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UPGRADING TO IGRT | How one health system built a long-term technology strategy

PRECISION MANUFACTURING | UK facility combines decades of experience with modern technologies
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ON THE COVER
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At Emory University School of Medicine’s Department of Radiation Oncology, we were one of the early implementers of IMRT. With IMRT, the goal was to make our treatment fields as small as possible. And we have done that—as much as possible—but there have been limits to what we could achieve.

Inverse planning for IMRT can create excellent treatment plans, but without image-guidance tools, we have not been able to fully translate the precision of IMRT into clinical practice. For example, in working with an IMRT plan for treating a brain tumor near the brain stem, if the patient setup is going to be off by just three to four millimeters, we have to add in a margin to account for that uncertainty, and that defeats the purpose of IMRT.

Pursuing precision
Shortly after our earliest experiments with IMRT, we began discussions with colleagues at Varian about what would be the next step for improving our implementation of IMRT. We were convinced that, to really deliver such tightly shaped fields, we needed something that would help us verify patient positioning on a daily basis.

Consequently, earlier this year, we added Varian’s new On-Board Imager™ accessory to our cancer-targeting arsenal. This new device gives us the opportunity to verify, prior to every treatment, that the treatment beam is exactly where we want it to be.

Through our early experiences with the device, we have seen that, over time, it will give us the confidence we need to create plans with smaller margins. We will be developing treatment protocols that deliver higher doses while reducing the dose to critical structures. Ideally, that will translate into better tumor control and fewer complications.

Initial evaluation
As the first site in the United States to install the On-Board Imager, Emory began by evaluating the equipment to see how helpful it would be. In our first week we treated several patients with brain, head-and-neck, and prostate cancer.

The On-Board Imager is a user-friendly system that expedites and automates patient positioning. It produces high-resolution kV X-ray images, and can track tumor motion using fluoroscopy. It enabled us to generate images of patients in the treatment position and match them up with reference images from treatment planning, either manually or automatically. We used both approaches successfully. The system then automatically calculated how much the treatment table should move in order to align the tumor with the beam. With the push of a button, and from outside the treatment room, our therapist then shifted the patient into the correct position for treatment.

The On-Board Imager is a user-friendly system that expedites and automates patient positioning.

During our first week of use, we found we were making millimeter shifts in our patients’ positions nearly every day. The entire process took just three to five minutes per patient, making it a clinically practical solution for improving patient care.

Essential image guidance
As the first U.S. center to use this technology, part of our job is to evaluate those parts of the system that operate automatically. With experience, we expect to become more comfortable with the automatic matching, for instance. For now, we are having our physicians perform visual evaluations of the matches and either accept them or make changes.

In July of this year, Emory also took delivery of a Trilogy™ linear accelerator. This system, which comes outfitted with an On-Board Imager, can deliver stereotactic radiosurgery and fractionated stereotactic radiation therapy, as well as 3D conformal radiotherapy, IMRT, and IGRT.

There is no question in our minds that the On-Board Imager was a mandatory next step in the fight for better tumor control and protection of normal tissues. As we look at the possibility of treating some forms of cancer with highly conformal or even stereotactic approaches, the ability to use image guidance to localize targets becomes essential.

Lawrence Davis, MD, is the chairman, and Timothy Fox, Ph.D., is the director of medical physics in the Department of Radiation Oncology at Emory University School of Medicine.
NEW CLINAC IX OFFERS INTEGRATED, CUSTOMIZABLE PLATFORM FOR HIGH-PRECISION IGRT

Building on an ongoing commitment to Dynamic Targeting® IGRT, Varian Medical Systems is introducing the Clinac® iX linear accelerator, a high-performance, customizable platform that incorporates a new 4D Integrated Treatment Console for improved workflow efficiency.

“The Clinac iX is a comprehensive, workflow-oriented solution that will enable treatment facilities to implement IGRT quickly and cost-effectively,” says Richard Stark, director of Varian’s delivery systems product line. “It was designed to make clinical implementation of sophisticated protocols easier.”

Affordable customization
Every Clinac iX is built on a high-performance, multifunctional foundation. “The Clinac iX grows out of our continuing commitment to develop powerful, versatile tools that enable doctors to use the most optimal form of treatment for each case and offer patients personalized cancer care,” says Stark.

Every Clinac iX system can be custom configured, and every system is easily upgradable. That means RT facilities can meet the specific needs of their sites today, while at the same time future upgrades become more convenient and affordable. With a Clinac iX, customers can initiate an IGRT program now, and later add on-board imaging, stereotactic capabilities, and other enhancements to the same technology foundation. “This is a future-ready platform,” says Stark. “It makes it easier for RT departments to provide patients with the most advanced treatments available today, at the same time it helps keep them prepared for tomorrow’s innovations.”

Exact alignment
Varian’s precision engineering is built into every Clinac iX system. “To deliver the right dose to the right place at the right time, you need precise image guidance,” says Lisa Hampton, Varian product manager. “And for image guidance to be meaningful for patient positioning, the imaging system must be reproducibly and accurately positioned relative to the treatment isocenter.”

Each Clinac iX provides the specific features required for a clinically viable, image-guided system: Exact alignment between imaging and treatment isocenters, Exact™ couch positioning accuracy, and best-in-industry beam delivery performance.
“The Clinac iX tightly integrates these elements to meet the clinical workflow needs for image-guided target localization,” says Hampton. “It is important that target localization and patient motion management be achievable within a standard treatment time slot, so that every radiation therapy clinic can implement these new techniques and every patient can benefit from them.”

Fully supported by Varian’s Inspiration®-radiation oncology management environment, the Clinac iX delivers integration of the image-guided treatment process from the early stages of treatment planning through treatment verification, delivery, and patient plan quality assurance.

Efficient design, integrated command center

For ease of use, the Clinac iX system features new styling and industrial design both in the treatment room and at the treatment console. The new design optimizes workflow, expedites system maintenance, and simplifies initial site preparation and ongoing space management.

The new 4D Integrated Treatment Console streamlines operations by combining control of the Clinac iX accelerator, the Millennium® multileaf collimator (MLC), the PortalVision™ megavoltage electronic portal imager, and the On-Board Imager® kV electronic imager.

“The ergonomic design at the treatment console places treatment delivery applications and control functions within easy reach of the therapist, simplifying and automating the process,” explains Hampton. “Rather than wrestling with different applications, the therapist can focus on fine-tuning the patient’s position using the tools for image guidance.”

An intuitive and easy-to-use interface eliminates multitasking over several workstations, enabling clinicians to eliminate redundant data entry and implement verification plans quickly and easily. The console displays patient treatment and equipment status information; automatically loads the MLC program, which can be edited without changing applications; displays MLC, jaw, and collimator motion during treatment; automates acquisition of electronic portal images; and permits online image review and analysis for patient positioning.

