

RAYSEARCH | REVIEW | 2018

RaySearch is advancing cancer treatment through pioneering software. Software has unlimited potential, and we believe it is now the driving force for innovation in oncology. Medical science never stands still, and neither does RaySearch. We work in close cooperation with leading cancer centers to bring scientific advancements faster to the clinical world. Today, our solutions support thousands of clinics worldwide in the fight against cancer.

And this is just the beginning.

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**ADVANCING  
CANCER  
TREATMENT**



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\*Subject to regulatory clearance in some markets.

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# LETTER FROM THE CEO

## We make the cancer care of tomorrow possible today

2018 was a year when RaySearch further stepped up the pace. We entered into new strategic partnerships, continued our global market offensive and launched pioneering products. A historic milestone was that RayCare, our revolutionary oncology information system, was used clinically for the first time.



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JOHAN LÖF  
CEO AND FOUNDER  
RAYSEARCH LABORATORIES

### THE CARE OF THE FUTURE IS POSSIBLE TODAY

RayCare brings a range of key benefits, including higher efficiency in cancer care. Cancer centers typically have several departments and multiple software systems. RayCare offers one point of control and guides clinicians through complex workflows, making it much easier to manage treatments. Activities that used to take several hours now take just a few minutes with RayCare.

As well as enabling more efficient use of resources, RayCare frees up time to optimize and individualize each treatment, which I firmly believe leads to a better outcome for patients. In this way, RayCare makes the cancer care of the future possible today. With this in mind, we were not surprised, though of course delighted and very proud, that RayCare was brought into clinical use so quickly, in combination with the RayStation treatment planning system, at Provision Cares Proton Therapy Nashville, US, in October. We received four orders for RayCare in 2018 from leading cancer centers, and we look toward the future with great confidence. This is just the beginning for RayCare.

### THE JOURNEY CONTINUES – AND THE PACE QUICKENS

Our vision is a world where cancer is conquered. Belief in development and advancement is part of our DNA, and has been since I founded RaySearch in 2000. Back then, the

company consisted of just two people and we began to build the business based on my doctoral dissertation on optimization of radiation therapy. We have always made significant investments in research and development, with two main aims: to develop new solutions and to strengthen existing ones. We continue to follow this approach, and in 2018 we increased the pace even further.

In the past, we have released new and expanded versions of our products once a year. Now we are doubling the pace. For example, updated versions of RayStation are now released twice per year. In December 2018, we also released two new RayStation products based on machine learning. This technology opens up exciting opportunities within our field and is a high priority for RaySearch. During the year, we also introduced a treatment control system, RayCommand, which coordinates different systems and machines used in the radiation therapy process to improve safety and efficiency. We were pleased to receive the first order in December, and we believe RayCommand is an important step forward in meeting the needs of cancer centers into the future.

#### **STRATEGIC PARTNERSHIPS**

RaySearch is stronger than ever. Demand for our products has never been higher, and the world's leading cancer centers view us as an important partner in developing the cancer care of the future. In 2018, we received several acknowledgments that our strategy is the correct one. In February, we entered into a strategic partnership with the University of Texas MD Anderson Cancer Center, one of the largest cancer centers in the world. The goals are to improve precision in the treatment of tumors and to improve access to adaptive radiation therapy, which is in use at specialized centers.

We reached another milestone in April when we entered into a long-term partnership agreement with Heidelberg University Hospital in Germany regarding RayCare. We have also entered into a partnership agreement with Eckert & Ziegler BEBIG, a European manufacturer of products for brachytherapy. In Japan, we signed a long-term research collaboration and licensing agreement, regarding carbon ion therapy, with the National Institute of Radiological Sciences and the National

Institutes for Quantum and Radiological Science and Technology. This type of strategic cooperations strengthen our customers and us.

We look forward to more exciting partnership opportunities in the future.

#### **A PROUD HISTORY**

Our customers are much more than just buyers of software. They are partners in a long-term relationship. With products such as RayStation, RayCare and RayCommand, we aim to provide cancer centers around the world with the best possible tools in the fight against cancer. Ultimately, it's about saving lives and improving the outlook for patients. We value our customers and work hard to take care of them. In our 20-year history, RaySearch has never lost a customer. Naturally, we will do our utmost to keep it that way into the future.

#### **THE PEOPLE BEHIND OUR SUCCESS**

None of what we have achieved would have been possible without the people who have chosen to work with us. RaySearch's highly specialized employees are our greatest asset. More than 300 committed and motivated employees work relentlessly every day to break new ground in the fight against cancer. In 2018, we recruited 67 people, and another 35 in the first quarter of 2019, mostly in research and development. We have continued our global market offensive, with more employees in more markets to ensure an even better service for customers.

To date, more than 550 radiation therapy centers in 36 countries have selected RayStation. There are more than 8,000 such centers worldwide, and this number is expected to increase significantly over the next decade. The reasons for this include increased incidence of cancer, growing understanding of the benefits of radiation therapy and major investments in cancer treatment in Asia. Our target is for at least 3,000 cancer centers to have purchased RayStation within ten years. Our global market offensive is an essential factor in achieving this, and we are pursuing these efforts with full force.

**Johan Löf**  
CEO and Founder, RaySearch Laboratories

RaySearch is a fast-growing company dedicated to continuous innovation. Our vision and mission help us break new ground every day. But it is also important to look back and contemplate the journey we've made. These are some highlights of what we have accomplished during 2018.

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#### OUR VISION

A world where cancer is conquered.

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#### OUR MISSION

We provide innovative software to continuously improve cancer treatment.

