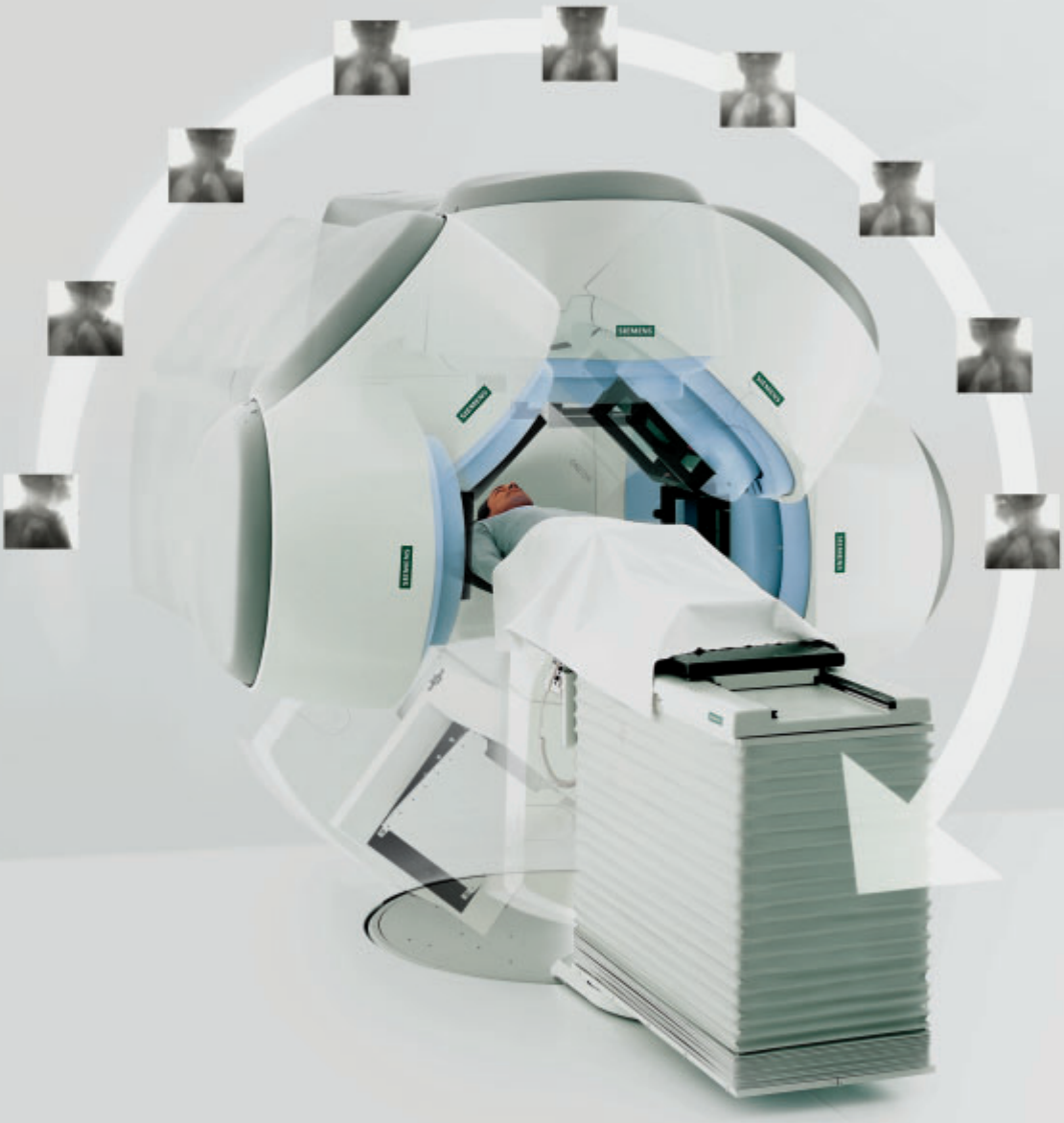
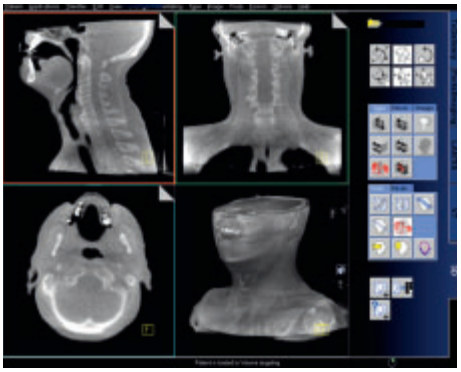

