



**PHILIPS**

Pinnacle<sup>3</sup>

SmartArc

## Customer Story

### Who?/ Where?

Swedish Cancer Institute (SCI) in Seattle, Washington, was founded 100 years ago and has grown into the Pacific Northwest's largest, most comprehensive nonprofit healthcare system.

Penrose Cancer Center in Colorado Springs, CO is one of the best-known, longest-standing community cancer programs in the western United States.

### Challenge?

Taking full advantage of the opportunities presented by volumetric modulated arc therapy (VMAT) to stay at the cutting edge of radiation oncology treatment planning and delivery.

### Solution?

While each institution uses linear accelerators from different manufacturers for the delivery of VMAT, both institutions rely on Philips Pinnacle<sup>3</sup> with SmartArc radiation-therapy planning.



Penrose Cancer Center,  
Colorado Springs, CO

Swedish Cancer Institute, Seattle, Washington

# Seamless **VMAT** planning across delivery systems

## Pinnacle<sup>3</sup> with SmartArc radiation-therapy planning

### SmartArc for smart therapy

The SmartArc module seamlessly integrates with the Philips Pinnacle<sup>3</sup> radiation-therapy system to create dosimetric plans for volumetric modulated arc therapy (VMAT) delivery. VMAT is an intensity modulated radiation therapy (IMRT) modality that combines dynamic gantry motion with beam-intensity modulation. It is designed to significantly reduce treatment time compared with traditional IMRT. Philips SmartArc is compatible with VMAT-capable linear accelerators from Elekta and Varian.

### Background

Swedish Cancer Institute (SCI) delivers SmartArc treatments on its Elekta linear accelerators and has treated numerous patients with SmartArc. The SCI team has utilized SmartArc in the treatment of a wide variety of cancers, including brain, head-and-neck, lung, liver, and pancreas. Clinicians have found it to be useful for all treatment sites that benefit from IMRT. On average, the SCI treats about six patients each day that were planned using SmartArc.

The team at Penrose uses VMAT plans for everything they had previously

treated with IMRT, including brain, thorax, prostate, and head-and-neck cancers. They treat about 20 patients per day planned with SmartArc using Varian accelerators.

### Results

David Shepard, Ph.D., director of medical physics at the SCI, reports that using SmartArc has cut IMRT delivery times by more than a factor of two and that the improved clinical throughput allows them to run a more efficient clinic. The faster treatments are also easier on patients and reduce the chance that a patient will move during the delivery of radiation. He notes, "We have been very pleased with the performance of the SmartArc module in Pinnacle<sup>3</sup>. It has been easy for our dosimetrists to learn and the plan quality is excellent."

Greg Gibbs, medical physicist at Penrose, agrees. "We can deliver the patient's treatments in two to three minutes as opposed to 10 to 20 minutes. The patient is able to lie still for two minutes much more easily than for 20 minutes. If we can deliver the treatment right away after positioning, the patient is more likely to be in the correct position when we deliver the treatment."

# Improved throughput...

“

**New technologies generally add complexity to treatments. We have found SmartArc to be an exception. It simplifies treatment planning and delivery.”**



David Shepard, Ph.D.  
Director of Medical Physics at SCI



Vivek Mehta, MD  
Radiation Oncologist at SCI,  
Director of the SCI Center for  
Advanced Targeted Radiotherapies

## **Expanding the number and types of patients for treatment**

The Center for Advanced Targeted Radiotherapies was developed within the SCI to provide an opportunity for its clinical experts and technology manufacturers to partner in a way that allows for the optimization and implementation of new technologies that can improve patient care. It encompasses the comprehensive and complementary array of advanced and emerging radiation delivery tools available to patients for both approved therapies and clinical-research efforts.

Dr. Vivek Mehta, director of the Center for Advanced Targeted Radiotherapies and a radiation oncologist at the SCI, values the use of SmartArc for its role in helping more patients undergo treatment:

**“Speed of delivery is very important because it reduces resource strain and improves throughput in a department. While this is a strong argument for implementation of VMAT, another equally strong argument is the ability to treat patients who previously couldn’t be treated. For example, we have had one or two patients who simply couldn’t tolerate the immobilization mask for a long treatment time. We have also had a few patients with back problems that create a significant obstacle for them, and by reducing the time on the table they were able to be treated.”**

Dr. Anuj Peddada, radiation oncologist at Penrose, concurs:

**“In addition, I think of the intrafraction movement of the patient during treatment for prostate cancer. There’s much less potential for patient movement during the shorter course of therapy than during the longer course.”**

Gina Nygaard, manager of radiation oncology at Penrose, adds:

**“Setup and treatment for IMRT head-and-neck treatment generally takes 20 to 30 minutes. Even with good immobilization, it is difficult for this group of patients. SmartArc has improved the length of time for these patients and made treatment delivery faster.”**

## **Up and running quickly**

According to Shepard, “As soon as the new delivery technology came out, we were ready to go on the planning side. The contouring tools and other functionalities are very useful. The scripting tools allow us to perform research with the system, which is a positive. Our radiation technologists are big fans of VMAT and the SmartArc tools because the treatments are efficient. New technologies generally add complexity to treatments. We have found SmartArc to be an exception. It simplifies treatment planning and delivery. Our therapists are asking to treat more patients with SmartArc plans because the treatments are efficient. The Elekta and Pinnacle<sup>3</sup> systems work well together. The interface is good and everything works well between them. The interface is fairly seamless.”

