




Optimizing Data Flow for Optimizing Patient Care



Over the past few years, radiation therapy technologies have become far more precise, but also much more extensive. This means that the requirements for an efficient and structured workflow have increased. Thus, the question remains: How do radiation therapy facilities organize their workflows to obtain optimal results? What are the issues and what are the solutions? Four radiation therapy centers display their different approaches for optimizing workflow and data management for best patient treatment.

By Irène Dietschi



As Head of Medical Physics, Dr. Gerd Lutters knows how important it is to have a set of comprehensive tools to help manage vast amounts of patient data and images.

“One job triggers the next.”

Gerd Lutters, PhD, Head of Medical Physics,
Institute for Radiation Oncology, Canton Hospital Aarau, Switzerland

Everyday, modern radiation therapy departments around the world use innovative technologies to help them consistently deliver accurate and precise patient treatments. As these technologies become more sophisticated, the need to seamlessly connect data, images, and clinical team members greatly increases. To accomplish this, departments are relying more and more on information technology (IT) solutions to help them create highly efficient workflows within their departments.

Canton Hospital Aarau, Switzerland

The Institute for Radiation Oncology at the Canton Hospital Aarau is one of the five largest radiation therapy facilities in Switzerland. Nearly 1,100 new patients are admitted each year, and a total of 18,000 radiation sessions are performed. The region has a population of about 570,000. The daily patient throughput averages five computed tomography (CT) exams for 3D-planning and 50 radiation sessions per ONCOR™ Linear Accelerator, ten of which are Intensity-Modulated Radiation Therapy (IMRT) sessions that are administered in part with MVision™ Megavoltage Cone Beam Imaging. The program also includes high dose rate (HDR) brachytherapy and regional hyperthermia, with 30 patients each per day. Between the end of 2004 and June 2006, the center, headed by Professor Stephan Bodis, MD, was newly designed and fully

reconstructed. Five new systems were purchased, radiation and workflow planning are now supported by state-of-the-art IT systems, and the rooms were remodeled to be more inviting to patients. In addition, Aarau is the only Swiss institute that has two radiation rooms where daylight can shine in.

The new treatment planning and delivery systems enable the oncologists at the Canton Hospital Aarau to offer a broad range of radiation treatments, including IMRT, Image-Guided Radiation Therapy with MVision, respiration-gated computed tomography, as well as brachytherapy and regional hyperthermia.

Within the culture of the institute, workflow is of great importance, as emphasized by Gerd Lutters, PhD, Head of Medical Physics. “In the case of complex 3D planning for curative patients, it is our objective that the time between the first consultation and the first radiation treatment does not exceed eight working days.” Waiting lists are avoided whenever possible. The motto at the hospital is ‘just in time.’ This requires that patient data is effectively transferred from one work step to the next, and promptly processed by personnel. “One job triggers the next,” says Dr. Lutters.

The new IT environment eliminates the need to rush hardcopy patient records and other information back and forth. “Today, we require that the paths are as controlled and secure as possible, because this allows for accurate and safe patient treatment,” says Dr. Lutters. The efficient



Dr. Lutters talking with Emely Rabe, Chief Therapist. She coordinates the therapist team and patient appointments, and ensures seamless workflow in the treatment rooms.

“Patient care involves more than medical and technical know-how, it also includes social competencies and team spirit – all of which have special importance at Aarau.”

Professor Stephan Bodis, MD, Head,
Institute for Radiation Oncology, Canton Hospital Aarau, Switzerland

workflows allow employees to focus on what is most important – patient care. “This involves more than medical and technical know-how, it also includes social competencies and team spirit – all of which have special importance at Aarau,” says Professor Dr. Bodis. Patient care at Aarau follows a set path: After registering, the patient arrives for

his or her first consultation at the treating physician’s office. On the same day, the therapy concept is discussed and recorded in writing in the daily team meeting. Next, a planning CT is generated and the positioning devices are determined. This information is secured both in writing and electronically with the *syngo*® Imaging XS image archive and the LANTIS™ oncology information system. Subsequently, the oncologist selects the image data on the *syngo* RT Oncologist workspace to display the tumor and critical organs three-dimensionally. This is frequently done after image fusion with positron emission tomography (PET) or with magnetic resonance imaging (MRI) data, which is selected from other databases within the Canton Hospital. The senior physician for planning approves the 3D outlines drawn into the image and also applies internal hospital standards.

From *syngo* RT Oncologist, the data is sent to the workstation of the dosimetrist, who establishes a machine control set from the determined radiation dose. In Aarau, these computers are located in the basement, where the specialists can focus on their work without interruptions. For IMRT, the dosimetrist uses KonRad™, a tool in the *syngo* RT Dosimetrist workspace, to support the planning process. The dosime-

trist computes how to optimize – that is, modulate – radiation for an irregularly shaped tumor mass and establishes the machine control data set. Using a phantom, the physicist individually controls the treatment plan directly at the linear accelerator for each respective patient. After the physicians’ planning discussion, all data – images as well as treatment data – is released in LANTIS, the data and verification system, so the information is available to the linear accelerator. The computed machine control set is checked one more time using the independent monitor unit control program Diamond (KS). For the initial setting with verification and the daily radiation treatment, the radiation technologist loads the data from LANTIS to the *syngo* RT Therapist workspace. Using the verification images (from the electronic portal imaging device [EPID] or from MVision), the team meets again after the first treatment session to review the treatment plan and the course of therapy one more time to ensure that the therapy is executed as planned.

