remain committed to a process of continual improvement.”

Karla Donohoe, senior director of marketing

TrueBeam Goes Clinical: Profiles of Two Early Adopters
“So far, it seems pretty stellar,” says Chris Dobelbower, MD, PhD, radiation oncologist at the University of Alabama at Birmingham (UAB), one of the first centers in the United States with the TrueBeam system. “TrueBeam is perfect for what we want to do—deliver efficient, quality patient care. And for patients with medically inoperable liver and lung lesions, it just may enable us to offer them something we couldn’t in the past.”

The TrueBeam system enables a radically different approach to treating cancer with IGRT. It incorporates numerous technical innovations that dynamically synchronize imaging, patient positioning, motion management, and treatment delivery during radiotherapy or radiosurgery, opening the door to new possibilities for the treatment of lung, breast, prostate, head and neck, and other cancers. The system delivers dose up to four times as fast as any other linear accelerator, and streamlines workflow to significantly reduce the number of steps needed to complete a treatment.

**University of Alabama at Birmingham**

Clinicians at the UAB Department of Radiation Oncology acquired TrueBeam because they wanted a system for delivering body and frameless brain radiosurgery along with conventional treatments. “TrueBeam was appealing because of its new architecture that allows higher dose rates and higher-quality imaging,” says John Fiveash, MD.

**From IMRT to hypofractionation to gating**

In selecting patients for treatment on the TrueBeam system, the clinical team at UAB has been moving through a progression of cases, starting with IMRT for head and neck, brain, paraspinal, and prostate cancer. They then moved on to hypofractionated brain cases, delivering five to six fractions using standard dose rates. The next step was gated SBRT for a metastatic adrenal lesion, followed by Gated RapidArc® SBRT for a liver tumor. The latter two were delivered using the system’s 10X High-Intensity Mode. “Another goal is to use Gated RapidArc radiosurgery for treatments in the lung,” says medical physicist Richard Popple, PhD. “By combining the increased speed of arc therapy with the further reductions in treatment time that a high dose delivery rate can help to achieve, we hope to develop lung treatments that couldn’t otherwise be delivered.”

As a step in this direction, Dobelbower recently used the TrueBeam system to treat a case of recurrent lung cancer. “The goal of the therapy was to control the disease in [the patient’s] chest and give her a break from chemotherapy,” he says. “I chose to treat her on the TrueBeam system because we could deliver her complicated, gated, multifield IMRT plan in only a few minutes. The gating feature was useful to account for tumor motion (as opposed to increasing the target volume), thus sparing normal lung tissue. The use of High-Intensity Mode allowed the treatment to be delivered rapidly. This minimized the time that the patient had to be on the table. I believe that both of these features improved our patient’s comfort and well-being.”

Since its introduction in April of this year, Varian’s TrueBeam™ system for image-guided radiotherapy and radiosurgery has been deployed at a number of treatment centers around the world, and early adopters are finding a lot to like.
Several weeks later, Christopher D. Willey, MD, PhD, was looking for a way to help a patient with both colon and non–small cell lung cancer that had been brought under control. A rising CEA level, however, led to the discovery of a solitary right-sided adrenal lesion that proved, via biopsy, to be a non–small cell lung cancer metastasis. “The tumor actually grew during his chemotherapy,” Willey says. “Surgery was not an option, so we offered SBRT using the TrueBeam system.”

The patient received 54 Gy delivered in three fractions on nonconsecutive days over an eight-day period. The treatment—an eight-field plan that included noncoplanar fields—was delivered using the 10X High-Intensity Mode. “It was phase gated 40 to 60 percent, so the maximum dose rate reached during each breath was about 1,850 to 1,950 MU per minute,” Willey says. “The beam-on time, including a second cone-beam CT image after the first five fields, was 24 to 26 minutes for each day. Using other systems, I suspect the same treatment would take closer to two hours.”

**Workflow issues and shorter treatment times**

Ronnie Hathorne, radiation therapy manager at UAB, thinks these reductions in treatment time are going to be essential for department planning. “Think about the impact on the clinic and the practice,” he says. “A normal gated lung treatment with intrafraction filming can take an hour to an hour and a half—and that’s if things go well. We’ve had cases when we’ve been able to complete 60 percent of a treatment and had to stop for some reason, and that can really disrupt the entire day.”