SIEMENS



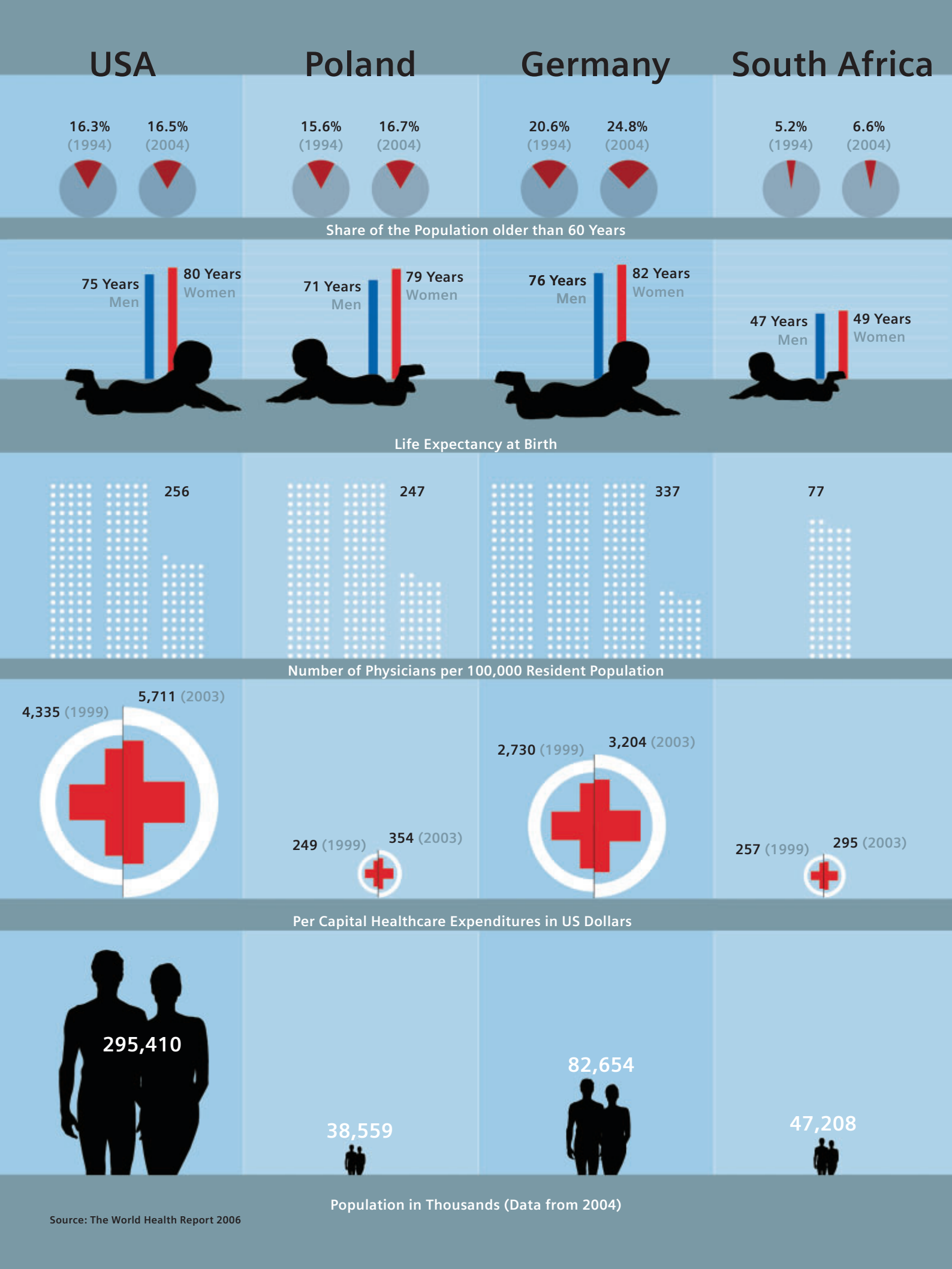
MVision enables imaging with the megavoltage radiation therapy treatment source to verify correct patient positioning just before treatment.