The 4D Console is fully integrated with Varian’s VARiS® Vision patient information database. Through the 4D Console, clinicians can also connect the Clinac iX system to hardware and software accessories from third-party vendors via a standard DICOM RT interface. Unlike an earlier system that loaded information one treatment field at a time during treatment, the new console works with entire treatment plans or groups of plans and operates independently from a hospital’s computer network so that treatments can be completed even if network connections are lost.

“The rapid adoption of Dynamic Targeting IGRT inspired the development of this system,” says Stark. “Now, with the Clinac iX platform and 4D Console, precision image-guided therapies will be even easier to implement and administer.”

ECLIPSE TREATMENT PLANNING SOFTWARE ENHANCEMENTS

Varian Medical Systems has introduced several new capabilities within its Eclipse® 3D radiotherapy treatment planning software, including:

- The AAA® dose calculation algorithm for improved precision in areas of tissue heterogeneity
- Automatic compensation for variations in tissue thickness
- The ability to combine multiple targets within a single treatment plan
- The ability to support inverse planning of IMRT treatment for Siemens, Elekta, and Mitsubishi linear accelerators
- Eclipse plans have long been seamlessly integrated for delivering both step-and-shoot and dynamic sliding-window treatments using Varian’s Clinac® accelerators, and Mitsubishi linear accelerators
- Eclipse plans can also be exported to other manufacturers’ accelerators, to deliver treatments according to those machines’ capabilities.

Chest wall treatment plan, created with the Eclipse treatment planning system. The dose distribution was calculated with the electron Monte Carlo algorithm.

The new AAA dose calculation algorithm improves radiation dose distributions in heterogeneous areas of the body such as the lung, where bone, dense soft tissues, and air pockets each interact with radiation in unique ways. Eclipse is now the first software to offer clinicians both the AAA photon algorithm and the electron Monte Carlo algorithm for planning radiotherapy treatments. The electron Monte Carlo algorithm was added to Eclipse last July for planning electron treatments of tumors close to the skin.

Improved breast cancer planning

An important new feature enables Eclipse users to automatically compensate for variability in tissue thickness in areas of the body such as the breast. Until now, it could be time consuming to develop plans that avoided creating “hot spots,” which sometimes occurred where tissues were thinnest. The software now offers field-in-field and electronic-surface-compensator capabilities that make it easier to deliver radiation doses more uniformly throughout the target area.

In addition, a new multiple-prescription plan feature enables clinicians to develop plans for delivering different dose prescriptions to different target areas within a single treatment, instead of having to prepare separate plans for different areas.

“The goal is to continue offering clinicians an ever-widening range of options for treating most forms of cancer,” adds Amacker. “Eclipse now provides greater versatility for personalizing the treatment according to the specifics of any case.”

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ON-BOARD IMAGER ADDS TOOLS FOR REAL-TIME TUMOR TRACKING AND RESPIRATORY GATING DURING IGRT

In early August 2004, Varian received FDA 510(k) clearance for a new suite of features that have been added to the company’s On-Board Imager™ system for Clinac® and Trilogy™ accelerators. These features include:

• Automated algorithms for marker matching based on radiopaque fiducial markers
• Gated radiographic image acquisition using the Real-Time Position Management (RPM™) respiratory gating system as a trigger
• Fluoroscopic pretreatment visual verification, again using the RPM gating system

With these new capabilities, the On-Board Imager becomes the first linac-based kV X-ray digital imaging system that can synchronize image acquisition with a patient’s respiratory cycle and automate marker matching for more precise tumor targeting.

With automated tumor marker detection, the On-Board Imager can now position a patient for treatment automatically and quickly by detecting and imaging gold seeds or other fiducial markers implanted in a tumor. And no other treatment room imaging system can characterize respiratory motion and automatically use the information to verify patient positioning and deliver treatments corrected for tumor motion.

Varian’s On-Board Imager is the first robotic, automated, clinically practical system for IGRT, enabling clinicians to obtain high-resolution digital images to pinpoint tumor sites, adjust patient positioning at the push of a button, and complete a treatment, all within the standard treatment time slot.

First cleared by the FDA in February of this year, the On-Board imager has been installed at Karolinska University Hospital in Stockholm, Sweden; Emory University in Atlanta, Georgia; the Henry Ford Health System in Detroit, Michigan; Memorial Sloan-Kettering Cancer Center in New York; M.D. Anderson Cancer Center in Houston, Texas; Hirslanden Klinik in Aarau, Switzerland; Albert-Ludwigs Universität in Freiburg, Germany; NYU Medical Center in New York; and Vanderbilt University Medical Center in Nashville, Tennessee. An additional 37 units are slated for installation at cancer centers worldwide.

“Our plan all along has been to continue adding to the On-Board Imager’s capabilities,” says Richard Levy, chairman and CEO of Varian Medical Systems. “There will be more new features in the future. It is deeply gratifying to see technological developments that have been years in the making coming to fruition for cancer patients.”

SWISS CLINIC INSTALLS ON-BOARD IMAGER SYSTEM

The Radio-Oncologic Institute in Aarau, Switzerland, is the site of Varian’s second On-Board Imager installation in Europe.

Clinicians at the private clinic, part of the Hirslanden Group, began to treat patients using the On-Board Imager system on a Clinac linear accelerator in early September. The institute celebrated the event by hosting a press conference for the local media and inviting local doctors to view demonstrations of the new equipment at the clinic.

The institute is well known for treating cancer patients with innovative therapies. Chief physicist Peter Cossmann, Ph.D., said the On-Board Imager device would enable the clinic to increase its use of radiotherapy and to start offering IMRT as a treatment.

The entire clinic, including the Radio-Oncologic Institute, has been equipped with a new electronic network and database for all patient and personnel data and resource planning, enabling clinicians to operate in an entirely paperless environment.
VARIAN MEDICAL SYSTEMS AND PROXIMA THERAPEUTICS FORM ALLIANCE

Varian Medical Systems and Proxima Therapeutics have formed an alliance to provide high dose rate (HDR) brachytherapy equipment to hospitals interested in offering partial breast irradiation.

Under the terms of the agreement, Proxima will become the exclusive third-party representative for Varian’s MammoSource™ HDR brachytherapy afterloader, developed specifically to work with Proxima’s MammoSite device for treating breast cancer with localized HDR brachytherapy. The MammoSource afterloader will be made available to treatment centers on a fee-for-use basis, subject to minimums.

