



SETTING STANDARDS FOR ONCOLOGY CARE in Latin America's most important economic, financial, and cultural metropolitan area: the Sírio-Libanês Hospital in São Paulo, Brazil.

Patients Benefit From Advanced Technology in Oncology Care

Cutting-edge IMRT and other solutions by Siemens help to place Hospital Sírio-Libanês in São Paulo, Brazil, at the forefront of radiation oncology in Latin America and beyond.

By Reinaldo José Lopes

It's been less than a year since Mauricio Ceschin, M.D., a gastroenterologist who also happens to have a successful career as a manager of health and insurance systems, took up a new challenge. This past January, he became the CEO of the Hospital Sírio-Libanês, one of the largest and most prestigious medical institutions in Brazil. "I can say I've sat on both sides of the table, so to speak. And this helps me to appreciate the unique blend we have here," says Dr. Ceschin. "We understand our institution to offer integrated solutions – for both our patients and healthcare insurers. And I just can't imagine that without cutting-edge technology. It's really one of the keys to reducing costs while improving the quality of care at the same time."

Sírio-Libanês, located at the bustling heart of downtown São Paulo and just a few blocks away from the city's renowned Paulista Avenue, has already gone a long way toward reaching this goal. Its main assets are a highly qualified medical staff and a close partnership

with Siemens Medical Solutions, especially in its oncology center. Since the late 1990s, the hospital has acquired an impressive array of cutting-edge technologies to treat patients in a faster, safer, and more precise way, improving treatment and quality of life for them while at the same time enhancing clinical and operational workflow for its doctors and technical staff.

The complex is an interesting mix of modernity and tradition: the older half of its facade still boasts the neoclassical, Parisian style that was all the rage in the 1920s, when Sírio-Libanês was founded (though it only officially became a hospital in 1965). It takes less than a 50-meter walk to get to the IEP, the hospital's Research and Teaching Institute, which is almost futuristic in appearance. Such contrast is the natural byproduct of a long history, through which Sírio-Libanês, originally a ladies' charity established by affluent immigrant families of Syrian and Lebanese descent, became one of the leading medical institutions in the country. Despite being a private insti-



THE OLDER PART of the hospital was built in the neoclassical style of the 1920s.



HAVING BEEN A MANAGER for health and insurance systems before he became Sírio's CEO, Dr. Mauricio Ceschin can say that he has sat on both sides of the table.

»Cutting-edge medical technology is really one of the keys to reducing costs while improving the quality of care at the same time.«

Maurício Ceschin, CEO, Sírio-Libanês Hospital, São Paulo, Brazil

tution, it still retains a strong philanthropic edge. Sírio-Libanês Hospital's Oncology Center, which includes the Radiation Oncology Department, originally established in 1971, put the hospital at the forefront of oncology treatment at that time, being the first in Latin America to benefit from a linear accelerator with a photon and electron beam. However, over the next two decades, major changes, both in medical imaging and radiation therapy, meant the hospital couldn't stand still. "Until 1997, we lived in a 2-dimensional age here," says Dr. João Luis Fernandes da Silva, the hospital's head of radiation oncology. That's when the hospital decided to invest heavily in radiation oncology. After having had a close look at different vendors, the decision was finally made to go with Siemens. "Not only did they have state-of-the-art technology; what distinguished them was the partnership approach – assessing our needs and demands as well as our challenges," he continues. After working for some time with 3D conformal radiation therapy, Sírio-Libanês again became a pioneer in Latin America by acquiring Siemens' Intensity Modulated Radiation Therapy (IMRT) equipment in 2000. This gave the hospital's team the ability to treat tumors with an unprecedented degree of accuracy and safety, explains Cecilia Maria Kalil Haddad, Sírio's chief medical physicist. "3D conformal is the standard in any oncology department. But, with IMRT, the treatment becomes much more personalized," she says. IMRT is such a leap forward because it manages to make the most of CT and other advanced imaging techniques. Back in the 2D era, it was nearly impossible to treat



DR. JOÃO LUIS FERNANDES DA SILVA (ABOVE) AND DR. CECILIA HADDAD (below right, together with technician Rosana Vieira de Freitas) both think that medicine and physics are two highly complementary disciplines in oncology care: One can't be successful without the other.