The Main Attraction: MVision

Four countries, four cultures, and one common problem: cancer. What are the experiences of physicians in the USA, South Africa, Poland, and Germany with MVision, Siemens new megavoltage cone beam imaging package for radiation therapy?

By Hildegard Kaulen, PhD

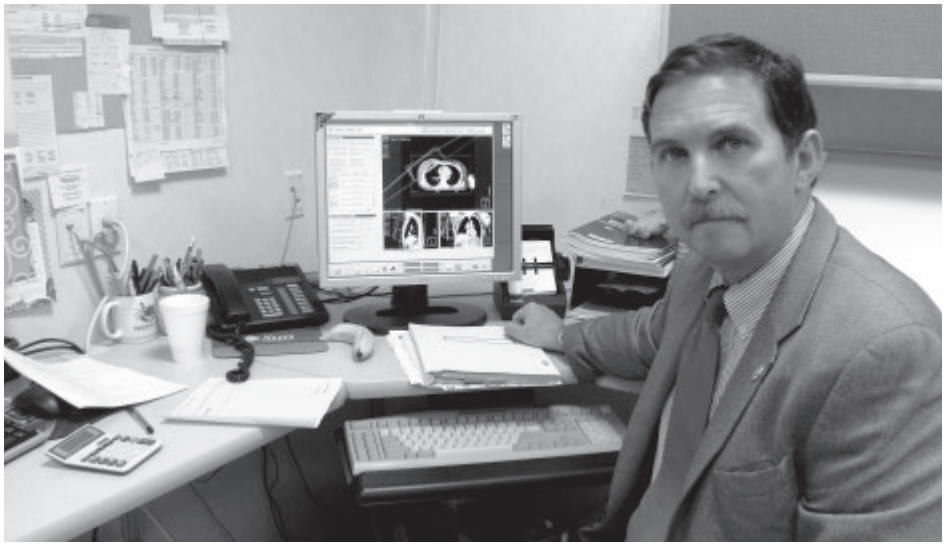
Using MVision™, the physician creates a cone beam computed tomography (CT) dataset of the target volume in the treatment position, compares it with the planning image, and adjusts the patient's position. The imaging system employs the same megavoltage cone beam used for therapy. No additional hardware is required at the linear accelerator.
As a result, the isocenter is the same for both applications: imaging and radiation therapy. The unique in-line technology offers complete coverage of the target volume. Patient access is ensured at all times. The standard set-up comprises an ONCOR™ or PRIMUS® Linear Accelerator and an amorphous silicon flat-panel detector to register the megavolt photons. The imaging system works with a *syngo*®-based workplace and is fully integrated into the clinical workflow. When the patient is positioned on the treatment table, the protocol for cone beam acquisition starts. The gantry then rotates in small steps – a total of 200 degrees – around the patient and acquires a projection image at each step. A three-dimensional volume data set is reconstructed from these and is automatically compared with the planning image made prior to therapy. The patient's position is then corrected by adjusting the table. The entire process, from acquisition of the projection images to optimum patient positioning, takes less than three minutes. *Medical Solutions* spoke to four institutes about their experiences with the new technology.



Source: The World Health Report 2006

USA

Helen F. Graham Cancer Center, Wilmington, Delaware, USA:
Wilmington is a city with 72,000 inhabitants and the headquarter for many companies due to advantageous tax laws. At the Helen F. Graham Cancer Center, 3,000 tumor patients are treated annually, 1,700 of whom undergo radiation therapy.