“The novel fee-for-use arrangement responds to the needs of cancer centers seeking a cost-effective solution for offering partial breast irradiation following lumpectomy,” says William Hyatt, general manager of Varian’s BrachyTherapy business. “The MammoSource system is designed to reduce the capital cost barriers often faced by hospitals wishing to offer this form of treatment.”

The MammoSource afterloader is more affordable than traditional HDR afterloaders, which incorporate up to 24 channels for delivering more complex forms of brachytherapy. Varian developed the MammoSource HDR afterloader to deliver radiation through a single channel, consistent with MammoSite’s single balloon catheter design. MammoSource is powered by Varian’s BrachyVision™ software, a state-of-the-art HDR brachytherapy treatment planning system.

NEW BRACHYTHERAPY APPLICATOR SUPPORTS TREATMENT OF EARLY-STAGE BREAST CANCER

Varian Medical Systems has introduced a new lightweight applicator for delivering post-lumpectomy partial breast irradiation. The Advanced Breast Template System for high dose rate (HDR) brachytherapy is the first commercially manufactured template system for interstitial breast brachytherapy using multiple implantation techniques. It simplifies the post-lumpectomy implantation of either needles or catheters for irradiation of the tumor bed where high dose rate brachytherapy is intended as the sole radiation treatment. It can also be used for more traditional boost treatments.

The Advanced Breast Template System consists of three main components: a lightweight titanium breast bridge, titanium stabilization rails, and Lexan breast templates. The system is flexible enough to accommodate the techniques described by Robert Kuske, MD, or by the group from Detroit’s William Beaumont Hospital that pioneered this approach for treating breast cancer.

The system’s components are housed in a convenient aluminum case that can be placed in an autoclave for sterilization. The breast templates come in three sizes for easy adaptation to patient anatomy and the desired isodose coverage. In addition, the positioning of needle holes at the very edge of the template means needles can be placed very close to the chest wall, as may be required for semi-freehand techniques.

Varian Medical Systems currently offers more than 50 applicator products for the GammaMed™ and VariSource™ brachytherapy systems. These applicators can be used to treat a wide range of cancers, including cancer of the vagina, cervix, endometrium, breast, bronchus, esophagus, nasopharynx, and prostate.

SMARTCONNECT TECHNOLOGY NOW SUPPORTS ACUITY SYSTEM USERS

Varian Medical Systems has expanded deployment of its SmartConnect™ technology to provide remote support for users of the Acuity™ planning, simulation, and verification system. Varian has already deployed the SmartConnect solution to support more than 300 treatment centers using Varian’s VARiS™ Vision oncology management system and the Millennium™ multileaf collimator.

“This additional deployment will make it possible for our team to provide immediate response to Acuity customer inquiries,” says Bob Larsen, Varian’s director of service marketing. “It will enable our staff to assist clients remotely by tuning performance, updating software, and solving operational problems. We’ll be able to assist therapists with better usage techniques and provide instructions on how to manipulate Acuity’s tool set to optimize imaging.”

SmartConnect technology connects Varian’s customer service department to the customer site so that Varian service personnel can remotely monitor equipment, generate performance reports, diagnose problems, and provide real-time support. Customers benefit through increased productivity and shortened response times because they no longer need to wait for a service engineer to arrive on site to solve performance or operational issues.

SmartConnect technology requires no phone lines, virtual private networks, or firewall exceptions, and maintains the security of electronic records.
UPGRADING to IGRT at the Henry Ford Health System

Keeping a treatment facility up-to-date in an environment of rapid technological change is no easy task. Advances that led to IMRT—increased conformality—are now engendering IGRT technologies for better targeting. This kind of rapid evolution requires careful planning to incorporate new technology, implement upgrades, and train clinical staff, all the while continuing to provide quality patient care.
The Upgrade Solutions Group from Varian Medical Systems is a team that works closely with customers to help keep clinical facilities up-to-date. In partnership with staff in Varian’s sales and service organizations, the Upgrade Solutions Group works with customers to inventory their current technology and catalog its capabilities, to analyze customers’ near- and longer-term needs, and to craft a possible technology upgrade road map that takes resource and budgetary limitations into account. This team focuses on helping customers make the most important changes first—changes that set up a platform for future evolution.

What follows is a case study about the upgrade path taken by one medical network, the Henry Ford Health System in Detroit, Michigan.

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“We treat about 200 patients daily among our core sites and affiliates. Volume continues to increase, and the IMRT and PortalVision upgrades have streamlined our workflow and patient throughput.”

Linda Wineski, administrator at the Josephine Ford Cancer Center.

The Henry Ford Health System

As one of the largest medical networks in the region, the Henry Ford Health System is committed to continuous improvement in patient care. More than 15 percent of all people in southeast Michigan diagnosed with cancer are treated at a Henry Ford facility. In order to support the patient load, it’s critical that all facilities in the network be equipped with the most advanced treatment technology.

Initiating a multiyear technology plan

The Henry Ford Health System began its relationship with Varian’s Upgrade Solutions Group in 2000 with the purchase of a PortalVision™ amorphous silicon portal imager. Shortly thereafter, the Henry Ford system replaced older treatment planning software with the Eclipse™ integrated treatment planning system, setting the stage for what would later become an all-Varian treatment solution for Henry Ford’s network of hospitals.

Over the next three years, a series of upgrades enabled Henry Ford’s various Michigan facilities to provide patients with a wider array of treatment services. First the Henry Ford Hospital in Detroit—the health system’s flagship hospital, whose services include clinics for breast and prostate cancer—upgraded both its 2100C Clinac® machines to deliver SmartBeam™ IMRT. Next, the Henry Ford Medical Center in West Bloomfield equipped its 2100C with a new PortalVision aS500 and upgraded the accelerator for IMRT. And then the Josephine Ford Cancer Center, a Trenton-based member of the network, added a 2100C/D machine, upgraded the Clinac console software, and installed a PortalVision aS500 with an Exact™ Arm.

Together, the Henry Ford Health System and Varian devised a comprehensive, multiyear plan for managing the hospital system’s radiation therapy equipment investment. In order to expand the benefits of the hospitals’ existing IMRT program, the planners looked toward the next logical step in radiation therapy: Dynamic Targeting™ IGRT (see sidebar on page 8). Unification of the network’s information system became another priority.

Creating a unified information system

In early 2004, the Henry Ford network upgraded its VARiS® Vision record-and-verify information system. The installation was a complex one, reaching across all five Henry Ford facilities.

With its VARiS Vision upgrade, the Henry Ford system connected a total of seven Clinac accelerators—along with their respective treatment planning systems, portal imagers, simulators, and multileaf collimators—into one network that would allow the various hospitals in the system to electronically share patient data, including medical records, images, and treatment records as well as scheduling and billing information. Various databases were merged into one central data repository. And 4D Integrated Treatment Consoles were added to each site, integrating the user controls of the Clinacs, MLCs, and electronic portal imagers to further streamline the information management process.