FROM TOP TO BOTTOM: Radiotherapy planning at Sírío-Libanês. Elizabeth Canhoto (center), chief radiation technologist, and Edilson Pelosi (bottom), physicist, found that with the help of Siemens, learning the new technologies and systems was fairly easy.

a tumor with a high dose of radiation; the danger of damaging adjacent and critical organs was just too high to be worth the risk. Doctors also lacked the ability to visualize the tumor volumetrically – to actually see the spatial relations between the tumor and the critical structures they wanted to spare. That's exactly what IMRT is able to do, in a way that's almost like "sculpting" the dose around the tumor. That means the modulated photon beams, featuring energies between 6 million and 18 million electron volts, reach the target in a nonuniform, heterogeneous way – tightly following the 3D shape of the affected area. Thanks to the resolution level of the CT images used for planning, those "slices" of tumor area that are relevant for intensity modulation can be as small as 3 mm.

Inverse Planning

A crucial step in this delicate process is inverse planning. "With forward planning, what we did was provide the treatment planning system with the number of fields, their weight, presence of wedges (physical barriers that modify the intensity of the beam), and so forth, and the system calculated the dose and distribution for us," says Dr. Haddad. However, as the name implies, inverse planning does just the opposite. "Let's say you need five beams, with different intensity levels, and a number of clinical constraints – for a prostate cancer, 25 percent of the rectum's volume can receive less than 70 Gy and the tumor prescription dose sometimes goes to 80 Gy, for example. You describe the clinical parameters in a mathematical way, and the software defines the modulated beams and calculates the dose you need to have those results," she explains.

Sírío's team is applying this process to treat a variety of tumors: head and neck, breast, prostate, rectum, and gynecological tumors. Since October 2000, Sírío has performed about 550 treatments. A treatment plan only receives the "go-ahead" after a quality assurance test has been performed for each patient. By using a phantom – basically a polymer box whose density is calibrated to mimic the fine detail of the tissues the beams are going

»With IMRT, we are able to direct the required dose at the tumor while sparing healthy tissue at the same time.«

Dr. Cecilia Kalil Haddad, Chief Physicist,
SÍrio-Libanês Hospital, São Paulo, Brazil

to go through – the team dramatically reduces the probability of errors during the actual treatment. Quality assurance is provided for by using ion chambers and films. “This is particularly important for head and neck tumors, where you have a lot of different structures: skin, bone, salivary glands, optic nerve, and so forth,” comments Dr. da Silva.

The Siemens BEAMVIEW™ System, a realtime portal imaging system attached to the linear accelerator, is also able to take into account a simple, yet very important source of errors – patient and organ movement. During and in between treatment sessions, patients and their organs tend to move, even marginally from session to session. This system with the integrated IM-MAXX™ automated delivery software planning system, allows for a reduction of the time the patient spends on the couch – and therefore the probability of errors.