Hathorne explains that traditionally, doctors have to deal with a tradeoff between effective gating and treatment time. “If you choose a window that allows you to have the beam on longer, you shorten the treatment but treat more healthy tissue. That could mean more side effects,” he says, pointing out that TrueBeam, with its Gated RapidArc and Intrafraction Motion Review—the ability to generate images during a gated treatment—will allow UAB clinicians to decrease the gating window to treat less tissue and still finish significantly faster.

Shorter prostate cancer treatments may also be in the cards. “It’s possible we could use the High-Intensity Mode at 2,400 monitor units per minute to treat prostate cases and achieve a significant reduction in treatment time,” says Popple. “There is nothing special about High-Intensity Mode that limits it to radiosurgery applications.”

**One-button IGRT with auto field sequencing**

Nathan Jordan, lead radiation therapist at UAB, says: “We’re getting used to the TrueBeam system and really liking the way the workflow goes. It seems user friendly because of the way each step is laid out. You can actually watch the patient the whole time rather than operating the machine, turning on the beam for each field,” he says, describing the auto field sequencing capabilities of the system. “It’s like the difference between a vehicle’s automatic transmission and a manual,” adds Hathorne. “For example: you don’t have to set the windowing levels and collimate to whatever you’re going to be imaging every day, even though it’s exactly what you did the day before for that same patient. Some parameters are saved from day to day, so you have a leg up when you start.”

**University Hospital Zürich**

The radiation oncology clinic at the University Hospital Zürich (UHZ) treats 1,300 new patients per year. Between March and July 2010, doctors at UHZ used a TrueBeam system optimized for image-guided radiosurgery to treat about 60 patients.

“The system is astonishingly easy to use,” says Urs Martin Lütolf, MD, clinical director and chairman of the department of radiation oncology at UHZ. “You do your initial positioning, take your images, and correct for any small deviation you have with submillimeter accuracy, all very quickly.” Speed has been a particular benefit for brain tumor patients who would otherwise have been treated with a frame-based system, where stereotactic treatments could take over an hour per fraction. “We cut that down to a maximum of 20 minutes,” Lütolf says, “so it’s taking us one-third of the time. Our measurements suggest that we have also increased our targeting precision by a factor of two.”

**Intracranial and extracranial stereotactic treatments**

The department has been emphasizing intracranial and extracranial stereotactic treatments in choosing patients because of the TrueBeam system’s extensive imaging capabilities as well as the high-definition multileaf collimator. In addition to brain cancer, UHZ clinicians have also treated both lung and liver cancer using the system. The patients are chosen from among those who have been deemed inoperable by UHZ surgeons and referred for radiotherapy.
“For lung cancer, we are treating a volume that encompasses the whole movement of the tumor during breathing,” Lütolf says. “We started using normal fractionation schemes; our plan in the very near future is to implement a high-dose hypofractionated protocol. There is data showing that this approach can yield excellent tumor control. So, at four times twelve gray, you can decrease the number of times the patient must come in for treatment, and if these are well executed, there doesn’t seem to be a great danger of increased toxicity.”

Head and neck and prostate cancer treatments
Other disease sites treated so far include head and neck and prostate cancer. “We are transferring cases where we think additional imaging will be an advantage,” Lütolf says. “Cone-beam CT imaging on TrueBeam is a convenient process and the position we achieve is extremely good. Our next step will be to apply TrueBeam’s motion management interface and advanced imaging capabilities to monitor prostate motion and organs at risk.”

The hospital is participating in an international trial of hypofractionated treatment for prostate cancer—the Conventional or Hypofractionated High Dose Intensity Modulated Radiotherapy for Prostate Cancer (CHHIP) trial. At UHZ, all patients in the trial are being treated on the TrueBeam system. “We are using TrueBeam’s more extensive imaging to be sure that we hit the prostate at its full volume each time,” says Lütolf. “We could do treatments for this study on other systems as well, but we believe the increased precision of the TrueBeam system for positioning patients is the way to go.”

High-Intensity Mode
The UHZ team has experimented with the use of High-Intensity Mode, delivering flattening-filter-free beams at the lower end of the available dose spectrum as a prelude to using these at up to 2,400 MU per minute in the future. Beams generated without a flattening filter have a peaked profile with a high dose rate in the middle of the beam and a steep fall-off at the edge of the field. The High-Intensity Mode utilizes this type of beam.

“I think the High-Intensity Mode is very exciting. At the highest dose rates, we could reduce the length of treatments to one-fourth the amount of time needed at lower dose rates. We’ll be completing a six- or seven-minute procedure in less than two minutes.”