After VARiS Vision product acceptance, Varian’s Clinical Support Services group provided on-site training to help familiarize users with the system’s new features. Six VARiS Vision specialists provided on-site training at the five Henry Ford sites.
Dynamic Targeting IGRT

With IMRT, the radiation beam is manipulated to match the dimensions of a tumor. By being better able to approximate the shape and size of the target, it has become possible to deliver a sufficiently potent dose of radiation that proves lethal to the tumor while reducing the amount of harm done to surrounding tissue. As tumor margins are reduced, it is possible to increase the dose of radiation directed at the target.

Image-guided radiation therapy makes IMRT delivery more effective by taking target motion into consideration. The most sophisticated IMRT technology can be rendered less effective by errors in patient positioning or by the effects of respiratory motion on tumors in or near certain parts of the body, such as the lung, liver, or pancreas. Over the course of a few days or even several hours, tumors can drift within the planned treatment area. As a result, the prescribed dose might not precisely reach its intended target and might instead be misdirected to normal tissue.

Dynamic Targeting™ IGRT is Varian’s comprehensive answer to this problem. A systemic solution, its tools include:

1. The PortalVision™ system with the Exact™ Arm, an amorphous silicon MV imager that can verify patient positioning prior to treatment delivery as well as verify field size and shape.
2. The Real-Time Position Management (RPM™) respiratory gating system, a noninvasive respiratory monitoring system that allows physicians to correct for intrafraction tumor motion by gating the beam to coincide with a designated point in the patient’s breathing cycle.
3. The Exact couch, whose repeat positioning and Indexed Immobilization™ features, moveable side rails, and carbon-fiber couch top reduce the likelihood of patient positioning errors.
4. The On-Board Imager™ device, the latest addition to Varian’s motion-management arsenal.

Varian’s new On-Board Imager is mounted onto the linear accelerator via robotically controlled arms that operate along three axes of motion. The On-Board Imager produces low-dose, high-resolution, kilovoltage X-ray images that, together with the PortalVision images that, together with the PortalVision system, a silicon MV imager that can verify patient positioning prior to treatment delivery, produce low-dose, high-resolution, kilovoltage X-ray images that can be used to track tumor motion in real-time.

With its VARiS Vision upgrade, the Henry Ford system connected a total of seven Clinac accelerators into one network that would allow the various hospitals in the system to electronically share patient data.

“Typically, the applications specialist will help each site ‘go live’ with their patients during a three-to-four-day period,” explains Matthew Adler, a clinical support specialist who worked on the Henry Ford project. “Given that Henry Ford’s configuration featured multiple locations, additional specialists were stationed at each location to help train approximately 65 staff members.”

Henry Ford’s multisite upgrade presented special challenges for Varian’s Clinical Support Services group. In order to prepare health system personnel for the upgrade and shorten downtime, an extra on-site meeting was held to confirm the joint strategy. Multiple conference calls were necessary to ensure that customer expectations were fully met.

Enhancing IGRT capabilities

Henry Ford’s early 2004 upgrades set the stage for the hospital network’s implementation of image-guided radiation therapy. In June of this year, the Josephine Ford Cancer Center became one of the first five facilities worldwide to install Varian’s new On-Board Imager™ system. This was an upgrade to the cancer center’s Clinac 21EX, a machine that was already outfitted with SmartBeam IMRT components, including a Millennium™ MLC-120, Dynamic MLC, and Auto Field Sequencing.

The PortalVision system on the 21EX machine was upgraded to a new system equipped with an Exact Arm to facilitate the On-Board Imager installation. Then the PortalVision system that had been removed from the 21EX machine was installed on a 2100C at the same site, enabling the cancer center to broaden its patient care services.

Looking forward

“Henry Ford intends to always be on the leading edge in terms of technology and patient care,” says Wineski. “The Novalis system, the beta testing for the Marconi large-bore CT, clinical trial involvement, and so on, support that statement. We are willing to offer site visits, and we look for partnering opportunities and beta testing of new equipment, all for the purpose of shared learning to contribute to the advancement of cancer therapy.”

As the field of radiation therapy continues to evolve with increasingly sophisticated software treatment applications and...
Varian’s regional sales groups are in frequent contact with customers, identifying their needs and advising them of solutions to help achieve their goals. After working with a customer to establish an appropriate upgrade path, the district sales manager consults with a representative of Varian’s Upgrade Solutions Group, who determines what equipment is installed at the customer’s facility and compares that information against product prerequisites. Based on this research, Varian generates an upgrade quotation for the customer.

“We’re in a unique position that allows us to work in tandem with the sales team to help our customers manage their existing assets,” says Sam Castellino, Varian’s Upgrade Solutions Group’s business unit manager. “We want to offer our customers the opportunity to position themselves for future technology upgrades.”

After an order for the upgrade is configured, Varian’s installation team works with the customer and with Varian’s product support engineering and manufacturing departments to coordinate the installation based on the customer’s timeline and the factory’s material availability. To ensure a smooth upgrade, a Varian representative visits the customer site, confirms the type of equipment installed, and compares this information against the items on the sales order. This step reduces the possibility of surprises during the actual installation that can result in machine downtime.

Finally, Varian’s support services personnel work closely with the customer and the installation project managers to create an implementation strategy that reflects the customer’s clinical objectives. “Through a variety of documentation and participation in a three-hour remote training session, we communicate the objectives that need to be achieved and lay out a strategy to achieve these goals,” says Matt Adler, Varian applications specialist.

“IGRT will be the standard of care in the very near future,” says Wineski. “It’s one of those, ‘How did we survive without this tool for so long?’ situations. No one, given the option, would choose to be treated on a linear accelerator without IGRT when a unit with that technology is available.”

Varian’s upgrade solutions task force

Helping customers develop the right asset management plan involves multiple departments within Varian Medical Systems.

In a collaborative effort, Varian Medical Systems and the Henry Ford Health System have customized a path that is right for the network’s hospitals and affiliates. And by regularly upgrading existing equipment, the hospital network has been able to provide its patients with the benefits of the latest advancements in cancer treatment. This forward-thinking approach has put Henry Ford network members in a position to confidently implement new programs such as SmartBeam IMRT and Dynamic Targeting IGRT.

The Henry Ford Health System’s VARIS Vision information system unifies five clinics with one network.

CRAWLEY: DECADES OF PRECISION MANUFACTURING
When deciding on a suitable location for assembling and testing the new On-Board Imager™ device, Varian Medical Systems opted for Crawley, one of its key manufacturing sites outside of the U.S. In so doing, they were putting their faith in more than 70 years of excellence in manufacturing precision equipment.