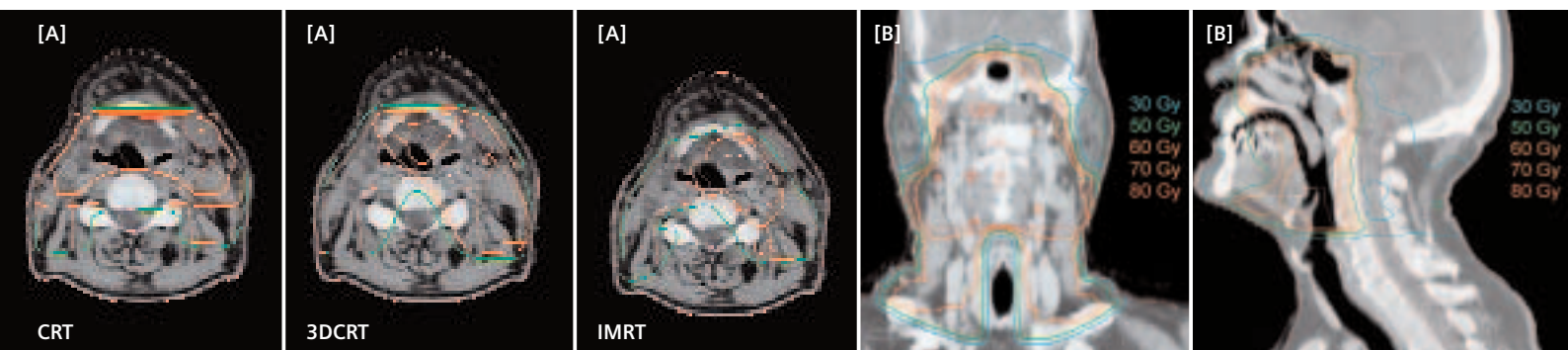
Stereotactic Radiosurgery

Besides IMRT applications, SÍrio’s team is also moving forward with stereotactic radiosurgery, a treatment that is highly recommended for small brain tumors. “We are just starting our radiosurgery activities, but the partnership with Siemens is changing that fast – especially when we look at the ModuLeaf™ collimator with leaves of 2.5 mm. We do feel we’re a priority for them in that regard,” says Dr. da Silva. He explains that the technique was initially used in single applications, but current developments, such as fractionated stereotactic radiotherapy, allow physicians to employ it over the course of six weeks to treat tumors of 4 cm or more in

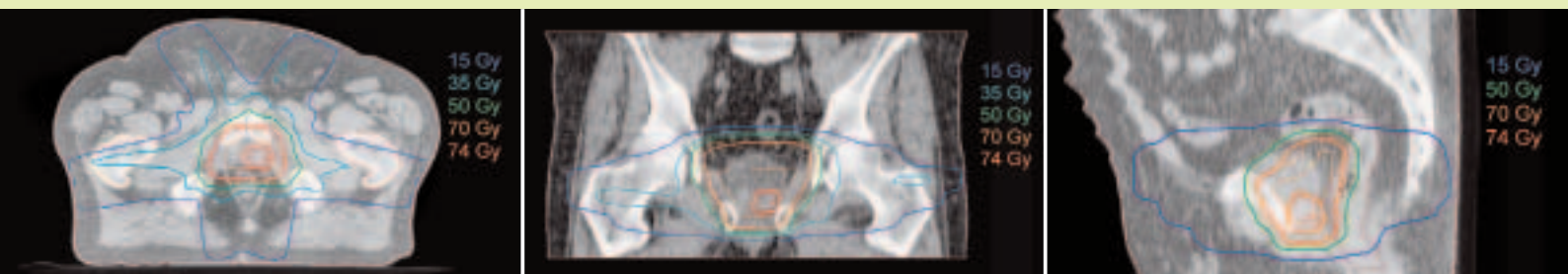


MAXIMUM PATIENT CARE is the credo of all employees at SÍrio-Libanês. Nurse Elizabete Duarte is preparing a patient for stereotactic radiosurgery.

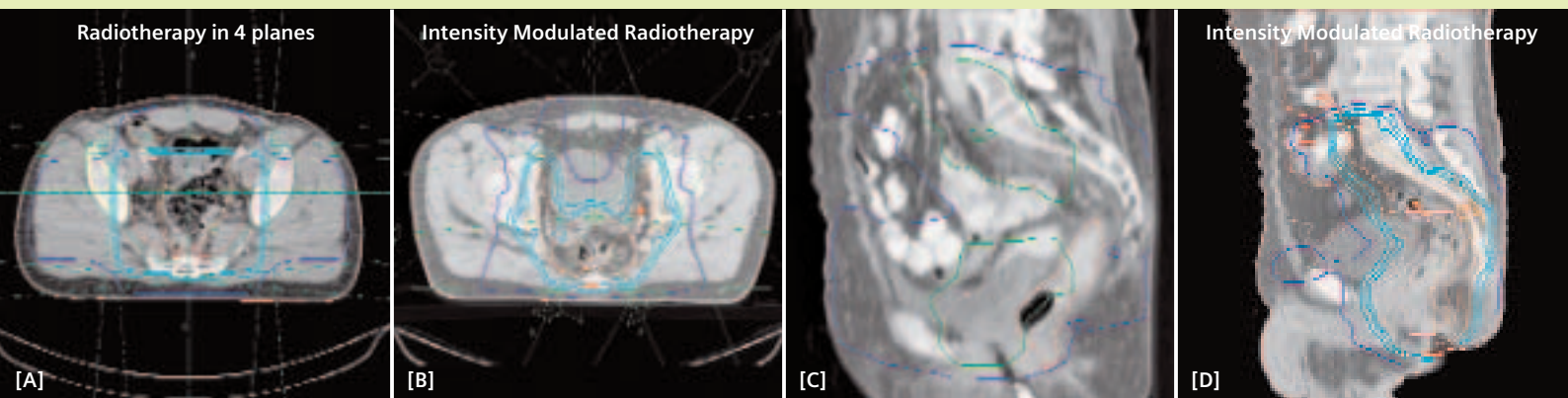
diameter. As is the case with IMRT, stereotactic radiosurgery helps physicians to achieve a very high conformability: deliver a high dose of radiation to the tumor, and protect normal brain tissue from the radiation beams. The next step will be extracranial fractionated stereotactic radiotherapy. No wonder that all this high-precision technology and careful planning also results in better workflow for the staff. “To deliver the IMRT treatment, we used to need 30 minutes. Now, with the