The entire data path from patient registration to the completion of therapy is handled electronically. However, until recently, the actual workflow had to be performed manually. For instance, staff members used physical mailboxes to inform one another when an individual work step was completed and the next one could be started. If the oncologist completed contouring, for example, he or she put the patient record into the dosimetrist’s mailbox so calculations could begin.

The disadvantage of this nonautomated process is a tendency toward errors. Potentially, a record could remain in the mailbox unnoticed or be lost. For Dr. Gerd Lutters, workflow now has a new meaning. It is an IT-supported, standardized process that combines all computer systems to ensure that data is available where it is needed, when it is needed.

Project in Aarau: Workflow Manager from Siemens

This goal is met by *syngo* RT Workflow*, a new system from Siemens, installed at the beginning of May as a limited release.

* This information about this product is preliminary. The product is under development and not commercially available in the US, and its future availability cannot be ensured.





According to Professor Dr. Stephan Bodis, a networked hospital and connections to external partners were a main focus for redesigning the Oncology Center in Aarau.



From left: Chief Therapists Marion Plewe, Senior Physician Andreas Küsters, MD, Chief Physicist Andreas Decknatel, and Chief Oncologist Hans Hoffmanns, MD



Radiation Oncology at Maria-Hilf Kliniken looks back on a history of more than 80 years.



Chief Physicist Andreas Decknatel knows about the challenge of networking systems from different manufacturers.

"In principle, *syngo* RT Workflow is a future-oriented system," says Dr. Lutters. It provides two important services. First, it combines image data and treatment data in one database. Previously, DICOM images did not recognize dose, and radiation data did not recognize images. Now, both types of images are automatically linked via *syngo* RT Workflow. Additionally, the system also stores reference images. As a second advantage, the system automatically sends patient data from one work step to the next via a predefined workflow. A traditional mailbox system with incoming and outgoing mail is now superfluous. *syngo* RT Workflow also prepares all data for every work step, quickly and reliably informs staff which work step contains what data, and alarms the respective expert as soon as a new job is waiting. If the identified team member is not available, *syngo* RT Workflow forwards the information to the entire work group, so that the data can be processed by a different person in the same reliable way. Should another delay occur, the system alarms management. With this type of workflow, it is almost impossible to forget or overlook anything.

What made the Aarau Center choose Siemens? "We wanted to establish a networked hospital with modern systems, but still wanted to connect to the world outside of the hospital," says Professor Dr. Bodis. The center must not only be able to function satisfactorily within its own walls, but also be able to connect to various other branches – keywords of electronic patient files, picture archiving and communication (PACS), communication with other hospitals and the family physician, as well as other networks. It should be possible to grow as technology further develops, Professor Dr. Bodis adds. "We consciously created a heterogeneous environment so we would not become dependent on a single manufacturer. The openness of the Siemens systems meets our requirements."

Kliniken Maria-Hilf GmbH, Mönchengladbach, Germany

The Hospital for Radiation Therapy in the Kliniken Maria Hilf GmbH in the German town of Mönchengladbach shares certain parallels with the center in Aarau. Similarly, this hospital was recently completely

remodeled – in this case, it moved into a new building – and systems from multiple manufacturers were acquired. In addition to three linear accelerators from Siemens, Mönchengladbach uses the full *syngo* Suite for Oncology. The remaining systems, for example the therapy planning system, are from Nucletron B.V., a company located in the Netherlands. The number of patients treated at Maria-Hilf is also comparable to the volume at Aarau. On a yearly basis, approximately 2,000 new patients undergo radiation therapy, and between 150 and 180 treatments are performed daily. Approximately 700,000 people live in the surrounding area. The throughput of 60 patients per day on each linear accelerator is slightly higher than in Aarau.

"We have a well-functioning workflow in Mönchengladbach," says Chief Oncologist Hans Hoffmanns, MD. "Our organization is electronically networked, manual activities are a thing of the past." Through real-time imaging methods, efficient workflows become possible. In the past, a great deal of time was lost, for example, for film exposures for field verifications. While certain things could be more streamlined,



Patients and physicians at Mönchengladbach are accompanied by art objects and a lot of daylight. From left: Hans Hoffmanns, MD, Anja Ilgemann, MD, and Thomas Schwerdtfeger, MD

“Our organization is electronically networked; manual transport is a thing of the past.”