Christopher Koprowski, MD, Chair of the Department of Radiation Oncology

KOPROWSKI: We have been working with MVision since fall 2005. We had one of the first prototypes. Since then, we have gained a lot of experience. MVision provides a more accurate and reliable localization of tissue, which is particularly interesting when performing radiation therapy for prostate cancer, cancers of the head and neck, and lung cancer. These are three types of cancers for which radiotherapy has always been difficult. The contours of the prostate are hard to discern due to low soft-tissue contrast and the concave shape of the organ. While it is comparatively easy to determine the center of the gland, it is far more difficult to determine the apex and base. Additionally, because the rectum and bladder are more sensitive to radiation than the prostate, the position of the target volume has to be determined precisely for dose escalation.

For this, we use gold seed markers that can be seen precisely with three monitor units, creating a clear representation of prostate location and enabling an exact overlay on the planning image. Since three monitor units are in the dose range of a normal X-ray film, and the position of the prostate varies somewhat depending on the contents of the rectum and bladder, we check their position prior to each radiation exposure. MVision has another important advantage. It provides a meaningful volume data set even in the presence of metal implants. Since many men with prostate cancer also have artificial hips, this is an advantage that cannot be underestimated.

Dose escalation for head and neck cancers is also difficult, often resulting in the loss of the salivary gland. To make the comparison between the planning image and the image in treatment position, we use the bony structures of the skull and spine. Depending on the type of tumor, the reference bones may differ. Sometimes we use the chin to compare the volume data set, sometimes the spine. The imaging dose again equals three monitor units.

The potential for MVision in visualizing lung cancer is intriguing. We use the same dose for imaging here as for the other two types of tumors. Since the acquisition of projection images is relatively slow as compared to normal breathing motion, the center of the cancer is seen as a cloud – it is almost a four-dimensional image of the tumor. To align the planning image with the image from the radiation therapy position, we visually determine the center of this cloud and use this as the reference point.

We have had very good experiences. Despite the time required for a precise determination of the current target volume, MVision has drastically improved our workflow and cut our work time in half. We work much faster today than before.

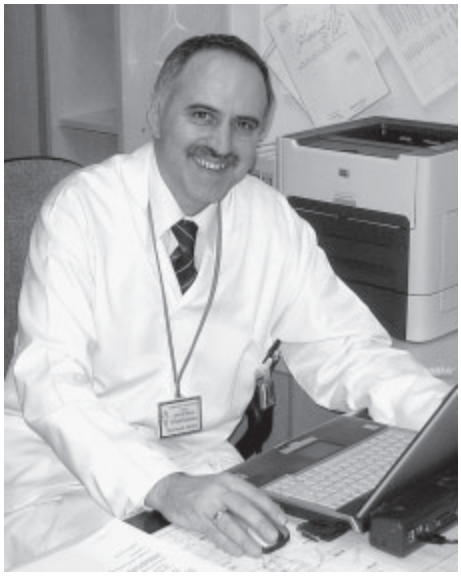
SOUTH AFRICA

Frank Daniels, Medical Physicist

DANIELS: We have been working with MVision for several weeks and are still in the phase of developing standardized protocols for all indications. We owe this imaging package to a state initiative to improve the equipment in public hospitals, and what we have done to date has provided us with consistent and reliable results. We also expect MVision to optimize our workflow. We treat a considerable number of patients everyday, but only have few medical personnel available. Therefore, we have to optimally use the available time while simultaneously further improving the treatment results. What we have seen from MVision already gives us hope that we will achieve this.

Pretoria Academic Hospital, Pretoria, South Africa: Pretoria is the official capital of South Africa. Located in the northeastern part of the country, it has a population of almost two million. The Pretoria Academic Hospital is a state-financed hospital, where every day, ten additional patients have to undergo radiation treatment, in addition to those already registered.