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2018 HIGHLIGHTS

**550**

RAYSTATION CLINICS  
in 36 countries

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**293**

EMPLOYEES  
as of December 2018

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**8**

RAYCARE PARTNERS  
in 5 countries

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**24**

NATIONALITIES  
of RaySearch staff

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**11**

RAYSEARCH OFFICES  
around the world

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**39**

AVERAGE AGE  
of RaySearch staff

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**19**

PARTNERSHIPS  
with clinics, universities and industries

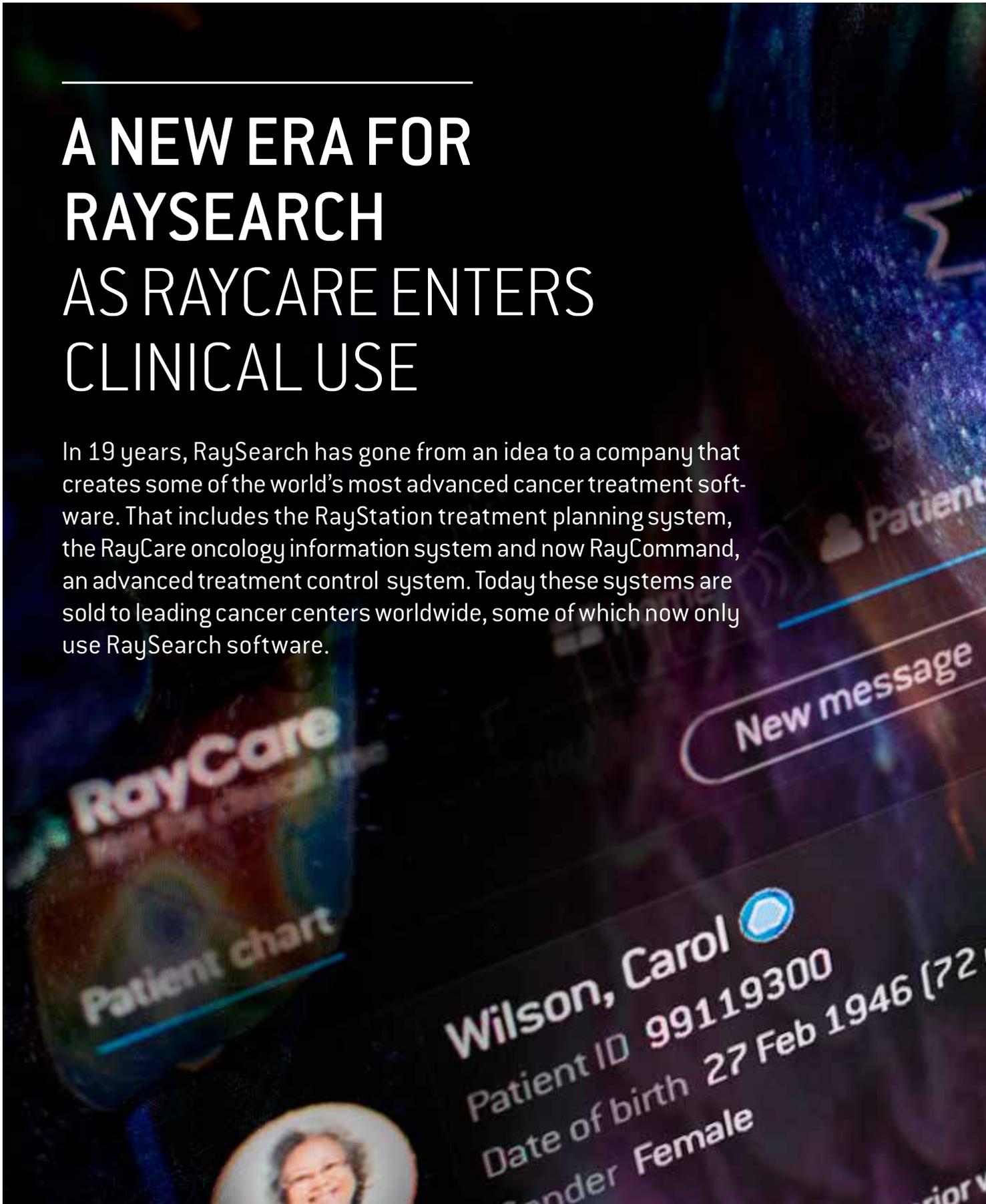
**37**

GRANTED PATENTS  
world-wide

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# A NEW ERA FOR RAYSEARCH AS RAYCARE ENTERS CLINICAL USE

In 19 years, RaySearch has gone from an idea to a company that creates some of the world's most advanced cancer treatment software. That includes the RayStation treatment planning system, the RayCare oncology information system and now RayCommand, an advanced treatment control system. Today these systems are sold to leading cancer centers worldwide, some of which now only use RaySearch software.







The business idea that RaySearch founder and CEO Johan Löf wrote for the Scandinavian entrepreneurship competition Venture Cup in 1999 was built on the findings of his PhD research into optimization of radiation therapy at the Royal Institute of Technology in Stockholm. He wanted to make a difference in cancer treatment and realized that software was the future. In 2000, following extensive work to develop algorithms and software, Johan Löf registered a company: RaySearch Laboratories AB.

#### THE EARLY DAYS

Developing advanced software at a high pace demands sufficient funding. But the most important factor from the start was to keep control of the company's direction, without interference from investors. The key was to establish successful commercial partnerships that would support further development. Just two months after registration of the company, RaySearch had its first partnership.

#### RAYSTATION COMES TO LIFE

For several years, RaySearch developed modules for treatment planning and distributed them to other vendors. But the idea of building its own treatment planning system took root within the company.

Some said the task of building a completely new treatment planning system was almost impossible—but the RaySearch team was determined to prove them wrong. The development started in 2008, and the determination paid off as proton therapy center WPE in Essen, Germany, became the first customer in 2009. The first patient treatment using RayStation was conducted in 2011.

#### THE FOUNDING OF RAYCARE

With RayStation established worldwide, the idea of a new oncology information system started to take shape. Such a system would be the key to driving adaptive therapy on a larger scale. It would also enable better follow-up on patient care and create significant efficiency gains.

Development started in 2012, with the goal of creating a pioneering system that would transform the duopoly-driven market.

#### THE FUTURE OF THE OIS

Starting from scratch gave RaySearch the freedom to create a system precisely tailored to the needs of modern oncology and ready for developments to come. Like RayStation, it needed to combine the highest standards of quality and speed with a user-friendly interface. Naturally, it should integrate seamlessly with RayStation and also be compatible with a wide range of treatment machines and clinical systems.

“Throughout its 19 years, RaySearch has combined innovation with independence. By funding new innovations from within the company, RaySearch has been able to steer its own direction, with the needs of patients and clinicians always in focus. Today's goal is the same as it has always been—to develop the best possible software to conquer cancer.



### RAYCARE IN CLINICAL USE

The first version of RayCare was released in December 2017. After just two months, Iridium Cancer Network in Belgium became the first center to use RayCare clinically. Around the same time, Provision Cares Proton Therapy Nashville became the first clinic to select RayCare as its sole oncology information system, and the clinic started treating patients during the fall of 2018. It was the ultimate proof of the need for a new approach to oncology information systems, and a change to the market status quo.

### THE NEXT INNOVATION: RAYCOMMAND

In December 2018, RaySearch announced the decision to begin development of another new system—a treatment control system called RayCommand. The move resulted from a request by Advanced Oncotherapy plc (AVO) for its first proton therapy facility in the UK.

RayCommand will be the link between the treatment planning system, the oncology information system and the treatment machine. It will coordinate and orchestrate the different systems involved in the treatment, which is essential to achieve safe and efficient patient treatments.

### FINANCIAL CONTROL IS KEY FOR INNOVATION

Throughout its 19 years, RaySearch has combined innovation with independence. By funding new innovations from within the company, RaySearch has been able to steer its own direction, with the needs of patients and clinicians always in focus. Today's goal is the same as it has always been—to develop the best possible software to conquer cancer. We're not done until cancer is.

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# PROVISION NASHVILLE: THE FIRST ALL-RAYSEARCH CLINIC

In 2018, Provision Cares Proton Therapy Nashville became the first clinic to use RaySearch software exclusively. The treatment planning system RayStation and the oncology information system RayCare have been in use at the clinic since treatments started. “It was a natural decision,” says Ben Frank, Vice President, Operations, at Provision Cares Proton Therapy Nashville.





**BEN FRANK, VICE PRESIDENT,  
OPERATIONS, AT PROVISION CARES  
PROTON THERAPY NASHVILLE**

The clinic opened in 2018 and treated its first patient in October of that year. It was a significant milestone for RaySearch. Provision was the first clinic to connect RayCare directly to the treatment delivery system, using it to record and verify the treatment sessions, and the second clinic to use RayCare clinically.

#### **GLOBAL FIRST**

The Provision Cares Cancer Network was established in 2014. Provision Cares Proton Therapy Knoxville was the first center to open and became the first proton center to use RayStation for clinical treatment planning.

The decision to choose RaySearch software for the new center in Nashville was an easy one, Ben Frank says. He adds that both Provision and RaySearch are based on the same innovative foundation, the desire to change and advance cancer care.

“RaySearch software was selected for multiple reasons, but the key is that using solely RaySearch software gives us a fully integrated system. When it comes to proton therapy, RayStation is the best treatment planning system on the market. We started hearing about RayCare and wanted to be a part of that journey.”

#### **SHAPING THE FUTURE**

It's a shared journey to influence the future of cancer care.

“Being part of the development of RayCare means we get to be at the forefront and help shape the next-generation oncology information system to ensure the best possible care for our patients.”

The decision to go with RayCare and RayStation was made before the Nashville center was established, and the implementation was done during the construction phase.

“It was perfect timing to integrate RayCare and train our staff,” Frank says. “Treatments started in October with a low patient volume in the beginning, allowing us time to adapt our treatments and design the best way to work.”

#### **STRONGER TOGETHER**

Having experienced RayStation, Frank was confident about RayCare.

“I knew how powerful and user-friendly RayStation is, and I was sure that RaySearch would deliver what they promised for RayCare. RayCare has great potential and I'm very excited to see what we can accomplish using the combined power of RayStation and RayCare.”

The integration with RayStation was an important factor for the center. “Being able to transfer data seamlessly is a huge advantage for us,” Frank says. “RayCare and RayStation will save us a lot of time and energy, being able to work fluidly between the two. One of the best aspects of RayCare is the way it is designed to scale up easily. I believe that RayCare will have a huge impact on efficiency and quality of care, and that it can change the industry standard. RaySearch has a great vision for this OIS.”