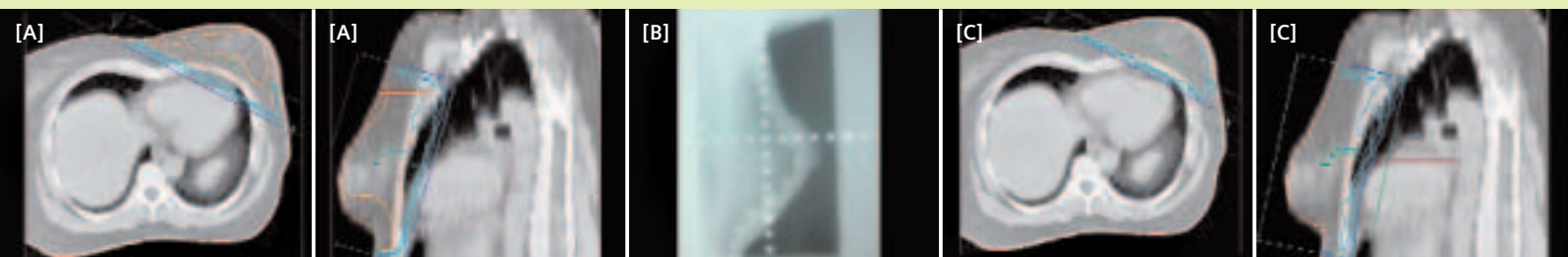
HEAD AND NECK: [A] IMRT renders higher conformality compared to conventional and 3D radiation therapy. [B] IMRT treatment of nasopharynx tumor: coronal and sagittal views, plan generated with KonRad RTP.



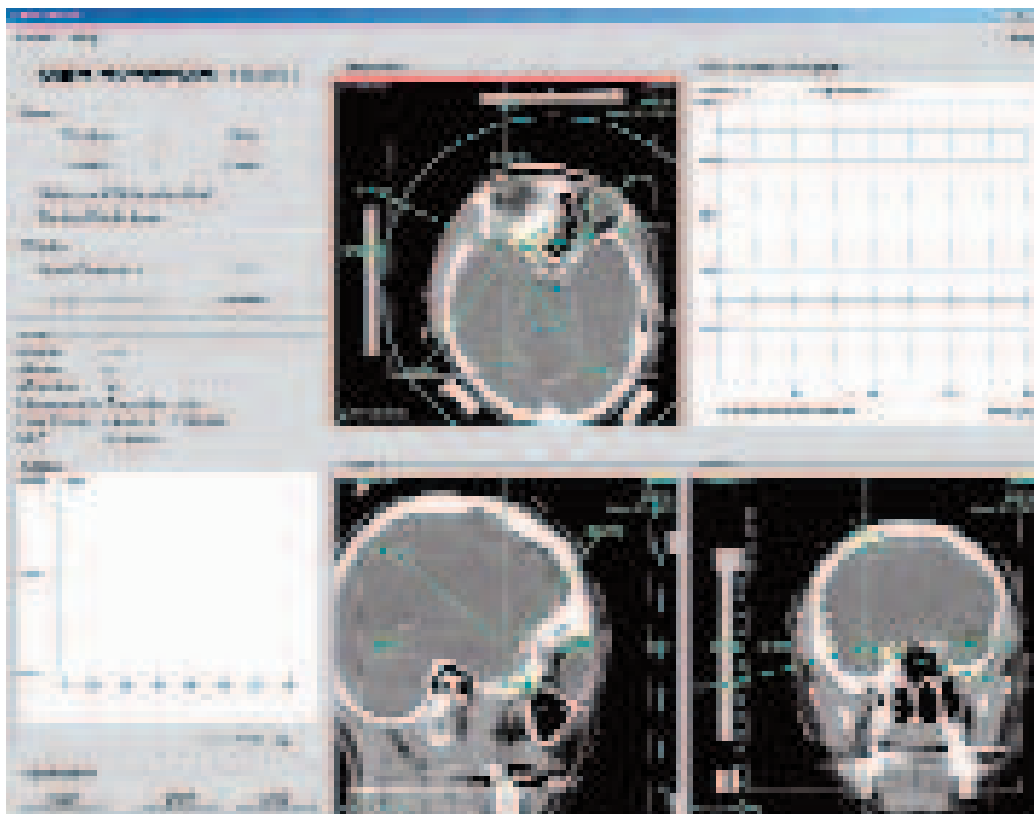
PROSTATE: IMRT (HSL technique) and concomitant boost SMART to tumor.