Hans Hoffmann, MD, Chief Oncologist,
Kliniken Maria Hilf GmbH, Mönchengladbach, Germany

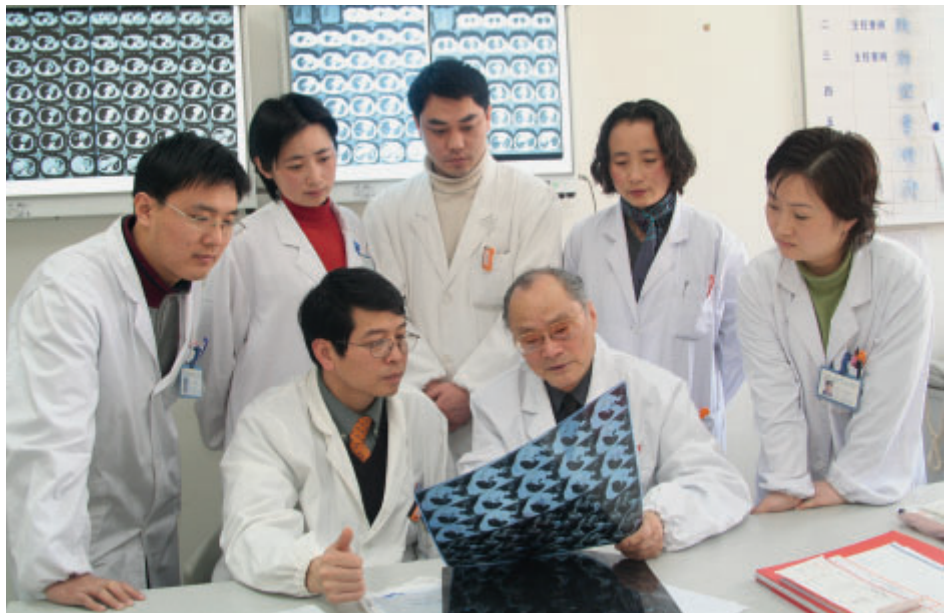
such as reading PET-CT images into the therapy planning system, quick improvements are expected in this area through the use of new software.

Head Physicist Andreas Decknatel explains: “If you work with two companies, their products often require more than one adjustment until they can communicate smoothly with one another.” However,

that was not an issue when representatives of Siemens and Nucletron came together and worked on the interfaces. “Compatibility is no longer a issue for us,” says Decknatel.

Shanghai Sixth People’s Hospital of the Jiao Tong University, China

The Shanghai Sixth People’s Hospital of the Jiao Tong University in China demonstrates that compatibility does not always go without saying. More than 12,000 new patients per year are treated in the radiation oncology department. In a center with a daily throughput of 80 patients per system, it is not uncommon for each delivery system to operate 11 hours a day. The challenges can intensify if staff members are faced with difficulties arising from having a multivendor environment. “Not every software runs on every computer,” says Chief Oncologist Shen Fu, MD, describing a basic challenge. Aside from the hospital’s work with Siemens, the institute works with half a dozen different manufacturers. The linear accelerators come from two different sources (Siemens Medical Solutions and Varian Medical Systems, Inc.) and the planning



Professor Dr. Shen Fu and Professor Dr. Liu Taifu (sitting, from left) discuss CT images with Ding Jinhua, resident, Zhang Qing, Associate Professor, Sun Yi, Assistant Professor, Peng Iihua, Associate Professor, and Shao Yuhui, Assistant Professor (standing, from left) at the Department of Radiation Oncology, Shanghai Sixth People’s Hospital.



Precise treatment planning and patient positioning are key to therapeutic success, especially when it comes to using innovative methods like those at the Odette Cancer Centre.

computers are even procured from three separate manufacturers. This heterogeneity can have a negative effect on workflow, explains Dr. Fu. For example, despite having a good archiving system, they can have difficulties retrieving patient data efficiently from the archive and making it available for individual work steps. Problems of compatibility do not affect Siemens products, emphasizes Dr. Fu. "Siemens systems are very open and efficient. And whenever there were questions with respect to interfaces, we received the best possible customer support."

Odette Cancer Centre, Toronto, Canada

With 13 linear accelerators, nine of them from Siemens, the Odette Cancer Centre has a reputation for offering patients advanced treatment options. "We are a very large department. In order to best serve our patients, our department workflow must be highly efficient," says Sheila Robson, Manager and Head of the Radiation Therapy Department. They are continuously working on making data transfer

even smoother in the direction of an oncology PACS system. "This is being done in the interest of increased efficiency," explains Peter O'Brien, Manager and Head of the Medical Physics Department. The heterogeneity of the systems could play a role – but not a decisive one. O'Brien and his colleagues go even further to add, "In the end, the entire IT support is of secondary importance to the workflow." What is far more important than technology is the human factor. The complexity of new technologies, combined with pressures to increase throughput, can potentially negatively affect a department's performance. To minimize this risk, IT solutions must be flexible and easy to use – complementing the tasks that need to be performed. The right tools, such as those offered by Siemens, can help facilitate workflow and minimize errors, enabling the clinical team to focus on what is most important – treating patients.

Irène Dietschi, a Swiss science journalist, lives in the vicinity of Aarau.

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Shen Fu, MD, Chief Oncologist,
Department of Oncology,
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