It's a partnership for the future, Frank says. “We share RaySearch's vision and we can provide the company with a lot of great input. We are ready to explore the future together. I believe that a couple of years from now, we will be discussing how RayCare has improved the quality of care for our patients.”





RayStation has provided us with great efficiency improvements. It is easy and intuitive to use, with a homogenous workflow, which has made the adoption very smooth. Thanks to its speed, making new and adaptive plans and improving the plan quality can easily be done in daily practice, without negatively impacting the clinical operation. We also have better plan consistency since the system brings a lot of automation. RayStation helped us to more efficiently handle patients who need re-irradiation, thanks to the deformable registration and dose tracking tools. Overall, we are very happy to have chosen RayStation, and we are not looking back.”

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PROF. DR. YOLANDE LIEVENS,  
CHAIR OF RADIATION ONCOLOGY DEPARTMENT,  
GHENT UNIVERSITY HOSPITAL

AMERICAS  
**196**

EUROPE/AFRICA  
**165**

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## EFFICIENCY AND AUTOMATION DRIVE SUCCESS

2018 saw continued growth in RayStation sales, as well as the first RayCare deals. Drivers for success include a strong focus on efficiency and increased demand for automation.

## ASIA-PACIFIC/MIDDLE EAST

189

## TOTAL

550



- RAYSEARCH OFFICES (11)
- RAYSEARCH DISTRIBUTORS (18)
- RAYSTATION CENTERS (550)
- RAYCARE PARTNERS (8)

**GROWTH STRATEGY**

RaySearch's strategy of actively targeting smaller clinics and non-academic hospitals in addition to its established user base, has begun to show results. There is significant desire to increase workflow efficiency across centers of all sizes, and this is helping fuel demand for RayStation.

The first clinical version of RayCare, the next-generation oncology information system, was launched in December 2017. The first orders were quickly placed, and the system was brought into clinical use within two months. There is great interest in the OIS, from smaller clinics as well as larger institutions, and the drive to boost efficiency is again a factor.

RayStation has a growing installed base and is widely appreciated for its innovative functionality and outstanding user experience. The seamless combination of RayStation and RayCare is expected to be an attractive proposition, bringing advanced functionality and usability to the whole clinic.

**DRIVE TO AUTOMATE**

This year has seen growing focus on the value of automation tools, with clinics showing increased interest in tools to increase efficiency and automate more of the activities. The possibility to work more efficiently in a variety of areas is gaining traction as a sales argument for RayStation.

In addition, existing customers are now using RayStation's advanced functionality to a greater extent, including automation functionality, templates and plan generation protocols.

**PROTON STRENGTH**

The proton therapy market is strong overall, and the machine-independent strategy of RayStation is paying off. RaySearch has at least 50% of the worldwide market share. Deals made in 2018 include sites for Mevion, IBA and Hitachi. The investment in supporting all available proton therapy delivery systems has helped to strengthen RaySearch's position in this specialized sector.

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## EUROPE

RaySearch is well established and well positioned for the future in Europe. The success rate in winning customers is excellent, especially when the selection process includes a thorough competitive evaluation.

The use of automated solutions increased during 2018. Examples include AMC Amsterdam and UMC Groningen, which both treated their first patients using plans generated by Plan Explorer in RayStation.

RayPlan made headway in Europe, particularly in France, where it gained significant attention. RayPlan provides a good toolset, especially for smaller clinics that need a robust, lower-cost solution.

The overall community is growing and developing into a useful knowledge-sharing forum for customers.

Use of scripting has increased among European clinics, and RaySearch has a close collaboration with customers in this area. RaySearch is pleased to see many advanced scripts being developed. There has been good collaboration between customers and the RaySearch service and development organizations. The collaboration has shown new possibilities and inspiration has been shared via user meetings and the RayStation community.

RaySearch made a breakthrough in Poland during 2018, with three new orders placed. RaySearch works closely with a distributor in Poland, and the relationship and sales effort are now paying off.

The UK had a very good year. It was interesting to note spending figures from the UK National Health Service: almost 80% of the spending on treatment planning systems was invested in RaySearch products. Development has been steady over the past five years, with investment from some major institutions. RaySearch is now present in more than 20 out of approximately 70 sites in the country.

The large RayStation order from Leeds Cancer Center was a significant highlight, with functionality including dose tracking, adaptive planning, VMAT, 3D-CRT, electron planning, automated breast planning and multi-criteria optimization.

Germany saw good sales performance, including orders from Heidelberg Ion Beam Therapy Center, Marburg Ion

Beam Therapy Center and Heidelberg University Hospital. The collaboration with Heidelberg University Hospital was strengthened and the center is also now a RayCare partner. There was also an increase in order from smaller clinics.

RaySearch currently has almost 50% market share in the Benelux region. Fewer tenders were published compared to the previous year, but RaySearch's position remains strong, with more tenders expected in the near future.

Activity was high in France throughout the year. RaySearch made a significant breakthrough on the private market with some key orders.

The functionality for TomoTherapy was a contributing factor for growth in Italy, where there is a large installed base of TomoTherapy systems.

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## AMERICAS

RaySearch has a strong installed base in North America, including some of the most prominent clinics in the world. This list includes sites such as the University of Maryland, the University of Wisconsin, MD Anderson Cancer Center, the University of North Carolina, the University of Florida Proton Therapy Institute, Miami Cancer Institute, Johns Hopkins/Sibley Proton, the University of Washington, several hospitals in the Providence network in the Northwest, Princess Margaret Hospital, Ottawa Medical Center, and several large centers in Quebec.

Just as many small and medium-sized centers are also using RayStation, with more considering the system as new research papers provide additional evidence of its benefits and consolidation of hospital systems leads to reassessment of vendors and products.

Sales activities increased significantly, and RaySearch has started to broaden its installed base with this increased variety of clinics. Sales and marketing efforts included a dramatic increase in onsite demonstrations and presence at local and regional shows and meetings. 2018 also saw further early adopter sales of RayCare.

Proton therapy continues to be an important and growing segment. Significant deals in 2018 included Oklahoma University and Emory Proton Therapy Center in Atlanta. Several more proton centers are expected to purchase RayStation over the next 24 months.

Canada had a good year, and RaySearch won all tenders offered in the Province of Quebec. Efforts in the other provinces continue, with RFPs and opportunities expected in Ontario and British Columbia.

RaySearch Americas recently began engaging with distributors in South America, and in Q1 2019, a Latin American Sales Director was recruited to drive sales in several of these countries. Large centers are being developed in Columbia, Chile and Mexico, and RaySearch looks forward to expanding in this market and establishing contracts with distributors in 2019.

To better serve the market, RaySearch Americas continues to grow rapidly, expanding by 40% in 2018. RaySearch opened two new offices during the year: a headquarters in the Empire State Building, New York, and a Silicon Valley office in Santa Clara, California. These offices will better enable advanced training for customers with state-of-the-art facilities. Software development will also take place at the Silicon Valley office, allowing strong connections with technology partners.

## ASIA-PACIFIC/MIDDLE EAST

Particle therapy continues to gain momentum in the region, and RaySearch has an outstanding reputation in the field. CGMH in Taiwan and Apollo Hospitals in India both moved to clinical use of RayStation in 2018.

RaySearch established the subsidiary company RaySearch India during the year and recruited sales and support staff. RaySearch also moved into two new countries, winning new RayStation customers in Israel and Malaysia.

Success has continued in Japan and RaySearch has a well-established and growing customer base. The landmark of 100 RayStation customers in the country was reached in October 2018.