Varian’s UK operation spent much of its first 50 years of existence as Test Equipment Models (TEM), making everything from motorboats and cabin cruisers to early prototype work for the Concorde supersonic jet. When Varian acquired TEM in 1984, the UK plant had already become a pioneer in the manufacture of radiation therapy simulators.

Today, helmed by managing director Stephen Turner, the Crawley site is home to a number of key functions and product lines, including Acuity™ simulators for planning and verifying radiation therapy treatment. In April of this year, the site celebrated the landmark of manufacturing 100 Acuity systems in just over a year of production, a figure that compared very well with the annual production rate for the Acuity’s predecessor, the Ximatron™.

Taking into account significant production lines for Exact™ couches, VariSource™ afterloaders, and the On-Board Imager, it’s clear that Crawley has become one of Varian’s most important engineering and manufacturing centers. Crawley also hosts Varian’s UK sales, service, and support organizations.

Can-do attitude

“It’s the sheer breadth of activities that take place at Crawley that make this place special,” says managing director Stephen Turner. “There’s a manufacturing and engineering focus that stretches back many years, and there’s a real ‘can-do’ attitude amongst our people. In addition, the people here work in many different functions and have multiple reporting lines, giving the UK staff a keen insight into all aspects of Varian’s business.”

“I organized a Varian supply chain cluster and involved half a dozen of our suppliers,” explains Flanagan. “As part of this effort, the whole production line was asked to come up with suggestions on how to improve production efficiency.”

According to Flanagan, the team pinned “process activity” post-it notes onto a board. Of 366 steps they identified, only 65 were viewed as adding value. During the course of this examination, it was calculated that a total of 3.2 miles were walked during a typical Acuity build process. By amending the build effort and physical material flow, this distance was reduced to less than half a mile per system, more than a six-fold reduction.

“This was achieved by moving work cells closer together and laying out the build bays differently,” says Flanagan. “The exercise also freed up 40 square meters of workspace, making room for the On-Board Imager production lines.” Indeed, the outcome was so impressive that several suppliers asked Flanagan to visit their plants and implement similar improvements.
Today, an Acuity system takes half the time it took to construct a Ximatron. Similar assessment exercises in the VariSource and Exact couch production areas yielded equally favorable results.

**Only as good as our suppliers**

The close working relationship with suppliers is typical of the philosophy at Crawley. “We are very dependent on our supply chain—we’re only as good as our suppliers,” says Flanagan. In addition to numerous local partners, Crawley’s “supplier” relationship also applies to Varian sites in Baden, Switzerland; Salt Lake City, Utah; and Palo Alto, California; with whom Crawley has very strong manufacturing ties.

Each year, Varian Crawley holds a “Suppliers’ Day,” handing out awards and providing dinner and entertainment. At this year’s event, the president of the British Chambers of Commerce presented prizes to the best-performing suppliers in a ceremony attended by many local dignitaries.

“We have a very close relationship with our suppliers, and they share our core skills—efficient manufacturing, assembly, and testing in a streamlined fashion,” says managing director Stephen Turner.

Along with continuous improvement on the shop floor, Varian Crawley has an equally strong commitment to personal development for all staff. The Varian University offers a two-pronged approach to personal development: Along with regular product training sessions for all employees, Varian also offers three-day “principles of management” courses and dedicated customer care and presentation skills courses.

This drive toward both personal and professional excellence is typical of Crawley and constitutes a fitting tribute to 70 years of precision and excellence in manufacturing.

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**PARTNERSHIP INITIATIVES**

The change of national government in 1997 brought about a raft of new investment in a much-cherished National Health Service (NHS) that has, for nearly 60 years, underpinned a commitment to “free at the point of delivery” healthcare for the UK’s citizens.

Somewhat controversially, the new Labor government continued the work of its Conservative predecessor and embraced the concept of limited private funding as part of what has traditionally been a state-funded national resource. The result is a sea change in the way new facilities are funded and a tremendous opportunity for equipment suppliers who are prepared to structure their product and services offering to meet the needs of the new health sector landscape.

Varian Medical Systems has been at the forefront in recognizing the new opportunities and wholeheartedly embracing the requirements of the government partnership initiatives known as PPP, PFI, and MES. Varian is now the leading supplier of radiation therapy equipment to UK hospitals and clinics.

Public Private Partnerships (PPP) is the umbrella name given to a range of initiatives that involve the private sector in the operation of public services. The Private Finance Initiative (PFI) is the most frequently used of these: Under PFI the government awards a long-term contract—usually more than 15 years—to the private sector to finance the building of a new facility and to run its nonclinical services such as maintenance, cleaning, and security. The clinical, medical, and nursing services continue to be provided by the NHS. Thus the government spreads the cost of new construction, and the responsibility for support services can be transferred to private companies. Varian has acted as a subcontractor in a number of high-profile PFI projects over the last seven years.

But what really sets Varian apart from the competition in the UK is its involvement in Managed Equipment Services (MES) schemes such as those seen in state-of-the-art radiotherapy units at Norwich & Norfolk Hospital and Plymouth Hospital, where the benefits of the manufacturer-led approach are only too apparent.

Under an MES, Varian negotiates directly with the NHS Trust to provide equipment and manage the ensuing relationship, including upgrades, maintenance, training, and a host of other ongoing services for the hospital.

“It’s a comprehensive long-term solution for the NHS Trust,” says Michael Sandhu, Varian’s European director of national accounts. “Good performance, reliability, and effective maintenance provision rate extremely highly in this system. We have been particularly successful in MES projects because our equipment is the most reliable on the market.”
Anyone familiar with Varian’s UK site should be equally familiar with the name “Myles.” Brothers Nick and Jeremy Myles are still key players in the Varian success story, some 70 years after their grandfather, Douglas Moss, founded a small precision-engineering firm on the outskirts of London. This firm became Test House Equipment in 1947, with 20 employees manufacturing wind tunnel balances and other scientific test equipment. During the 1950s, following a move to Crawley, the company began making gyroscopes for guided missiles, accelerometers, and other precision-engineering tools and changed its name accordingly to Test Equipment Models (TEM).

Douglas Moss died in 1951 and his son-in-law, Ronald Myles, became managing director. It was early in Myles’s 35-year period of leadership that the company became involved in radiotherapy, building the stand and gantry of a Cobalt 60 teletherapy unit in 1955.

In 1964, TEM manufactured the first commercial radiotherapy treatment planning simulator, the prototype of which was installed at Hammersmith Hospital, London. Five years later, the first simulator was sold, this time to nearby St. Bart’s Hospital.