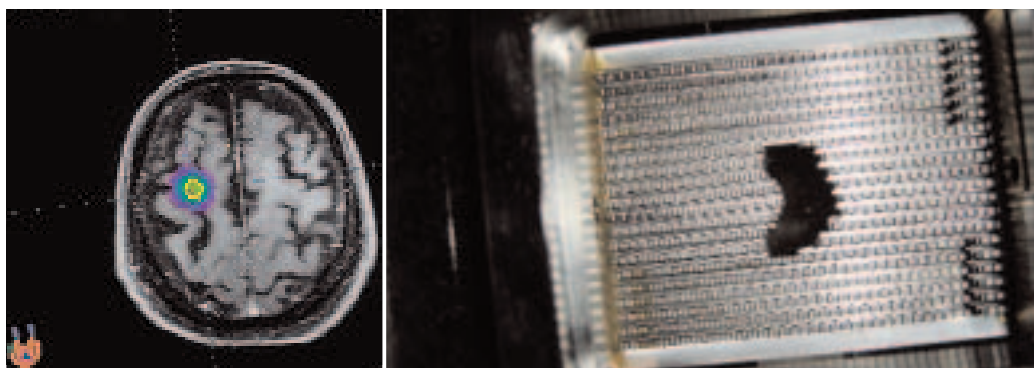
RECTUM: Comparison between conventional radiotherapy and IMRT: [A] axial plane (conventional), [B] axial (IMRT), [C] sagittal (conventional), [D] sagittal (IMRT). IMRT delivery technique encompasses less volume, thus protecting bladder and bone tissue.



BREAST: Forward IMRT technique is applied when heterogeneity is greater than 10 percent. Practical and easy-to-deliver treatment routine homogenizes dose to breast and provides excellent dose sparing to lung and heart. [A] Conventional technique – axial and sagittal scans, [B] Multileaf collimator, [C] modulated technique – axial and sagittal scans.



THE KONRAD Inverse Planning Software is the clinically proven inverse treatment planning application that enables physicians to accurately irradiate the tumor while protecting adjacent organs. KonRad imports CT images and the anatomical structures for fast and efficient inverse treatment planning. Typical sites where the advantages of KonRad software have already been clinically proven include prostate, head and neck, brain, pancreas, spinal cord, breast, pituitary, and the pelvic area.



THE MODULEAF Mini Multileaf collimator (2.5 mm leaf width) generates precise and delicate shaping for advanced radiation treatment. It is the preferred tool for advanced radiotherapy techniques, such as 3D conformal, IMRT, and stereotactic treatments. It delivers a precise radiation dose to the target volume while sparing critical tissue. This is clinically valuable for a wide range of treatment applications. The clinical image shows radiotherapy to a right brain lesion using the ModuLeaf collimator, featuring a leaf width of 2.5 mm.