**30%**  
MARKET SHARE  
in United Kingdom

**50%**  
MARKET SHARE  
in Benelux region

EUROPE

**40%**  
STAFF GROWTH IN US  
to better serve the market

**100%**  
TENDERS WON  
on all tenders offered in  
Province of Québec

AMERICAS

**100**  
RAYSTATION CUSTOMERS  
in Japan in 2018

APAC

## MARKET IN FOCUS: UNITED KINGDOM

2018 was a strong year for RaySearch in the UK. The company reinforced its strong position and is well established with a strong installed base. Wayne Martel, Regional Business Director, RaySearch UK and Ireland, outlines the key achievements.



WAYNE MARTEL  
REGIONAL BUSINESS DIRECTOR  
RAYSEARCH UK AND IRELAND

### HOW DID 2018 GO FOR RAYSEARCH IN THE UK?

2018 was another excellent year, with multiple institutions selecting RayStation as their new treatment planning solution. Over 80% of all spending on treatment planning systems, via the NHS Supply Chain Framework, was for RayStation. It was particularly pleasing to welcome two of the largest clinics in the UK, Leeds Cancer Centre and Christie Hospital, to the RaySearch community, as well as Advanced Oncotherapy, which became our first RayCare customer in the UK. Our clinical customers now range from leading university hospitals to smaller regional hospitals, and there are multiple research systems in prominent academic research groups.

RaySearch is continually represented at local meetings and conferences, and the UK community is very keen to get involved with the development of our products.

### WHAT IS THE KEY TO THIS SUCCESS?

A vital aspect is giving our users excellent support every step of the way, from discussing requirements to implementation and training. We have a fantastic team in place. Our people can provide expertise in all these aspects and they are very much appreciated by the users.

It's also great to be able to call on our UK clinics as references, not only for potential new projects, but also to bring new users into contact with experienced RayStation users.



#### HOW WOULD YOU DESCRIBE THE UK MARKET?

There is a combination of public institutions and an ever-increasing number of smaller private facilities. They all prioritize advanced technology and strive to provide the best tools and solutions for their patients. The innovations RaySearch provides have enabled customers to increase efficiency while enhancing the service to patients.

The public market ranges from small clinics with perhaps two treatment units, to large sites with additional satellite centers. These networked sites have the capacity to treat thousands of patients each year, and it's essential for them to provide the same quality of service at all sites. The private market is generally made up of smaller centers. Many are located in the south of the country, but more and more private facilities are now opening nationwide.

#### HOW IS THE UK HEALTHCARE FUNDED?

The healthcare market in the UK is generally funded by the government and currently facing its own financial constraints and struggles in terms of securing capital budgets to replace equipment or software solutions. However, the oncology sector continues to secure funding to allow institutions to replace existing systems and implement innovative solutions such as RayStation. Most opportunities are through competitive tender or framework mini-competitions, and RaySearch has performed very well in these projects.

The UK private sector is expanding, though opportunities are still limited.

**20** CUSTOMERS  
in United Kingdom

#### WHAT ARE YOUR HOPES FOR 2019?

To continue to provide excellent service and support to RaySearch customers. With that in mind, we plan to increase the number of support staff within RaySearch UK in 2019. We hope to add to our existing installed base, and there are several exciting projects on the horizon.

We're looking forward to helping our users implement some of the unique new features in the latest RayStation releases.

Requests for information and demonstrations of RayCare are also increasing and we plan to visit these interested parties to showcase what RayCare can currently do for them, as well as promoting its future possibilities.



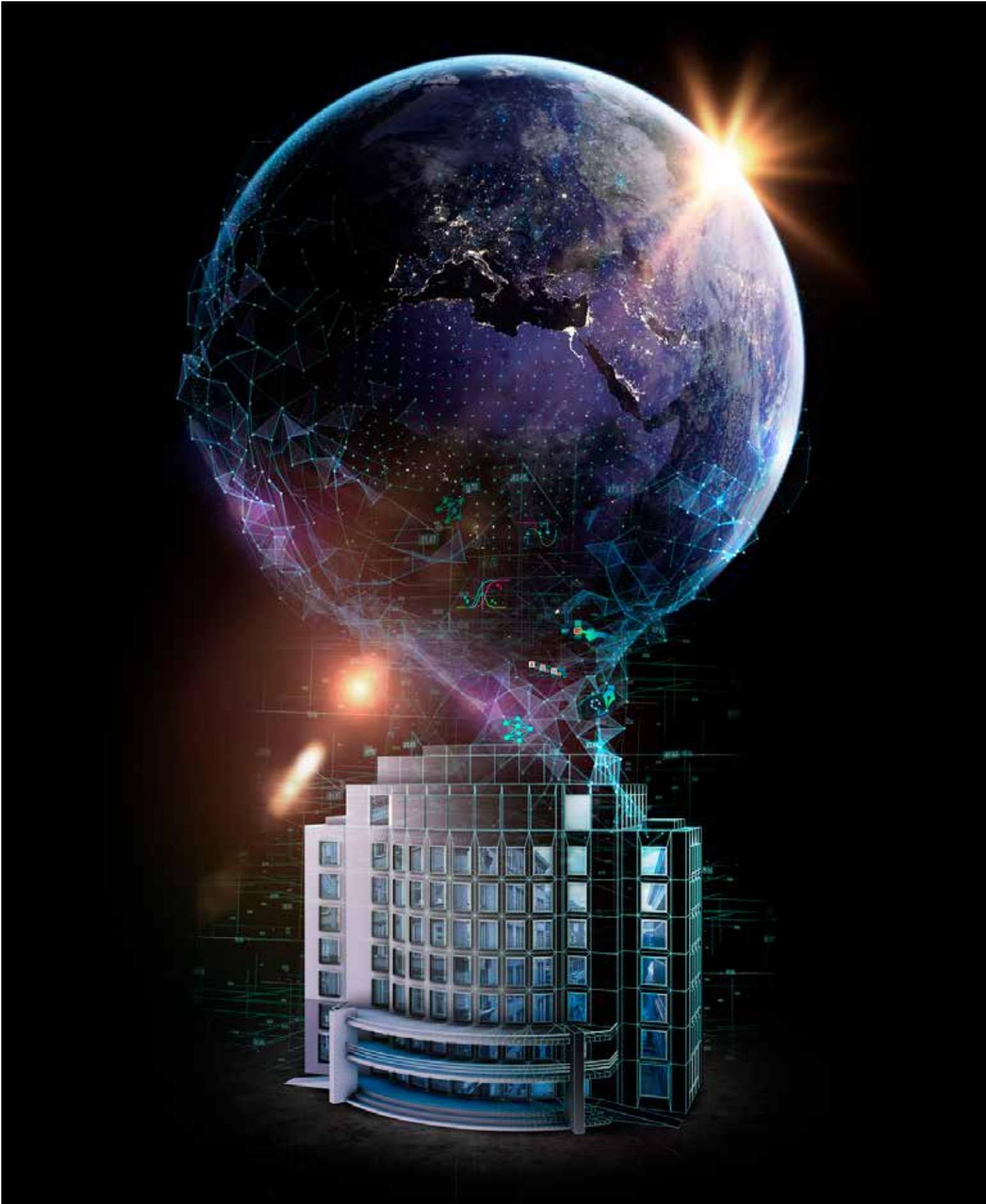


2018 was another very successful year for RaySearch UK, strengthening our presence with significant academic and clinical contracts, with some of the largest clinics in the country. Our first proton partner and our first RayCare customer were also welcomed on board. It's extremely pleasing to witness RayStation users implementing all the advanced functionalities that will increase their efficiency and improve their services.”

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WAYNE MARTEL,  
REGIONAL BUSINESS DIRECTOR,  
RAYSEARCH UK AND IRELAND







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# THE FIRST-EVER TREATMENT PLANNING SYSTEM WITH MACHINE LEARNING

RaySearch is here to advance cancer treatment, ensuring that new developments and innovations reach patients faster. A rapid pace of development enabled the release of the first-ever treatment planning system with machine learning in 2018. This will take treatment planning to new heights.



## RAYSTATION 8: GROUNDBREAKING FEATURES

2018 had a lot in store for RayStation. Version 8 of the treatment planning system was launched during the year, with two successive releases: RayStation 8A and RayStation 8B. The new version includes some groundbreaking features, says Emil Ekström, Chief Functionality Owner for RayStation.