The paths of TEM and Varian crossed in the early 1980s. At the time, TEM acted as UK distributor for Varian’s Clinac linear accelerators, and Varian was returning the favor by distributing TEM’s simulators. When Varian bought TEM in 1984, the site had some 60 people producing about 15 simulators per year, along with other radiotherapy equipment.

The first Ximatron simulator was installed in 1986, and manufacturing of treatment couches was phased in from the U.S. the same year. With Varian’s brachytherapy business growing in importance, it was not long before a VariSource manufacturing line and brachytherapy engineering facility were established at Crawley.

In recent years, Varian UK has gone from strength to strength, successfully growing sales, service, and support groups and winning prestigious national awards for export, technology, and training. Today, as part of Varian Medical Systems, more than 200 employees at Crawley are continuing the precision-engineering legacy of Douglas Moss and Ronald Myles.
Aesthetics are important at the radiotherapy department of the world-famous Karolinska Institute in Stockholm, Sweden. Members of the staff create art to adorn the walls. During treatment, patients can choose from a selection of soothing music or bring in their own tapes.

Getting things right aesthetically is extremely important to the 100 radiotherapy staff members at this pioneering institute in the northern part of Stockholm.

But just as aesthetics are paramount, so is an effective and integrated treatment process. Professor Ingemar Naslund, MD, Ph.D., and his team know that integration between planning, verification, and delivery systems is crucial to delivering world-class radiotherapy treatment to the more than 3,000 cancer patients who come to Karolinska each year.

Through integration, treatment can be delivered more swiftly and with sufficient accuracy to increase the dose and thereby the effectiveness. Through integration, radiotherapists and physicists can trust that their treatment processes incorporate coordinated strategies for dealing with tumor movements, so that lesions are targeted with precision. Through integration, more patients can be treated more efficiently and waiting times can be reduced.

Physicist Bruno Sorcini works with the On-Board Imager device.
many oncologists see as the future of radiation oncology. In this patient’s case, the fluoroscopic kV images taken by the On-Board Imager were so precise that they even uncovered evidence of a stent or catheter insertion that previous imaging studies had missed—evidence of an earlier operation, probably for an aorta.

Naslund, head of the radiotherapy unit at Karolinska, was impressed with the results. “This first use of the On-Board Imager has worked very well and we will be increasing its use as we go forward,” he says. “The image quality is extremely good, and images can be integrated automatically and easily into the treatment process to make it very appropriate for use in a busy radiotherapy unit.”

“We want images of the patient lying on the treatment couch in the same position that he or she will assume during treatment, without any movement,” adds senior physicist Bruno Sorcini, Ph.D. “As well as making that a possibility, this system also allows us to make minor adjustments to patient positioning by moving the couch remotely, either from the external control room or by using the infrared hand pendant control.”

Using the On-Board Imager system, doctors generated digital X-ray images of the patient’s tumor and compared them with CT scans and digitally reconstructed radiograph (DRR) images to ensure the tumor had not changed or moved prior to treatment. By imaging in the fluoroscopic mode, doctors were also able to track the tumor’s movement due to the patient’s breathing cycle. This enabled radiotherapists to verify the tumor position in about two minutes before delivering a palliative fraction. The patient has had a total of 39 fractions—2 Gy per fraction, five times a week—and the clinicians have been able to achieve one-to-two-millimeter accuracy using the On-Board Imager.

The future of radiation oncology
Prior to the advent of IGRT, radiation oncologists have had to contend with variations in patient positioning and with respiratory motion by treating a margin of healthy tissue around the tumor. IGRT enables doctors to locate the tumor while the patient is in the treatment position and to minimize the volume of healthy tissue exposed to radiation during treatment.

“Our new automated system for image-guided radiotherapy enables clinicians to obtain high-resolution X-ray images to pinpoint tumor sites, adjust patient positioning when necessary, and complete a treatment, all within the standard treatment time slot,” says Timothy Guertin, president of Varian’s Oncology Systems business.

“Today’s typical radiotherapy unit is extremely busy, and efficiency will be the key to the success of IGRT,” adds Guertin. “We have combined two important technologies on one platform: low-dose, high-resolution kilovoltage X-ray imaging and integrated software control of all treatment parameters. This enables improved, fast, cost-effective automated treatments that are conducive to patient comfort.”

On-board imaging
Varian’s On-Board Imager is unique in that it has been designed specifically to integrate seamlessly into the treatment planning and data management systems already used by radiotherapy departments. In this way, it is the first clinically usable device of its kind available to radiation oncologists.

“Varian’s emphasis on integration is the right approach,” says Aris Tilikidis, Ph.D., head physicist at Karolinska. “It takes too much time to move information and treatment data back and forth between different systems, and you can never be certain the information is absolutely correct unless it integrates seamlessly. Using this system, everything is integrated.”

Physicist Bruno Sorcini has been attending conferences and delivering papers on the groundbreaking work that is taking place at the Karolinska Institute’s radiotherapy (or Strahlbehandling) unit, whose staff includes 15 medical physicists and four full-time radiation oncologists. The Institute, which serves a catchment area of 1.9 million people in Stockholm and neighboring Götland, has been using Varian equipment for almost 20 years and currently delivers external beam radiation using five Clinac linear accelerators. Almost 3,000 patients receive external beam radiation treatment at Karolinska each year. With this high workload, reliability and seamless integration are crucial. ●
Today, a year after integrating VARiS MedOncology into their radiotherapy and chemotherapy systems, the hospital’s Colney Centre is well placed to gauge the benefits that such a system can bring, as well as to highlight some of the hurdles they have had to overcome to personalize the system for their own specific needs.

VARiS MedOncology is a comprehensive software system for managing medical oncology that includes patient management tools for electronic medical record and treatment scheduling, patient safety assurance, chemotherapy prescribing, pharmacy dispensing, and electronic charge capture, as well as tools to support clinical trial participation and the collection and analysis of research data.

Starting afresh at a completely new greenfield site gave oncologists at the UK’s Norfolk and Norwich University Hospital a great opportunity to implement database systems ideally suited to help them achieve their goal of a paperless environment. Norfolk and Norwich was one of the first hospitals in Europe to introduce the OpTx® oncology management software, now called VARiS® MedOncology.

**Paperless radiotherapy and chemotherapy**

“It’s not very often that oncology departments have an opportunity to start from scratch and implement systems exactly as you’d like, but that was the situation for us,” says Professor Ann Barrett, the Colney Centre’s lead oncology clinician. “I’d recommend any hospital take advantage of such an opportunity if it arises. In our case, we wanted to go completely electronic and have a paperless environment for both radiotherapy and chemotherapy.”