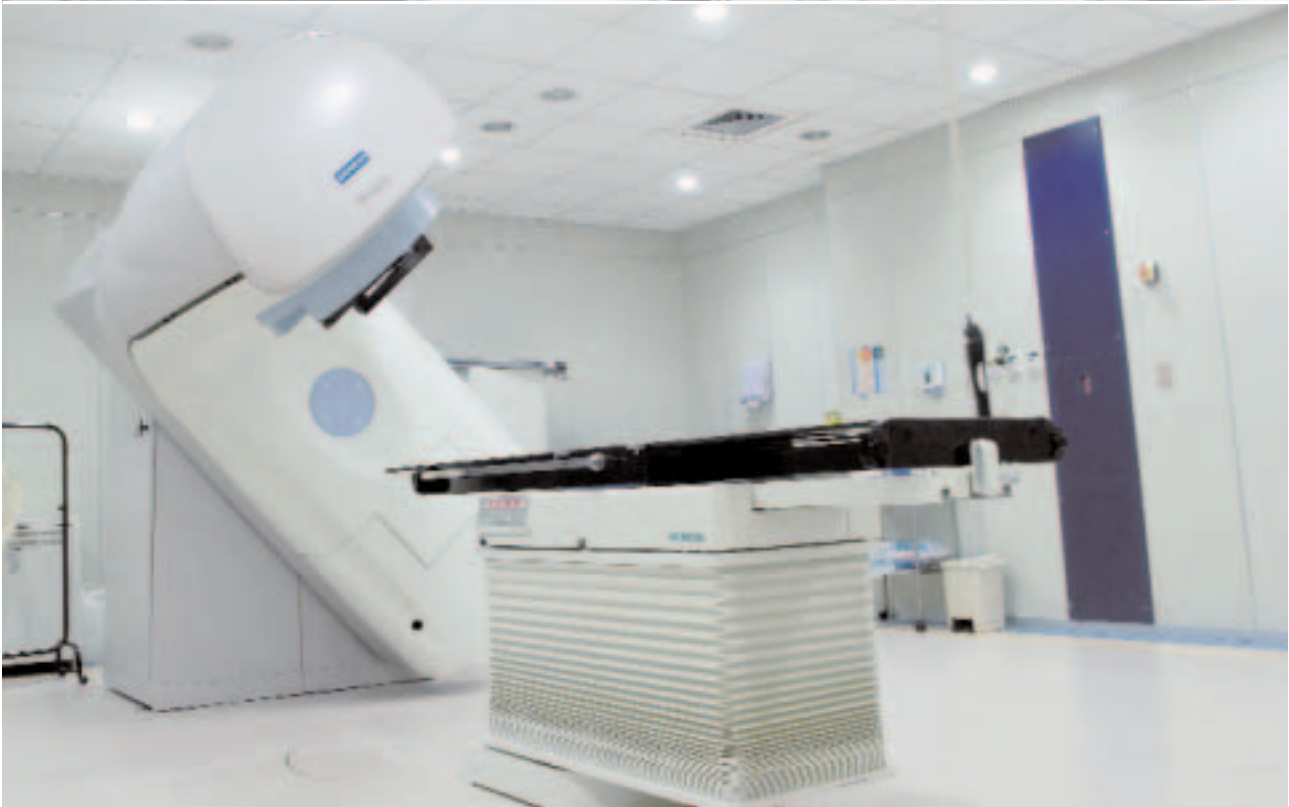
SECOND OPINION: Advanced communications technology gives Sírio's oncology team the opportunity to discuss treatment plans with other radiation therapy specialists from all over the world.

»I just can't imagine going back to the way we worked before.«

Elizabeth Canhoto,
Chief Radiation Therapist,
Sírio-Libanês Hospital,
São Paulo, Brazil

clinical and technical experience – and with IM-MAXX – about 14 minutes are enough. That means we're now treating four patients in just one hour, when we treated less than two before," says Dr. Haddad. The team is starting to use the Siemens KonRad™ Inverse Treatment Planning System as their new tool for inverse planning, and anticipates even further improvements. "In one minute, KonRad basically performs calculations that took us four or five hours back in 2000. Besides that, KonRad has the additional advantage of being very user-friendly." "I just can't imagine going back to the way we worked

before. Actually, my main concern is which new technologies we'll be engaged in in the future," echoes Elizabeth Canhoto, chief radiation therapist. With 26 years of experience in the field, Canhoto followed every major development in treatment and planning. For her and the team of 14 technicians, learning the whole routine of operating the new systems was challenging. However, with the help of Siemens' experts, it's become second nature for them, she says. Ultimately, it's the patients who benefit the most from the new methods, and the staff has witnessed that time and again. "The



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DR. DA SILVA AND DR. HADDAD say that they are proud to host the 5th Latin American IMRT Symposium at Sírio-Libanês' Research and Teaching Institute (IEP).

»The patients respond very positively to the therapy. It really improves their quality of life.«

Elizabete Duarte Alves,
Oncology Care Nurse,
Sírio-Libanês Hospital,
São Paulo, Brazil

impact of all these technologies is very positive. You can see that in terms of how the patients respond to the therapy and how their quality of life improves,” says Elizabete Duarte Alves, a nurse at Sírio’s Oncology Center. “We know we’re using the most modern methods available, and so do the patients – which is why they also feel more confident and optimistic about their own treatment. For us nurses this is wonderful.”