Urs Martin Lütolf, MD, University Hospital Zürich

According to Lütolf, radiotherapy systems that take significantly longer to deliver a treatment create a problem that they then need to solve. “Longer treatments that take an hour or more—those systems have to spend even more time periodically checking on the patient’s position, observing any changes, and making corrections to make sure that, after 40 minutes, you’re still targeting the right spot,” he says. “This is not an issue when treating on a TrueBeam system.”

Lütolf likes the system’s tight integration of all the controls at a single console. “It’s a big step forward,” he says. “From the technician’s perspective, instead of having to interact with three or four monitors, you have everything in one view. It’s easy to follow exactly what’s going on, even for a person who is not familiar with operating the console—like me. It’s what we expect from modern design.”

First TrueBeam Treatment at Stanford
On September 16, clinicians at Stanford delivered the first of a four-fraction SBRT treatment for stage I non–small cell lung cancer using their newly installed TrueBeam™ system. It consisted of a two-arc RapidArc® treatment using the 6X High-Intensity Mode and a dose rate of 1,400 MU/min., according to Max Diehn, MD, PhD, assistant professor at the Stanford Cancer Center.

“Once we adjusted the patient’s position based on the cone-beam CT, treating the two arcs took only about three minutes,” Diehn says. “I’m eager to start using Gated RapidArc for SBRT treatments in the thorax, which we will be able to do in the near future. This will allow us to shrink the target volumes for our SBRT lung treatments even further and to spare more normal tissue.”
“To do this right, we need a guide,” Kim Wolpert realized. Freeing a radiation oncology department from a dependence on paper records and processes wasn’t going to be easy. Wolpert, the radiation oncology administrative director at Decatur Memorial Hospital, in Decatur, Illinois, came to this realization after visiting several other departments that had already made the transformation to a paperless environment.

A community hospital goes paperless

“During those site visits, I recognized the profound change that going paperless would mean for us,” Wolpert explains. “Every process would be affected, so it was important to do it right.”

The help that Decatur Memorial needed came in the form of Varian clinical consulting services. In less than four months in mid-2009, the radiation oncology department went from paper-laden to paper-free for all new patients.

Decatur Memorial Hospital is a 356-bed hospital serving a community of 196,000 people. In 2008, it became one of the few hospitals in the United States to go entirely electronic with a physician order-entry system for inpatients. In 2009, the radiation oncology department was ready to follow suit with an electronic medical record (EMR) that would eliminate all paper, including charts, forms, checklists, and even post-it notes. Treating 45 patients a day, the department is equipped with advanced Varian solutions, including the Novalis Tx™ radiosurgery platform, RapidArc® technology, Eclipse™ treatment planning, and the ARIA® oncology information system, which initially had been used mainly for scheduling.

Going paperless was the means to bigger ends. It would improve the legibility of the patient record, enhancing safety. With no physical files lying around, the confidentiality of patient data would be more secure. From the business standpoint, the department would improve revenue with more efficient billing, reduce the high cost of off-site storage, and qualify for new financial incentives from the government for the “meaningful use” of an EMR. Most of all, the department wanted simultaneous access to patient data.

“We created a spaghetti map of our department showing how much time was spent looking for charts each day. We even had big magnetic boards for tracking the charts of every new patient,” recalls Wolpert. “With the electronic record, a physician, dosimetrist, physicist, and receptionist can all access the same record at the same time.”

Getting to this efficiency requires careful groundwork. “You have to figure out what will drive your workflow instead of the paper chart,” says Wolpert. For this a consultant who understands the clinical environment is indispensable. “All our consultants have a clinical background,” says Rob Thibault, manager of clinical implementation consulting at Varian.
Chad Guenther, the Varian consultant who worked with Decatur, visited the department to learn its processes and workflow. He evaluated the paper chart and all other departmental documents, and he interviewed key staff members from every functional group. He mapped current processes and created a plan and schedule showing when the processes would become electronic. He worked with Wolpert to translate their more than 100 documents into an efficient electronic workflow. He also met with the hospital information systems department about hardware, software, and network requirements. “We call Chad ‘The Wizard,’” says Wolpert. “He customized ARIA to meet our needs, not the other way around.”