Although the main hospital still uses paper records, the radiotherapy department now has an entirely paperless environment, and VARiS MedOncology is helping them to integrate the chemotherapy department into this process.
"We are very fortunate in having a PACS system here that feeds into our radiotherapy planning system, and we retain our planning images in the same system," adds Barrett. "They are instantaneously available, and it ensures nothing gets lost. We have viewing screens of the same quality that radiologists have, and this is extremely important.

"As far as the MedOncology system goes, because we are used to working electronically for radiotherapy, we are very happy about moving towards a completely electronic system for chemotherapy prescription and delivery."

The Colney Centre uses VARiS MedOncology for every stage of the patient’s chemotherapy process, including scheduling treatment and arranging the teleclinic, where nurses ring patients in advance of an appointment to ensure they are well enough to attend chemotherapy.

Additionally, Varian is now preparing to introduce its own documents solution in order to maintain the benefits of the more personalized elements of the facility’s previous computerized notes system. Although the previous system was not easily searchable, it allowed the capture of doctors’ notes, which helped to identify the patients as individuals.

“There’s an element of medicine that is about maintaining a narrative,” says Barrett. “The patient tells you what they do, where they’re going on holiday, what their relatives do, and you can recall the patient in the future through this information. As well as all the data for data fields, we want something that reminds us of the patients as unique individuals. In this way, you have the richness of being able to remember personal information, and these are the things that make the practice of medicine more personal.”

"With MedOncology, you can set up a report based on a whole host of criteria. It’s a wonderful auditing tool. In addition, we know precisely where everybody is in the system at any time.”

Professor Ann Barrett, the Colney Centre’s lead oncology clinician

“"The protocols for treatment are all in the system,” adds Barrett. “You do not have to work out every specific regimen; you just click on the appropriate fields and they work them out for you. VARiS MedOncology will also feed information into the center’s results database."

Although treatment schedules are worked out automatically, there is one area where pharmacy staff at the Colney Centre still don’t embrace the concept of a paperless environment.

“"The pharmacy still gives out paper prescriptions because the nurses still like to have a piece of paper to sign,” says Barrett. “In some ways, embracing systems such as VARiS MedOncology involves a cultural change in the way staff do their jobs. It will change, but it takes time.”

Personalizing the system

Varian Medical Systems is working closely with the Colney Centre to manage another important change—using the system to provide a safe prescribing environment while ensuring that flexibility in the process is maintained. Doses and intervals between treatments are often altered during the course of a patient’s treatment program. To ensure patient safety, careful configuration of the system is necessary, as are the definition and implementation of standard procedures.

Steve Laws, VARiS MedOncology account manager with Varian, says, “We understand Norwich’s requirements and we are delighted to be able to work closely with oncology departments such as the Colney Centre to ensure we continue to meet customer needs.”

Expanded applications—and benefits

Barrett says that as soon as any minor wrinkles have been ironed out with the introduction of these new capabilities, VARiS MedOncology will be rolled out across the whole system. She is particularly excited about its capability as part of the audit process.

“"With MedOncology, you can set up a report based on a whole host of criteria—how many patients we have treated, with which drug, what type of cancer, how many patients each doctor has treated each month, how the patients are responding, whether we wasted any chemo treatments because the patient didn’t turn up, and so on. It’s a wonderful auditing tool. In addition, we know precisely where everybody is in the system at any time.”

“I am extremely confident this system will work exceptionally well for us, provided it can continue to provide the flexibility we need and we continue to change the working practices of some of the staff. It’s understandable that some people have a way of working that they’re comfortable with, but the benefits of this system are so great that we need to be using it for the whole system.”

Among those benefits are greater efficiency, greater patient throughput, and reduced waiting times, all of which have helped the Colney Centre to meet government targets on waiting times. The center serves a network of six primary care trusts throughout north Norfolk, an area of about 750,000 people. They treat 2,500 new patients each year and are currently carrying out 800 normalized fractions, or treatments, a month. ●
"Dr. Perkins had been to the ASCO meeting in New Orleans in June, and came back with the news that the product we were using was being discontinued," she says. "But he'd also seen the new VARI® MedOncology system from Varian, and he arranged for us to see a demonstration. We liked what we saw, and we gave him our feedback. He decided to go with it almost immediately."

Christopher Perkins, MD, is the founder and medical director of this two-physician medical oncology practice in Fresno, California. He had been using a new electronic medical record system for eight months when the vendor was acquired and customers were told that they could continue using the system only if they purchased pharmaceuticals from the new company, and that there would be only limited ongoing support. After seeing VARI MedOncology (formerly OpTx®) at ASCO, he decided to make the switch.

Accelerating the conversion

Marnie Sanders, Varian Medical Systems project manager, was put in charge of the conversion. "With most customers, we're going from a paper to electronic environment. That usually takes an average of three months to set up equipment, get interfaces completed and tested, train the superusers who will train the rest of the staff, work out all the processes, and then come back to 'go live' with the final launch.

"In this case, Dr. Perkins felt he had a gun to his head. His staff members were nearly used to using an electronic record. There was no time for project planning, process reengineering, or extensive staff training. So we worked out a compressed timeline for transitioning this practice to VARI MedOncology."

Sanders visited the site for four days in July 2004. She brought a generic database with her, and gathered as much information as she could about the kinds of data staff members were entering into their existing database. She used her observations to determine how VARI MedOncology could be best configured to meet this customer's needs. Sanders then worked with a team of about eight people based in Varian offices in Winnipeg and Edmonton, Canada, to configure the MedOncology database, set up the crucial interfaces, and enter important data. The group in Canada worked via remote connections through the Internet. They set up and tested new interfaces to connect with Medical Manager, the patient accounting system used at the site, and Schuylab, a laboratory information system. Both interfaces were up and running by the end of Sanders's four-day visit.

A smooth implementation

At that point, the staff began using the VARI MedOncology system for all new patient information. They kept their old system running in a “view only” mode so they could easily refer to historical information. The facility's historical records—eight months' worth—were exported onto a CD and sent to Varian's MedOncology offices in Edmonton, where they were converted for downloading into the VARI MedOncology system. "The staff at California Oncology did not have to rekey all that data," says Sanders. The new system was complete by the end of August.

"It’s a real testament to the staff at California Oncology that we got this transition completed so quickly," Sanders adds. "They really applied themselves; they had great attitudes, were willing to move forward and to do whatever it took. They really stepped up to the challenge."

Harris has similarly warm words for Varian. "I've been really pleased. Everyone has been quick to respond whenever we have needed something. We went pretty fast. They've been helpful in every way. If we wanted something changed or added, Marnie would go right in or get someone else to take care of it, usually by the next day. It just didn't seem like any job was too big for them."