POLAND

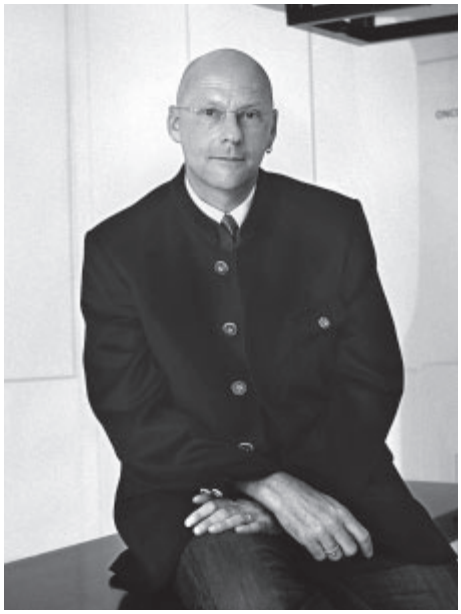


Pawel Kukolowicz, PhD,
Senior Medical Physicist

KUKOLOWICZ: We have had MVision since January 2006 and have been working with it regularly since April 2006. Since then, we have developed standardized protocols for almost all applications. We were initially worried about the high dose administered via the megavoltage cone beam during imaging, and felt we had to find a compromise between applied dose and soft tissue contrast. As a result, we initially used MVision only for patients being radiated with a high cumulative dose and scheduled for subsequent surgery. The dose for imaging – at that time it was eight monitor units – represented less than 1.5 percent of the cumulative dose. We felt that was justifiable. Today, we use five monitor units and know from numerous experiments that this extra dose is no cause for alarm. In fact, we now use MVision daily, and because it is integrated into the workflow, we are able to save time and increase efficiency. With MVision, all steps occur automatically.
While we currently use MVision for all types of tumors, we generally use the PRIMATOM™, an inroom CT system, for cancers of the head and neck. This system has two advantages for these indications. With PRIMATOM, the field of view is large, and it is possible to calculate the applied dose. From our perspective, this is a significant advantage when radiating head and neck tumors, given the extremely sensitive adjacent structures at risk. It is beneficial to have both MVision and the CT-on-rails. We have the flexibility to choose the application that best fits our needs.

Holycross Cancer Center, Kielce, Poland:
Kielce is a city located in a rural area in the southeastern part of the country with a population of 200,000. It is a center for the sale of agricultural products. At the Holycross Cancer Center, 140 patients undergo radiation therapy daily. In addition to MVision, the hospital also uses PRIMATOM. In this system, the linear accelerator is complemented by a CT on rails. At first, the treatment table is rotated 180 degrees away from the gantry, such that a diagnostic image can be made with a kilovoltage beam, and then turned back for irradiating the patient.

GERMANY



Gerd Schenk, PhD, Senior Medical Physicist

SCHENK: We have purchased MVision, but have not yet integrated it into routine operation. For us, this investment is another step into Intensity-Modulated Radiation Therapy (IMRT), a method that soon will be impossible to avoid and which we, as a private practice, feel obligated to use. Precise patient positioning is indispensable for IMRT. First of all, it is the only way to deliver tightly conformed radiation protocols, and second, the high dose range outside the target volume is, in fact, reduced using IMRT. However, large areas of the body are still irradiated with a lower dose. This is due to the larger number of angles used with somewhat deeper penetration depths. For this reason, the position of risk structures has to be determined precisely when using IMRT. MVision can also be integrated optimally into our workflow. Using a ten-megabyte remote connection, all data streams are forwarded to a center in Passau, Germany, to which eight other private practices are connected. As a result, all administrative functions are performed outside the practice, which reduces onsite costs and improves profitability. This is how we, as a private practice, can afford such an investment in the future.

Altötting Radiation Therapy, Altötting, Germany: Altötting is a small town in Upper Bavaria, 90 kilometers east of Munich, with 12,000 residents. It is known outside the region as a place of pilgrimage. Altötting Radiation Therapy is a private practice where 60 patients per day receive radiation therapy. The facility cooperates closely with hospitals and specialists in the vicinity.