The department has been paperless since July 15, 2009. “Many departments will use ARIA for recording patient demographic information and managing treatment planning, but they continue to enter doctors’ consultation notes or dictations into a paper chart,” says Guenther. “The Decatur folks do everything online in ARIA, soup to nuts, from patient intake on the first day to running outcome reports on the back end.”

As a result, workflow is more efficient because it is now driven by tasks, says Wolpert. “Probably the greatest impact of improved efficiency is at the treatment machines. It allows therapists to pay attention to what is important, which is the patients and the safe delivery of their treatments.”

A regional center transforms for growth

Almost 700 miles away, clinicians at the John B. Amos Cancer Center in Columbus, Georgia, were looking into options for upgrading their technology, with several goals in mind. Primarily, they wanted to advance the quality and efficiency of care so they could treat an increasing volume of patients. They wanted to offer patients the most advanced radiation treatment options available and add a stereotactic radiosurgery service. They also wanted an integrated electronic medical record that would allow them to go paperless throughout the cancer center. They believed the best way to accomplish these goals was through an integrated system with one source of accountability for all the elements.

The project, now under way, is to replace three Elekta linacs with three Varian systems, replace Pinnacle with the Eclipse treatment planning system, and replace MOSAIQ with the ARIA oncology information system. “At more than US$10 million, the project represents a huge commitment for our organization, especially during these economic times,” says Matt Sherer, MBA, MHA, administrative director. “With a project of this size, we were looking for someone to be a true partner with us as we move forward.”

The center went live with ARIA Clinical Assessment and Dynamic Documents at the beginning of June. “We had lots of online and on-site training before our ‘go live,’” says Sherer. “We worked internally to evaluate our processes and how we could improve them, and looked at how ARIA could help us improve them as well. With all of this effort, we were able to see all of our on-treatment patients (about 80) on the first day and document their visits in ARIA.”

“With a project of this size, we were looking for someone to be a true partner with us as we move forward.”
Matt Sherer, John B. Amos Cancer Center
With the ARIA system, the radiation oncology department has improved its efficiency. Sherer reports that patients move more efficiently through the system, and caregivers are able to spend their time more efficiently as well. He expects to eliminate the last vestiges of temporary paper within weeks.

“I can’t say enough good things about Martha Jones, the consultant who worked with us,” says Sherer, who maintains that, to be a real partner, a consultant has to be a coach, a leader when appropriate, a cheerleader, and a fearless communicator. Jones, a consultant with 20 years of experience as a radiation therapist, has been all that. “She and the rest of the Varian team want to make sure that we’re successful in our projects,” says Sherer.

Clinical implementation services answer a growing demand

These two centers are in the vanguard of the paperless revolution. At an announcement of final government rules for the meaningful use of electronic health records (EHRs), Kathleen Sibelius, secretary of the U.S. Department of Health and Human Services, noted that only 20 percent of hospitals and 10 percent of physicians use basic EHRs, and she expressed hope that more provider groups will embrace the new standards. To assist cancer care centers, Varian’s consulting services group is developing programs to help customers use ARIA to achieve meaningful use of electronic medical records so they can qualify for payments under the American Recovery and Reinvestment Act (ARRA).

While EMR implementations are accelerating, Varian offers other clinical implementation consulting services as well. These include migration to Varian technology from other systems, new site installation for one or more sites, and overall process evaluation. Varian Medical Systems now offers its clinical implementation consulting services in Europe and Australasia as well as North America. By operating with greater efficiency, departments may more easily introduce advanced treatments and reduce the time and cost of providing the best possible patient care.

NOW WE KNOW
Varian gears for EHR certification in the United States

U.S. healthcare providers now know what they must do to receive incentive payments for the “meaningful use” of electronic health records under the 2009 HITECH act. In July 2010, the Centers for Medicare & Medicaid Services (CMS) and the Office of the National Coordinator for Health Information Technology (ONC) released initial standards, implementation specifications, and certification criteria for EHR technology.

The incentives for EHR certification are substantial: up to US$44,000 over a five-year period for private practice oncologists, and as much as US$2 million for hospitals. Penalties for failing to implement certified EHRs, in the form of lower Medicare payments, will start in 2015. Now that the certification guidelines have been published, Varian is working on programs to help customers implement the ARIA oncology information system in a way that meets the guidelines. Look for assistance from Varian in the following areas:

• ARIA upgrades that close any gaps in functionality
• Upgrade assistance and training in how new ARIA features can support efforts to comply with the meaningful use guidelines
• A variety of consulting services, including gap analysis, implementation of existing and new ARIA features based on the meaningful use guidelines, process redesign, and workflow optimization
• ARIA reports designed to monitor and measure compliance with EHR meaningful use criteria

Nancy Heifferon is a freelance healthcare writer.
Cancer patients across Latin America are steadily gaining access to advanced radiotherapy, as treatment centers in the region step up efforts to deploy the latest RT technologies.