According to Alves, who’s been working in radiation oncology for the past six years, the incidence of complications in patients is much lower at Sírio-Libanês than at other oncology centers where she has worked. For breast cancer patients, skin lesions, which can be quite painful and bothersome, are significantly reduced, and the aesthetic outcome is much better.

Says Dr. da Silva: “IMRT provides a better chance of cure, especially in head and neck

and prostate cancers. And, of course, the morbidity is much lower. You are able to avoid or lessen a number of dreadful side effects, among them xerostomia – the atrophy of salivary glands. For prostate cancer patients, there’s also a reduced risk of rectum toxicity by five times compared to conventional 3D treatment.”

Sharing Knowledge

The team’s experience with these cutting-edge solutions may still seem relatively recent, but as one of Latin America’s training centers, Sírio-Libanês is actually helping other health centers, giving training for high technology applications for radiation oncologists, physicists, technologists, and nurses from many countries in Latin America and Europe. More than 80 professionals have been trained to perform prostate permanent implants with iodine. This year, for example, the hospital

is hosting the 5th Latin American IMRT Symposium. Through its Research and Teaching Institute, it also offers a 3-year training program for radiation therapists and two years of training for physicists. The team itself is in constant contact with the best experts in the US and Europe: a teleconference room provides them with second opinions in real time. "The fact that so much is invested in specialization is unprecedented. We are one of the very few private institutions in Brazil with five residents," notes Dr. da Silva, himself the president of SBRT, the Brazilian Radiotherapy Society.

For Dr. Ceschin, Sírio-Libanês needs to go still further in terms of technological integration and efficiency. "It's all about aligning interests in every corner of our institution. When our interests are aligned, you win when I win. Our doctors have to think in terms of results, and in terms of costs. Nowadays, being cost-effective is an obligation," he argues. Besides the strong collaboration with Siemens, there are plans to boost the institution's potential for research and innovation even more. One of its assets in this regard is the fact that many of his doctors are also affiliated with the University of São Paulo (USP) and other higher education centers. In June, the hospital's research branch took a significant step forward by teaming up with Brazilian neuroscientist Miguel Nicolelis from North Carolina's Duke University. Nicolelis has already achieved an impressive number of breakthroughs in his attempts to create bionic members that could be operated by a person's own brainpower. In experiments with monkeys, he showed it was possible to translate the signal from hundreds of neurons into movements of a mechanic arm. His agreement with Sírio-Libanês involves the first clinical trial of this concept in a Brazilian handicapped patient over the next three years.

Even if the collaboration with Nicolelis falls short of the revolution it promises to be, Ceschin still envisions a hospital whose excellence may be recognized outside the borders of Brazil or Latin America itself. "The fact is that we can offer lower costs for services whose effectiveness is quite similar to the best centers



Sírio-Libanês Hospital, São Paulo, Brazil

With 54 000 square meters, 2 300 employees, world-renowned physicians in 60 specialties, two surgical centers, two ICUs, and a capacity of 50 surgical procedures daily, the Hospital Sírio-Libanês is one of the largest and most important hospitals in Brazil and Latin America.

Three keywords encompass the hospital's vision:

Leadership: Sírio was the first Brazilian hospital to have an intensive care unit and a linear accelerator for radiotherapy. Now it is the first hospital in Latin America to own a PET/CT system and to have IMRT available in its oncology department.

Excellence: This is demonstrated by its standard of attending to the public with a highly qualified staff, excellent diagnostic tools, and advanced treatment capabilities.

Humanism: This mentality is an essential condition for a good and satisfying doctor-patient relationship, going back to the hospital's founders, the Ladies' Beneficent Society.

Undoubtedly, these challenges will continue to be the mission of Sírio-Libanês for this new century – and above all, decisive factors in its success.

worldwide. That's why we hope to attract patients not only from Latin America, but also from Africa or even the Middle East," a region with which Sírio-Libanês still has strong cultural ties, as the hospital's name suggests. "I'm not sure if we have the best plan; however, we have a goal. And if we manage to translate our clinical excellence into economic excellence, we will soon be there."

Author: Reinaldo José Lopes is a science writer at Folha de São Paulo, Brazil's leading daily newspaper.