EMIL EKSTRÖM  
CHIEF FUNCTIONALITY OWNER FOR RAYSTATION

### WHAT ARE THE HIGHLIGHTS OF RAYSTATION 8?

We have made some great improvements and new advances over the past year that we are very proud of. Features in these RayStation releases make everyday work easier for clinicians, and I believe some will also revolutionize radiation therapy treatment planning.

I am most proud of the machine learning and deep learning features introduced in RayStation 8B. This is the first time that machine learning has been included in a treatment planning system. Automated treatment planning and automated organ segmentation in RayStation use machine learning to help improve efficiency and consistency in the clinic. The algorithms are trained on data and gain knowledge from it, using a learning process resembling that of a human brain. That is remarkable.

We also extended support for the TomoTherapy® and Radixact systems from Accuray. RayStation now supports the TomoDirect™ delivery mode in addition to TomoHelical™. This is a step closer to our goal of unifying treatment planning for as many delivery systems as possible.

I love RayStation's multi-criteria optimization, and the latest release includes a significant enhancement for VMAT planning. The new segment-based optimization mode, which uses sliding window VMAT sequencing, ensures that the dose you see after using the sliders to balance the various trade-offs is exactly what you get in



**Our philosophy is that RayStation should be independent and compatible with as many other systems and machines as possible. We have a fast pace of development because we want to ensure our customers have access to cutting-edge functionality.”**

the deliverable plan. Iterative VMAT optimization is no longer needed, which will save time in the treatment planning process.

We introduced tools for boron neutron capture therapy (BNCT) planning, a unique type of radiation therapy that enables targeting of cancer at the cellular level. I'm excited to advance this treatment technique together with our partners.

There were also many general improvements and enhancements, including handling of relative biological effectiveness for proton dose, collimation of individual energy layers for the Mevion S250i HYPERSCAN proton therapy system Adaptive Aperture™, a fast Monte Carlo dose engine for photons\* and a new module for efficient evaluation of treatment plan robustness.

#### **WHAT IS THE DEVELOPMENT PHILOSOPHY FOR RAYSTATION?**

Our philosophy is that RayStation should be independent and compatible with as many other systems and machines as possible. We have a fast pace of development because we want to ensure our customers have access to cutting-edge functionality. We strive to incorporate customers' enhancement requests, but we are also committed to developing RayStation for the future, which includes working on features that have not yet been asked for. That's what keeps us innovative and true to our mission to advance cancer treatment.

In the last few years, we have done one major release of RayStation per year. Now we are up to two. The faster pace is mainly due to two factors: our commitment to bringing the latest developments to the market as soon as possible, and the need to keep up with the development of RayCare. RayStation and RayCare go hand in hand, and the seamless integration of the two systems is reflected in the simultaneous releases, where major features in RayStation support RayCare and vice versa. However, RayStation will continue to evolve as an independent system.

#### **HOW WILL RAYSTATION MAINTAIN ITS LEAD IN INNOVATION?**

RayStation is one of the foremost treatment planning systems on the market today, and that's not something that happened by accident. We got here by working hard and smart. Our research, machine learning, and development departments work dynamically together and independently of releases. This is essential: it allows us to focus on research in collaboration with clinics and other partners in parallel with the daily progress of the releases.

The knowledge and engagement of our clinical and industry partners are critical to our development work. Just one example is Princess Margaret Cancer Centre's contribution to our machine learning features. We are all part of the fight against cancer, and the greatest advances come from working together.

\*Subject to regulatory clearance in some markets.



## UNLEASHING THE POWER OF MACHINE LEARNING

Machine learning is rapidly transforming many areas of technology. It will be a cornerstone of healthcare software in the future, and a core element of both RayStation and RayCare. Fredrik Löfman, Head of Machine Learning at RaySearch, gives an update on progress, projects and future plans.



FREDRIK LÖFMAN  
HEAD OF MACHINE LEARNING

### IS MACHINE LEARNING IN RAYSEARCH PRODUCTS YET?

Yes! We went live with machine learning in the RayStation 8B release in December 2018. The machine learning applications are automated organ segmentation and automated treatment planning, both of which are included in this release.

### WHAT DO THESE APPLICATIONS ENABLE?

Automated organ segmentation enables fast and high-quality rendering of organ volumes. The method is based on deep learning, which is a sub-branch of machine learning. Deep learning is concerned with algorithms inspired by the neural networks of the brain. These artificial neural networks can learn many levels of abstraction to perform complex tasks and are very suitable for segmenting medical image data. The method is very fast. All organs included in the neural network model are generated in less than a minute, and accuracy continues to increase as the system learns from additional data.

Automated treatment planning is a functionality we have developed in collaboration with Princess Margaret Cancer Centre in Toronto, Canada. RayStation is delivered with models trained on the center's data and it is also possible for a clinic to train models on its own clinical data. We use machine learning to predict personalized dose for the patient, then generate a deliverable treatment plan without the need for manual planning steps.

This approach is very useful as we get a lot of information when we apply the model. This makes it possible to generate a wide range of alternative plans with slightly differing characteristics, so it's easier for the clinician to understand trade-offs and match the plan to the individual. The machine learning models for segmentation and planning are trained offline, and the generation of treatment plans and organs can be scripted for full automation.

In combination, these two applications will be extremely useful for automating the treatment planning process, which can enable clinical implementation of online adaptive therapy.

#### WHAT ELSE IS IN THE PIPELINE?

One area where we have made excellent progress is deep learning for automated target volume delineation, where we have a very fruitful research collaboration with Massachusetts General Hospital in Boston. We believe the uncertainty in target volume is one of the largest issues to be addressed in radiation oncology to increase treatment precision and improve treatment outcomes. This project is an important step towards increasing certainty and consistency in target volume delineation.

There are many more possibilities for machine learning. We are also looking at machine learning approaches for image transformation, data structuring, decision support, quality assessment and anomaly detection.

During 2019, we will integrate machine learning with Plan Explorer in RayStation, enhancing the automatic generation and navigation of treatment plan alternatives.

#### WHAT ABOUT RAYCARE?

The plan from the outset has been for RayCare to become a learning system. Currently, we are working on identifying the areas where machine learning will be most useful and most beneficial. The wealth of data that RayCare generates will enable great insights with the right analytics tools and is the ideal starting point for a

machine learning system. We see several opportunities in RayCare to help clinics streamline their workflows and support users in their daily work.

#### WHAT IS THE APPROACH TO DATA HANDLING?

Data is critical as it's the foundation for machine learning. To this end, we have developed prototypes of RayAnalytics, an oncology data platform for gathering, structuring, visualizing and analyzing data related to workflows, treatments and processes. The aim is for a shared platform that will support model sharing, enable researchers and groups to access clinical data in a structured way and get more insight from data.

RayAnalytics simplifies the selection of training data for machine learning and enables better models, which will lead to improved treatment consistency within and between clinics. There is already a great deal of interest in this capability.

#### WHAT ARE YOU MOST EXCITED ABOUT?

It's exciting to be up and running with machine learning capabilities in RayStation. But we are always thinking several steps ahead; we have many exciting developments in progress, not least building an analytics platform and developing machine learning applications in RayCare. Also, I'm very happy with the fantastic collaborations we have established with some of the leading cancer centers in Europe and North America. Their dedication and clinical input are critical to us.

Machine learning is one of the fastest-paced areas of technology. New discoveries and approaches are emerging all the time, so we have to keep innovating and moving forward, applying new methods to existing problems where they can make an impact to support end-users and make our products smarter. The opportunity for clinics to share knowledge through machine learning is very interesting and has huge potential.

I'm confident that 2019 will be a big year for machine learning.



## RAYCARE: DELIVERING ON THE DREAM

RayCare, the next-generation oncology information system, is a clinical reality. The first clinical version was released in December 2017. Iridium Cancer Network in Belgium adopted the system immediately and began using it to treat patients within just two months. The next clinic to go live was Provision Cares Proton Therapy Center in Nashville, US, which has used RayCare as its sole OIS since the center first opened.