Across the region, centers are investing in scalable radiotherapy delivery systems and software that will enable them to upgrade patient care by gradually adding capabilities like intensity modulation (IMRT), image guidance (IGRT), RapidArc® radiotherapy, and in some cases even stereotactic approaches like SBRT and SRS.

"In preparation for advancing along this continuum, we’re seeing more widespread adoption of technology systems that make it possible to serve patients now while preparing for the future," says Brett Jackson, head of Varian’s Latin America sales operation. "Customers are procuring an IGRT-enabled delivery system from Varian, developing familiarity with Eclipse™ treatment planning, and then, as funding and training become more available, using these tools to unlock advanced capabilities for their patients.”

Three treatment centers in Brazil, Colombia, and Mexico are representative of this trend. All three have invested in Varian technology for planning and delivering advanced treatments. All three are meeting the challenges of gearing up to offer patients more treatment options. And all three are committed to making state-of-the-art cancer treatment more accessible to the people of Latin America.

**Radium Instituto de Oncologia, Campinas, Brazil**

The Radium Instituto de Oncologia, a private clinic under the direction and ownership of Carlos R. Monti, MD, is working to bring advanced treatment options to the people of Campinas, Brazil, about 80 kilometers north of São Paulo. Radium serves a metropolitan area of four million people. There, some 20 patients per day now receive IMRT or IGRT treatments planned with Eclipse. The center also offers high- and low-dose-rate brachytherapy, treating about ten prostate LDR, four prostate HDR, and eight gynecological HDR cases each month.
“Eclipse is a good choice for my clinic because it is very comfortable for the physicist and very fast to do many alternate plans.”

Carlos R. Monti, MD, Radium Instituto de Oncologia

Monti feels that, although Brazil treatment centers face logistical and financial hurdles when upgrading radiotherapy services, including low reimbursement rates from insurance companies coupled with the high cost of technology, these hurdles can be overcome. For one thing, the demand for advanced therapies has been rising among the people. “With the Internet, people have more opportunities to learn about more advanced treatments,” he says.

Radium Instituto de Oncologia began adding IGRT capabilities in 2006, with a Varian 6EX Clinac® and a SonArray® ultrasound positioning device. Of the technologies emerging today, Monti is most interested in RapidArc for its potential to treat more patients. He says he already has the treatment planning system for it. “Eclipse is a good choice for my clinic because it is very reliable,” says Monti. “It is very comfortable for the physicist and very fast to do many alternate plans.”

Monti is optimistic about the future of radiation oncology in Latin America. “As the economy of the region improves—you can see this happening in Colombia, Peru, and Brazil today—I feel that the doctors will put money into new technology,” he says.

Instituto Nacional de Cancerología, Bogota, Colombia

The National Cancer Institute (NCI) is a public entity that provides services to all the people of Colombia. It is a comprehensive center, providing multidisciplinary care that includes diagnostic imaging, medical and radiation oncology, surgery, and palliative care as well as social and psychological services to cancer patients. NCI also offers postgraduate degrees in all branches of oncology and training programs for radiation oncologists, medical physicists, and radiation therapists. The NCI carries out extensive research and publishes a quarterly scientific journal. The NCI Department of Radiation Therapy has published clinical research on the treatment of prostate cancer, breast cancer, and brain metastases. Currently the institute is participating in a clinical trial for cervical and very fast to do many alternate plans.”

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In radiation oncology, NCI has implemented 3D conformal, IMRT, and IGRT techniques, intraoperative radiotherapy, and brachytherapy. It plans to expand its radiosurgery program. The radiotherapy department treats 1,800 new patients a year, at a volume of 120 to 150 patients per day. Although implementing advanced technologies improves the quality of treatment for patients, it creates a challenge for the institute. “The use of the latest complex technologies has decreased the number of clinical consultations we can do,” explains Rosalba Ospino, chief of radiotherapy and medical physics. “We need to spend more time planning, especially in delineating the planning target volumes, yet we have limited human resources. As a result, we have to take the time from other activities such as consultation.” Eclipse helps meet the challenge of planning more complex treatments with limited resources, says Ospino, who has experience with many treatment planning systems. “Eclipse is very friendly software,” says Ospino. “It is easy to learn and to teach to others.”