## **Clinical perspective**

Dr. Mehta states, “Like other clinicians, I want to deliver the highest possible dose of radiation to the tumor and spare the most normal tissue. It makes sense to me that we would use SmartArc VMAT in every patient that we would consider for IMRT.”

This echoes the viewpoint of Shepard. “Physician buy-in has been fairly easy,” he says. “If you’re already doing IMRT, it’s a fairly straightforward adjustment from a physician perspective. More physicians are starting to try this and to run plans, and they find how much more efficient the plans are and the high quality of the plans, and so everybody’s [in SCI] getting on board with it. We have more and more physicians advocating to get their patients treated with SmartArc and VMAT.”

## **The familiarity of IMRT**

Gibbs shares his experience. “It’s the same beam model we’ve been refining for 15 years,” he says. “We already know that it works and nothing really has changed in the calculation. The optimization has changed, but the beam model is the same. There were some little changes we’ve made in our optimization parameters, but nothing major.”

Dr. Alan Monroe, radiation oncologist at Penrose, views VMAT with SmartArc as a natural extension of IMRT. “It’s IMRT delivered efficiently,” he says. “I like the convenience for the patient, the therapists are happy, and we’re



# ...for a more efficient clinic.

getting good plans. SmartArc is the next generation of the planning of IMRT. Whatever is appropriate for IMRT is appropriate for SmartArc."

Lori Malenfant, dosimetrist at Penrose, notes the ease of use. "I thought it was an easy switchover from what we were doing before," she says.

Shepard continues, "If you're already doing IMRT planning in Pinnacle<sup>3</sup>, switching to SmartArc is fairly straightforward. You're defining your prescriptions the same way. For contouring and setting up treatment goals, the majority of the process is the same as it was before. You need to learn to set up some of your VMAT parameters, but once you've done it a few times, you've got the hang of it and it's a fairly straightforward process. If you already have experience with IMRT planning on Pinnacle<sup>3</sup>, you will be up and running pretty quickly with SmartArc. I was impressed that Philips came out with a ready for prime-time product that gave good plans right from the start."

## **Even complex treatments in standard time slots**

Shepard affirms that "SmartArc has dramatically improved the efficiency of our IMRT deliveries. We can now deliver even our most complex IMRT treatment

in less than five minutes. The rotational nature of SmartArc also has dosimetric advantages. Rotational delivery does not increase the total integral dose delivered to the patient, but rather provides greater flexibility in how we shape the dose. We can deliver even the most complex treatments in standard delivery time slots. We're using it more for a variety of sites, particularly head-and-neck sites. You get the dosimetric advantage of rotational therapy, plus the efficiency gains are most dramatic there because that's where fixed-field IMRT takes the most time, for the head-and-neck cases. We're also using SmartArc for lung stereotactic body radiotherapy (SBRT)."

## **Rigorous quality assurance**

A key to success is to set up a thorough quality-assurance program, Shepard says. "Due to the fully dynamic nature of SmartArc delivery, it is critical to evaluate the performance of your delivery system." Dr. Monroe notes, "It is nice to feel comfortable about delivering this technology to our patients. We have not had immediate clinical issues. The therapists feel very comfortable delivering these plans. I had a little bit of skepticism at first, but when I saw the quality assurance (QA) process it seems [to me] like a pretty robust program. The plans look great." Gibbs asserts, "It's a lot better, but it's not really that different. The QA is 5% of the time. Because we deliver all of the beams at once, it's just much faster to collect the data and a

whole lot faster and easier to analyze it." According to Malenfant, "The calculation times are longer but the plans are actually completed more quickly. We can plan a SmartArc in 30 minutes." Thorsten Ostrander, dosimetrist at Penrose, adds, "We prefer it over the 3D conformal plans."

## **The relationship with Philips**

Teams from both institutions agree that they chose Philips based on positive working relationships and the company's commitment to providing world-class planning solutions.

## **Future possibilities**

Shepard says, "VMAT may become a more popular delivery technique than fixed-field IMRT due to the efficiency gains provided by VMAT and the dosimetric advantage of rotational delivery. An idea that is intriguing is performing cone-beam CT imaging during VMAT delivery."

In summary, Shepard states, "New technologies such as VMAT present great opportunities to improve the quality of care that we provide to our patients. With its advanced planning tools, the Pinnacle<sup>3</sup> treatment-planning system is allowing us to take full advantage of the capabilities of these new technologies." Gibbs concurs. "My advice to others? Don't wait," he says. "The model is good and the treatment is efficient and delivered faster."

“All the things we learned with [Pinnacle<sup>3</sup>] IMRT just transferred right over.”

**Greg Gibbs**  
Medical Physicist  
Penrose Cancer Center

## **Penrose Cancer Center team**

(Back Row):

**Thorsten Ostrander, CMD**

**Alan Monroe, MD, Radiation Oncologist**

(Front Row):

**Anuj Peddada, MD, Radiation Oncologist**

**Gyongyver Bulz, Medical Physicist**

**Lori Malenfant, CMD**

**Greg Gibbs, Medical Physicist**





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