Since launch, several new releases have further evolved performance and added a range of advanced features. Derek Olander, Head of RayCare Product Management and Commercialization, outlines the achievements so far and what's on the horizon.



DEREK OLANDER  
HEAD OF RAYCARE PRODUCT MANAGEMENT  
AND COMMERCIALIZATION  
RAYSEARCH AMERICAS

### WHAT HAS THE INTEREST LEVEL BEEN SINCE THE LAUNCH OF RAYCARE 1?

We expected a lot of attention with the launch, but the level of interest has been astonishing. What's more, it's not just the large clinics – it's everything from big academic centers down to small single-linac centers. The breadth of the cross section has exceeded our expectations.

The very first deal we signed was with a community clinic in the US. Although it's primarily a regional player, it's a center that aims to be at the forefront of oncology technology.

One year after launch, we have two leading centers that are already treating patients using RayCare, and I'm certain many more will soon follow.



RayCare is now a full-fledged system in clinical operation, and we are well positioned for further commercial success in the coming years.”

#### WHAT IS DRIVING THE INTEREST?

I believe this cross-section of interest in part reflects a growing understanding that software will be increasingly critical to achieving clinical leadership in the future. It also demonstrates the drive for all kinds of centers to achieve workflow efficiency gains.

The capabilities of software to optimize oncology are almost limitless; this is where the greatest innovations are taking place. Clinics are recognizing the possibilities and taking greater pains to ensure they choose the software partner that best meets their needs – for today and tomorrow.

RayCare is the first OIS developed from scratch in this new era. A time when new treatment approaches, such as adaptive therapy, are breaking through. Often, they place different demands on the OIS. RayCare was created for this new era, offering possibilities that couldn't be achieved before. The aim is to set the standard by which all OIS will be measured.

#### HOW IMPORTANT IS THE INTEGRATION WITH RAYSTATION?

Naturally, RayCare is designed to be highly compatible with other treatment planning systems, but there are some great synergies when you combine it with RayStation. Working with the two is a seamless experience, which saves time and effort. But the benefits go deeper than that. The combination gives you a whole new level of transparency and insight into the workflow. For example, the system knows exactly how much time is spent on each action, not just the arbitrary times when tasks are assigned and completed.

You can see RayCare as an ecosystem for optimizing care. Optimizing the workflow enables departments to boost efficiency, which is complemented by the treatment delivery optimization that RayStation makes possible. And with the integration of machine learning technology, it becomes possible to optimize the entire care episode to develop better overall treatment approaches.

#### WHAT IS ON THE HORIZON NOW?

We have come out of the gate strongly, with further signed deals in Europe, South America and North America. RayCare is now a full-fledged system in clinical operation, and we are well positioned for further commercial success in the coming years.

Naturally, a high priority is to continually develop the product and keep rolling out these improvements to customers. We are adding new features and overall improvements on an ongoing basis.

#### WHAT IS HAPPENING IN THE ORGANIZATION?

We are continuing to expand our Silicon Valley tech hub. Our Santa Clara office opened its doors in December 2018, and we have already run several training courses there.

During 2019 we will expand further. We will recruit additional expertise, strengthen our presence and give our customers even better access to services.

This is an era of new directions for the oncology industry, and an exciting time for RayCare.



**BJÖRN HÅRDEMARK**  
DEPUTY CEO

## RAYCOMMAND

During 2018, it was announced that RaySearch would develop a treatment control system: RayCommand. The decision was connected to an order from Advanced Oncotherapy PLC (AVO) in London, for its first proton therapy facility. Björn Hårdemark, Deputy CEO, talks about the latest addition.

### WHAT IS RAYCOMMAND?

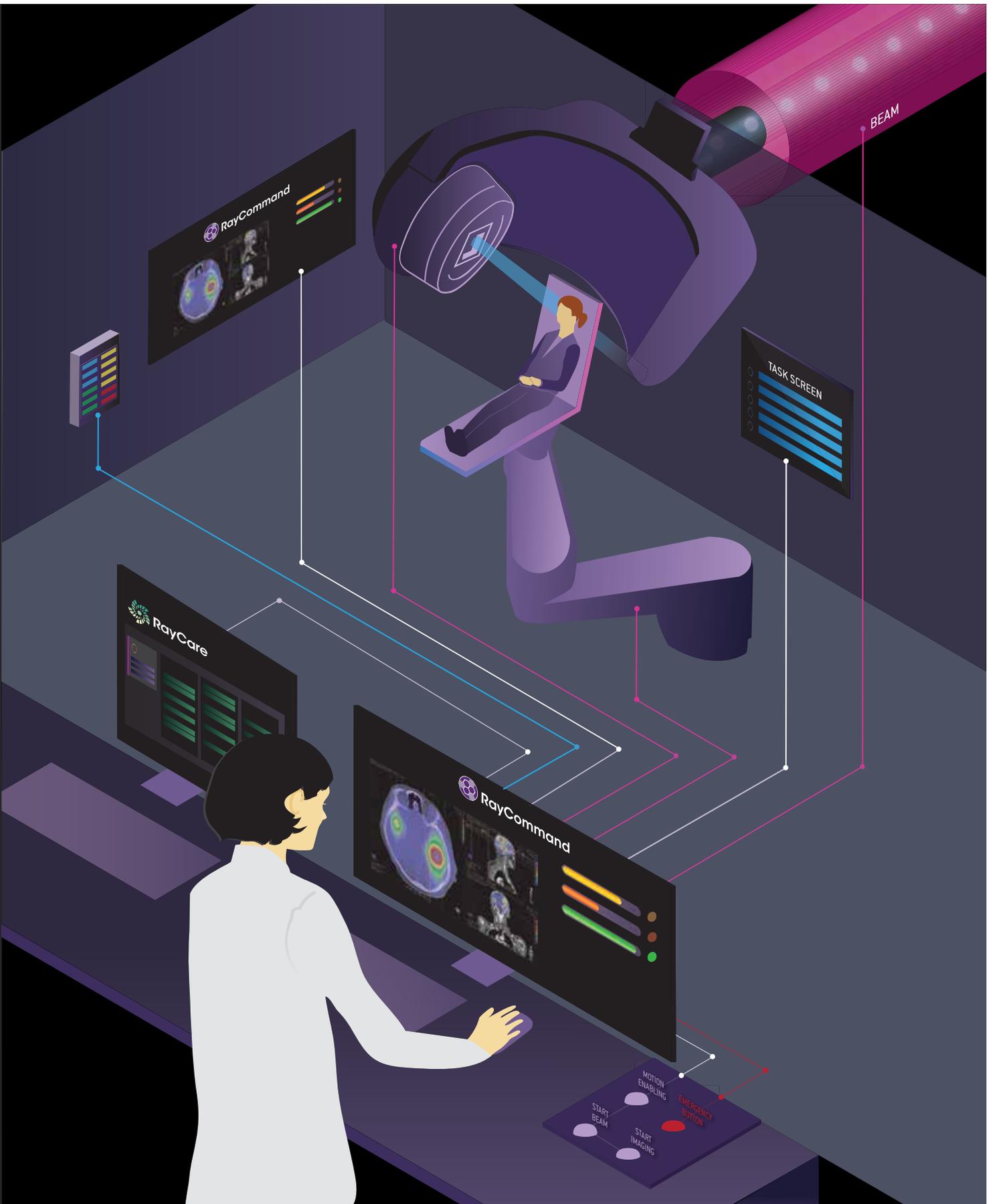
RayCommand is a treatment control system, which is the link between the treatment planning system, the oncology information system and the treatment machine. It will coordinate and orchestrate the different systems involved in the treatment.