In the coming years, Ospino expects to see the use of new technology expand in South America. She also foresees an increase in collaborative research with the United States and Europe, which will result in further technology improvements and higher-quality treatment.

“We have been able to offer these technologies to everybody in the country, not only for certain people. This has created more work, more challenges, but also more satisfaction.”

Luis Felipe Villasenor, MS, Hospital General de México

The Hospital General de México is a teaching and public hospital serving all of Mexico. The radiation oncology department there is one of the busiest in the world, treating 320 patients per day in two shifts. That adds up to nearly 7,000 treatments per month. The department has four treatment rooms with two cobalt units and two linear accelerators, one of which is a Varian 21EX Clinac equipped for IGRT and respiratory gating.

As productive as the radiation oncology department is in treating a large volume of patients, the demand is even greater. “Our greatest challenge is to cover 100 percent of the demand we have for treatment,” says Luis Felipe Villasenor, MS, chief of the hospital’s physics department.

A related challenge, he says, is providing dynamic therapies, such as gated IMRT, to more patients. “We started IMRT three years ago, which has allowed oncologists to escalate dose, and now they are seeing the results—better tumor control,” says Villasenor. When the hospital acquires a Novalis T×™ system as planned, Villasenor expects the department will be able to treat at least 50 percent of its patients with IMRT and also be able to perform at least four radiosurgery treatments a week.

“We have been able to offer these technologies to everybody in the country, not only for certain people,” he says. “This has created more work, more challenges, but also more satisfaction.”

“These three sites are great examples of what is possible when you take an incremental approach to a big set of challenges,” says Jackson. “Across Latin America, a critical mass of expertise is building up as key centers across the region adopt new technology, develop the skills to use it, and start helping others to do the same.”
“It’s not often that one witnesses a revolution, albeit a quiet one, in the field of brachytherapy,” says Dorin Todor, PhD, head of brachytherapy at Virginia Commonwealth University in Richmond, Virginia. “In the business of computing accurate dose, Acuros® is indeed a major change in paradigm. If the brachytherapy community would be the Star Trek’s Enterprise ship, Acuros definitely feels like warp velocity.”

This is Todor’s view of Acuros BV advanced dose calculation for brachytherapy, introduced last year as a significantly more accurate way of calculating the dosimetry of cancer treatments.1 Acuros BV enables clinicians to rapidly calculate patient doses for brachytherapy treatments with an extremely high level of accuracy and is an alternative to traditional, slower Monte Carlo methods.  

“While Monte Carlo software packages have existed for a long time, the tediousness of using them, combined with hours or days of running the algorithms, has made them virtually impossible for use in the clinic, rendering them useful only to a handful of researchers for mostly academic purposes,” says Todor.  

“Acuros appears to be a major step forward in accuracy and speed, but there is a long road ahead of us, since most of the previous clinical experience was acquired in the TG-43 dosimetry protocol era,” adds Todor. “We, as a community, now need to find out and outline how knowing accurately the delivered dose in various anatomical sites might impact prescription values and treatment guidelines based on less accurate formalisms.”
Early research on dosimetric accuracy of Acuros BV

Several other experts have recently published or presented on early research into the dosimetric accuracy of Acuros BV.

Mark Rivard, PhD, professor of radiation oncology and chief medical physicist at Tufts Medical Center in Boston, says, “I have been evaluating the Acuros BV system since mid-2009, and it is clear the sophisticated dose calculation algorithm is revolutionary for brachytherapy, with speed that is phenomenal compared to Monte Carlo–based calculations.” In a presentation at this year’s American Association of Physicists in Medicine (AAPM) meeting, Rivard reported that Acuros BV would provide more accurate high-dose-rate (HDR) brachytherapy dose distributions than were previously clinically possible.

Also at this year’s AAPM meeting, Firas Mourtada, PhD, presented findings from a retrospective comparison of TG-43 dose calculations and Acuros BV for cervical cancer patients. The study, which was conducted by a team from MD Anderson Cancer Center in Houston, Texas, concluded that although the doses at clinical reference points and hot spots agreed within 3.3 percent, there was a range of variation seen when the entire dose grid was examined.