And what does Harris think of the VARI MedOncology system? "It seems really easy," she marvels. "I can find my way through it. It looks just like a—a chart!"
“We wanted to see if this approach would be beneficial,” says Lattanzi. “With previously treated cancer, the nature of the disease is such that it likely will require a higher radiation dose than is normally used. In addition, we needed to do the best possible job of protecting the tissues surrounding the target. We implemented a hypofractionated approach, similar to that being undertaken with radiotherapy tools developed for neurosurgery.”

**The extracranial radiosurgery protocol**

With radiosurgery for extracranial lesions, patient fixation is a major issue. Lattanzi uses the BodyFix vacuum fixation system from Medical Intelligence, GmbH, to immobilize patients during initial simulation. At that time, the BodyArray—a fiducial array of stereotactic localizers (markers)—is referenced to a carbon fiber board that is attached to the BodyFix device. The patient undergoes a CT simulation, which references the patient to the array. This process determines exactly where, in three-dimensional space, the patient’s tumor is in relation to the fiducial markers on the fixation system board.

Lattanzi then plans the treatment, using either a 3D conformal or IMRT modality. “We generally prepare both a 3D conformal and an IMRT plan, and see which is better,” he says. “Our current protocol is for delivering 400 cGy over five fractions, with treatments scheduled twice a week. It’s important to note that these were all plans for previously irradiated patients. They often do not have very many treatment options.”

When the patient returns for treatment, he or she is placed back into the BodyFix device. Lattanzi uses Varian’s optical cameras, mounted in the treatment room, along with SonArray® 3D ultrasound reconstruction software, to position the patient for treatment. “Using the fiducial array and the room-based optical cameras from Varian, the SonArray software confirms tumor localization prior to treatment,” he says. “Then the treatment is delivered.”

Varian’s stereotactic patient positioning tools can also be used with ultrasound, for treating lesions that are amenable to ultrasound imaging. “If you can ultrasound the lesion, then you don’t need the array affixed to the couch, because there’s already an array on the ultrasound machine probe,” Lattanzi explains. “When you take the ultrasound image, you localize the patient to that picture. We can use ultrasound for liver and other abdominal lesions, but we can’t use it for spinal tumors.”

**Exceptional response rates, minimal toxicity**

Lattanzi and his team have treated approximately 35 patients according to their extracranial stereotactic radiosurgery protocol. “The treatments generally take no longer than the amount of time required to deliver conventional radiation therapy,” Lattanzi says. “And it does not require any invasive techniques. Other systems for delivering extracranial radiosurgery require the surgical implantation of seeds for tracking, and treatments that can take up to six hours.”

Lattanzi and his team have documented response rates of 89 percent, based on pretreatment evaluation and quality-of-life scoring. They have also documented an 81 percent radiographic response rate, based on evaluations of the lesion after treatment. Only two of the 35 patients developed grade 2 toxicity.

“We have seen exceptional response rates with minimal toxicity for patients who have limited other options,” Lattanzi says.

According to Richard Stark, director of Varian’s delivery systems product line, helping radiation oncology departments implement stereotactic treatment approaches has become a major focus for Varian. “That’s why we developed the new Trilogy™ accelerator, which can deliver all the conventional forms of radiation therapy as well as stereotactic radiosurgery and fractionated stereotactic radiation therapy,” he says. “The Trilogy system can handle any cancer case that is treatable with radiation therapy. It’s part of our commitment to providing versatile treatment tools so doctors can use the most appropriate form of treatment for every single patient.”
## TRAINING OPPORTUNITIES IN THE U.S.

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<tr>
<td>High Dose Rate Brachytherapy for Prostate, Gynecological, and Breast Cancer course</td>
<td>25–26 October 2004</td>
<td>Seattle Prostate Institute (SPI), Seattle, Washington</td>
<td><a href="http://www.seattleprostateinst.com/coursedescriptions_highdose.htm">Visit</a>.</td>
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<tr>
<td>IMRT Treatment Planning and Dosimetry workshop</td>
<td>December 2004</td>
<td>Memorial Sloan-Kettering Cancer Center, New York, New York</td>
<td>Contact Gloria Hinds at <a href="mailto:hindsg@mskcc.org">hindsg@mskcc.org</a>.</td>
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<tr>
<td>Varian Medical Systems product training programs</td>
<td>Various</td>
<td>Varian Education Centers in Milpitas, California, and Las Vegas, Nevada</td>
<td><a href="http://www.varian.com/courses">Visit</a>.</td>
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## TRAINING OPPORTUNITIES IN EUROPE

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<tr>
<td>Eclipse™ Applications course</td>
<td>16–18 November 2004</td>
<td>Zug, Switzerland</td>
<td>Contact <a href="mailto:education.europe@varian.com">education.europe@varian.com</a>.</td>
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<tr>
<td>Eclipse Fast Track course</td>
<td>30 November–2 December 2004</td>
<td>Zug, Switzerland</td>
<td>Contact <a href="mailto:education.europe@varian.com">education.europe@varian.com</a>.</td>
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<td>Eclipse Management course</td>
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<td>Gating School course</td>
<td>4–6 November 2004</td>
<td>Copenhagen, Denmark</td>
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<tr>
<td>IMRT School</td>
<td>1–4 February 2005</td>
<td>Dijon, France</td>
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<tr>
<td>System Implementation course</td>
<td>7–9 December 2004</td>
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<tr>
<td>VARiS® Infomaker Reports course</td>
<td>12–14 October 2004 23–25 November 2004</td>
<td>Zug, Switzerland</td>
<td>Contact <a href="mailto:education.europe@varian.com">education.europe@varian.com</a>.</td>
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Varian Medical Systems and Florida Hospital, a healthcare system including 17 Florida hospitals, have formed a strategic alliance to provide a state-of-the-art radiation therapy training site at Florida Hospital’s Celebration Health facility in Celebration, Florida.

“We are pleased to be working with Florida Hospital to set up a facility where professionals can receive hands-on training in the newest radiation therapy processes, using our fully integrated system of equipment and software tools,” said Richard M. Levy, chairman and CEO of Varian Medical Systems. “The field of radiation oncology is dealing with a shortage of clinical professionals who have been trained to use the latest technologies.”

Florida Hospital and Varian will equip a learning center and technology showcase at Florida Hospital Celebration Health with the latest and most up-to-date systems for treating cancer with radiation therapy. Florida Hospital personnel will design and deliver educational programs for doctors, medical physicists, and other clinical professionals who use Varian equipment to treat cancer patients around the world.

Visitors to the learning center at Florida Hospital Celebration Health will learn the most advanced treatment processes including intensity-modulated radiation therapy (IMRT) and Dynamic Targeting™ image-guided radiation therapy (IGRT).
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