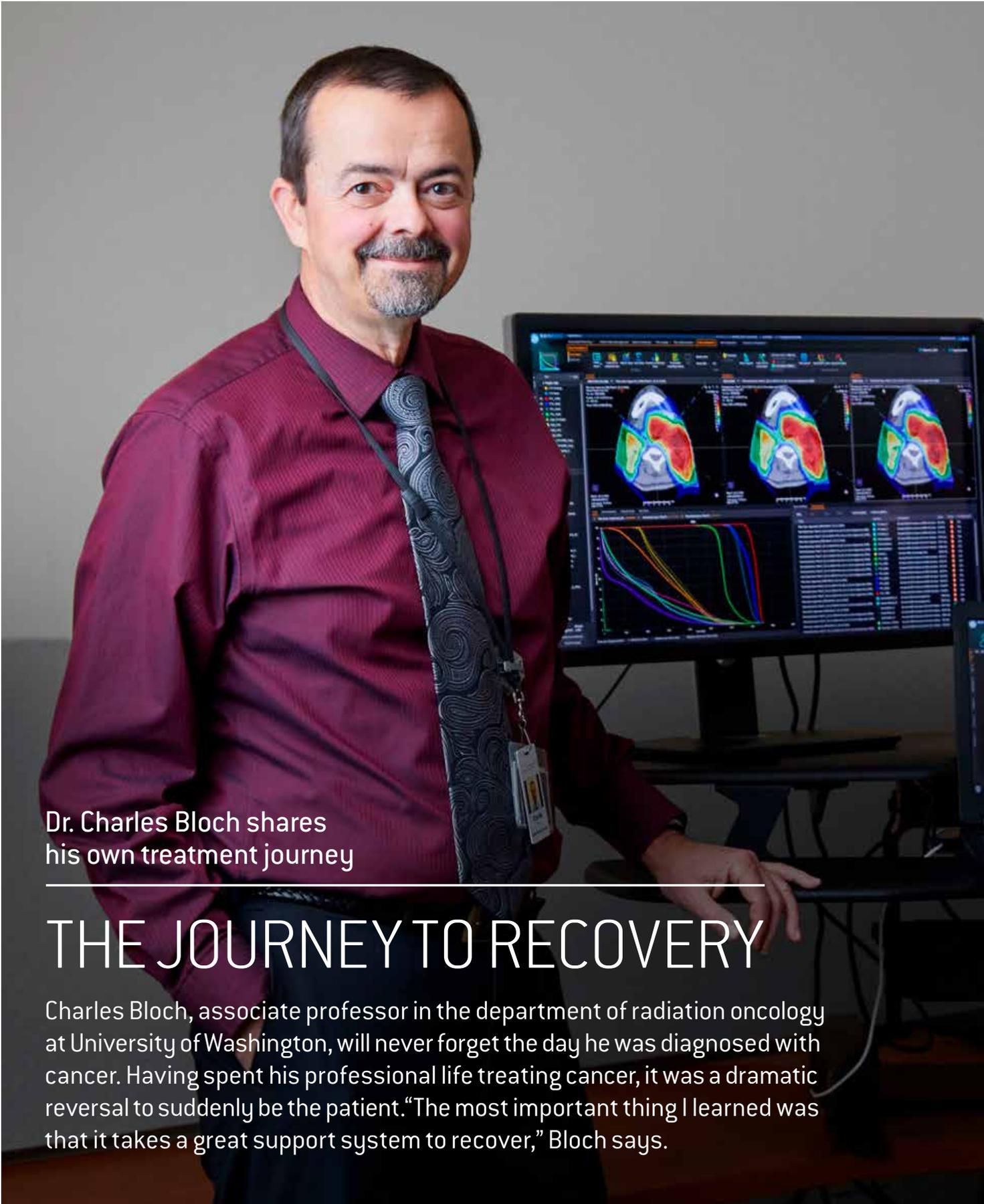
### WHY DID RAYSEARCH DECIDE TO DEVELOP THIS SYSTEM?

AVO had placed an order for both RayStation and RayCare and was requesting a treatment control system. We decided to build it as we saw a unique opportunity to harmonize the treatment process. The set of systems from RaySearch combines to deliver a comprehensive software solution for the front end of radiation therapy delivery.

### WHAT DOES A TRIO OF RAYSEARCH SYSTEMS MEAN FOR THE INDUSTRY?

RayCommand, RayStation and RayCare will together become a software suite that covers all the needs of a radiation therapy clinic, from the reception, consultation and treatment planning all the way into the treatment room. RayCommand will enable online adaptive radiation therapy. Support for offline treatment adaptation has been a key feature of RayStation for many years, but clinical implementation with the other oncology information systems on the market was complex. RayCare overcomes that, but for online treatment adaptations, the treatment control system must also be involved. RayCommand now makes that possible. It's an important step towards becoming a truly unified oncology software solution provider.



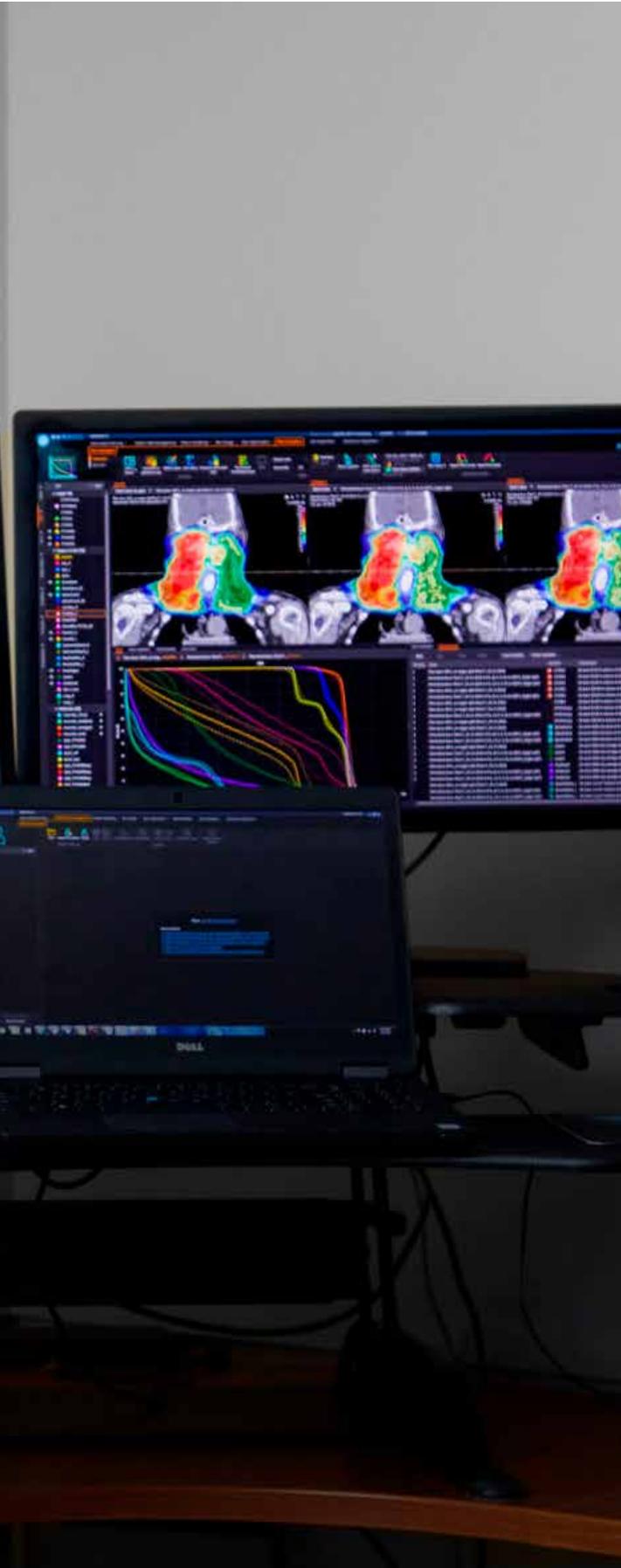
A photograph of Dr. Charles Bloch, a man with a goatee, wearing a maroon shirt and a patterned tie. He is standing in front of a large computer monitor displaying medical data, including three cross-sectional scans of a human torso with color-coded areas and a line graph below them. He has his right hand on the desk in front of the monitor.