Panos Papagiannis, PhD, and his team at the department of medical physics at the University of Athens in Greece carried out an independent dosimetric accuracy check of the new system that was written up earlier this year in the journal *Medical Physics*. “We implemented a series of tests following a graded approach and concluded that Acuros BV is the first treatment planning system that not only handles standard TG-43–based calculations but also incorporates the capability to accurately calculate truly individualized patient dose distributions,” says Papagiannis.

Improving dose calculations

Dose levels for brachytherapy have generally been calculated as if the sources were surrounded by water, whereas in reality a patient’s anatomy contains many different materials such as bone, tissue, and air, as well as additional materials that are often present from inserted applicators. In the past the only way to account for this was using Monte Carlo calculation techniques, something that was only available as a research tool. Now, for the first time in routine clinical brachytherapy, Acuros BV is able to account for the dose effects from these variations.

“Calculation times for Acuros BV tend to average between three and eight minutes, depending on the applicator used. By comparison, the same calculations could take hours or days using the standard Monte Carlo method,” says Sophie Wetherall, Varian product manager. “Acuros BV offers an improvement in dose calculation that will help clinicians make better decisions about dose to their patients and further their knowledge and ability to make treatments even more accurate.”

1. “Significantly more accurate” compared to TG-43.
This summer, a 51-year-old breast cancer patient became the first person in the world to receive a Gated RapidArc® treatment. The treatment took place at the Istituto Oncologico della Svizzera Italiana (IOSI) radiation oncology unit in Bellinzona, Switzerland.

Gated RapidArc makes it possible to use respiratory gating during a single- or multiple-arc RapidArc treatment. As the gantry rotates around the patient, it stops for the duration of the “beam-hold” period, backs up slightly, and resumes during “beam on,” delivering the beam only during the specified portions of the patient’s respiratory cycle. This technique increases the precision of treatment delivery by compensating for tumor motion.

Dr. Giorgia Nicolini, medical physicist at IOSI, says, “This was a very fast and straightforward procedure for the patient, who didn’t speak the local language, Italian, but in any case found it very easy to follow instructions for gating. She was fully cooperative and the part of the treatment time taken up by breathing management decreased after the first sessions. She also appreciated having to spend less time on the treatment couch.”

For the last five years this team has been using breath-hold gating to better spare the heart and lung during radiotherapy for all left breast cancer patients. Prior to Gated RapidArc, conventional gated IMRT treatments would have taken 15 minutes to deliver. Using two-arc Gated RapidArc, delivered with one arc clockwise and the second arc counter-clockwise, the treatments can be concluded in around four minutes.

“We used two partial arcs to avoid entering at all from the contralateral side, which allows us to better spare the contralateral breast,” says Antonella Richetti, MD, head of the IOSI radiation oncology department. “This approach, by adding degrees of freedom to the dose optimization process, helps us to shape a better dose distribution. In complex cases such as this one where nodes are involved, this is particularly important.”

According to Nicolini, clinicians at IOSI compared RapidArc and IMRT treatment plans for the patient and determined that RapidArc offered a better dose distribution. In addition, RapidArc enabled the dose to be delivered using fewer than half the dose monitor units needed for an equivalent conventional seven-field IMRT treatment.

“We are now using Gated RapidArc to treat all left-sided breast cancer patients when there is nodal involvement. We are also planning to use the technique for lung and other thoracic and abdominal tumors when suitable.”

Giorgia Nicolini, IOSI

“We’re excited about the potential of Gated RapidArc to reduce exposure of organs such as the heart and lung, especially when we’re using high doses, or treating patients who have comorbidities like cardiovascular or respiratory disease,” Richetti adds. “It will also be important for treatment patients who are receiving systemic chemotherapy or targeted therapies that are potentially cardio-toxic.”

Gated RapidArc is a standard feature on Varian’s new TrueBeam™ system and is available as an option or upgrade on the Trilogy® and Clinac® iX accelerators.
Eclipse. How treatment planning should be.

The Eclipse™ treatment planning system is your simple solution to the challenges of modern complex radiotherapy techniques. The difficult task of managing patient and tumor motion just got easier with Varian’s Gated RapidArc technology. You can plan with confidence knowing Eclipse provides the flexibility and control you need. And with the integration of sophisticated QA tools for precision and speed, you now have the power to make the complex seem easy. Turn complexity into simplicity with Eclipse – Point. Click. Plan.

Cancer cases are complex. Planning for treatment doesn’t have to be.

To learn more visit our website at www.varian.com/eclipse