Dr. Charles Bloch shares  
his own treatment journey

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## THE JOURNEY TO RECOVERY

Charles Bloch, associate professor in the department of radiation oncology at University of Washington, will never forget the day he was diagnosed with cancer. Having spent his professional life treating cancer, it was a dramatic reversal to suddenly be the patient. “The most important thing I learned was that it takes a great support system to recover,” Bloch says.



Charles Bloch has more than 25 years' experience as a medical physicist within radiation oncology, gained at some of the best-known centers in the US. Currently, he is a faculty member at the University of Washington and provides clinical support at the Seattle Cancer Care Alliance Proton Therapy Center. The center adopted RayStation in 2015—a move Bloch is happy with.

"Choosing RayStation as our treatment planning system was absolutely the right decision. I would recommend it to anyone," he says.

#### ACTIVE INVOLVEMENT

In October 2016, Bloch was diagnosed with oropharyngeal cancer, which had spread to lymph nodes in his neck. As for any cancer patient, the diagnosis was devastating. However, Bloch had great insight into his condition, and he knew every detail about the treatment he would receive—a combination of surgery and proton therapy.

"I have worked at some of the best clinics in the US, with some of the best people in the industry," Bloch says. "When choosing the right center for my own case, I weighed in factors such as the clinicians, the treatment planning system and the treatment delivery machine. In the end, I chose my own department."

Making this decision required total confidence in his team and the department's quality of treatment.

"I'm really proud that my team was the top choice to treat me. I had a great confidence in them as I've viewed their work daily for many years."

#### THE ROAD BACK

After recovering from surgery, Bloch received proton therapy over a three-month period. All treatment planning was carried out on RayStation. Today, he considers himself fully recovered.

"I was treated using the best equipment available. For that I'm grateful," Bloch says. "I was lucky. I'm happy to talk about my outcome and the excellent treatment I got. I even show my own plans when I give talks."

#### SUPPORT MAKES THE DIFFERENCE

Now back at work, Bloch has even greater confidence in the work he and his team do. He also emphasizes the importance of support from family and friends.

"I wouldn't say that I do my work any differently now, but I can relate to the patients in a new way. Being sick showed me the need for a strong support system. I got amazing support from those close to me, and I wish the same kind of support for all patients. It really concerns me when I see they don't have it. We can create great plans but having someone there to take care of you is a big factor for recovery."

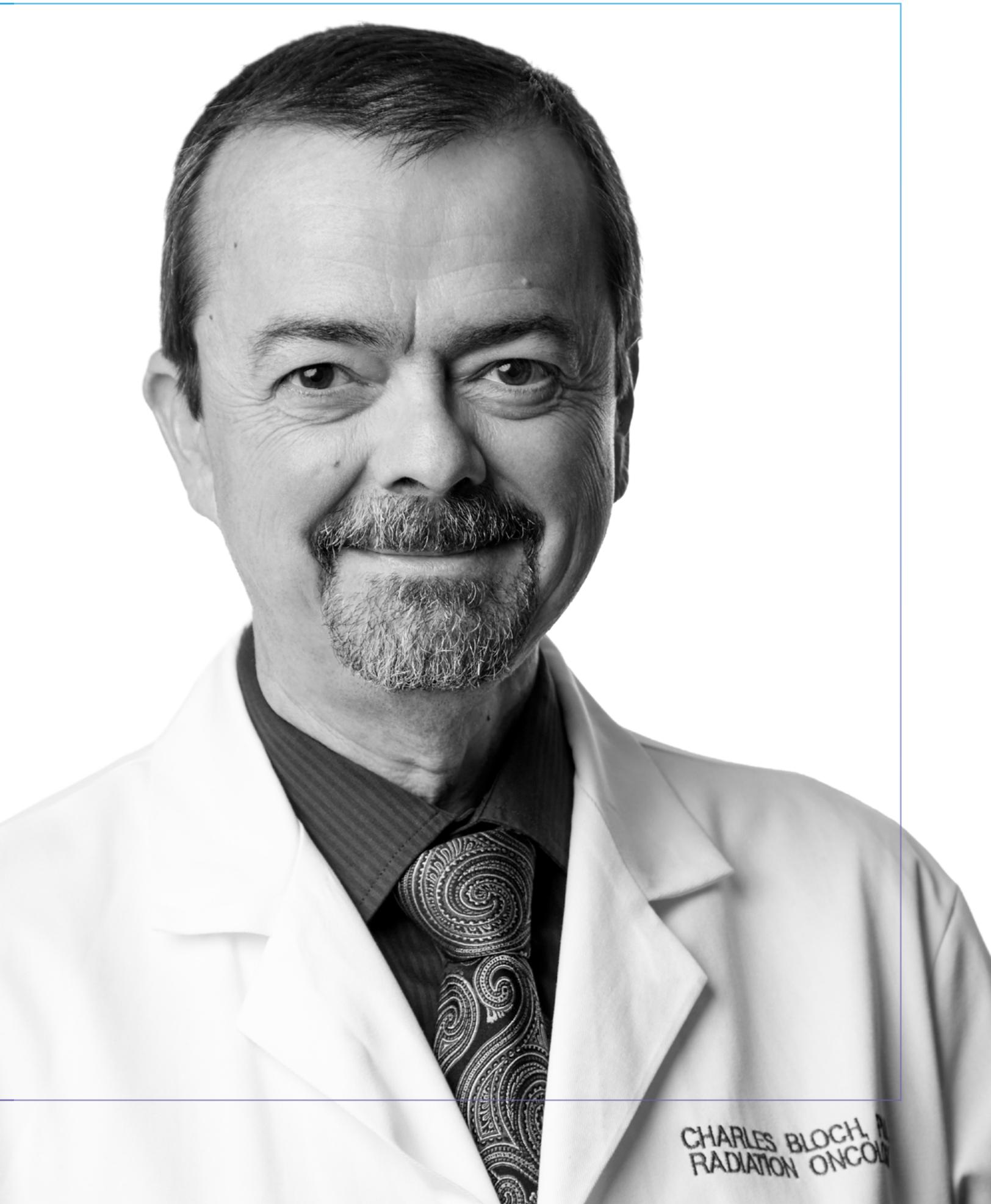


I received my treatment at my place of work, completed by my colleagues, who used RayStation. RayStation provides good tools to make great plans, and I would recommend it to anyone who asks. I trusted my colleagues completely with my treatment, a trust that comes from seeing the treatment plans they do daily, knowing the great quality in them. For that I'm grateful, and today I'm fully recovered."

Charles Bloch was diagnosed with oropharyngeal cancer and chose to be treated at his own department, which uses RayStation treatment planning system.

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CHARLES BLOCH, PH.D., ASSOCIATE PROFESSOR  
AT THE DEPARTMENT OF RADIATION ONCOLOGY,  
SEATTLE CANCER CARE ALLIANCE  
PROTON THERAPY CENTER



CHARLES BLOCH, M.D.  
RADIATION ONCOLOGY



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# GEARING UP FOR A NEW SUPPORT

Support is an essential component of RaySearch's solutions. We put great effort into making sure our customers get the most from their systems.



## THE PEOPLE BEHIND RAYSEARCH SUPPORT

Niclas Borglund, Director of Service based in Stockholm, discusses the service approach and how RaySearch is gearing up for the global uptake of RayCare.



NICLAS BORGLUND  
DIRECTOR OF SERVICE

### WHAT IS YOUR MAIN FOCUS TODAY?

RayCare! We expect to see rapid uptake, which will mean significant support needs. The support needs are also different compared to RayStation as the users are much more diverse—they can include almost anyone in the clinic. And as RayCare is a business-critical system, having the right support is key. It's an exciting phase as we're doing something completely new with RayCare, with proactive support as a central element.

### HOW IS THE SERVICE DEPARTMENT GEARING UP?

Over the past year, we've been ramping up and reorganizing the department and our applications task force to be ready to support RayCare. That includes a detailed understanding of the best approach to installation, hardware needs, training requirements and more.

We have also created some new support roles, including dedicated first-line support staff and professional services specialists. The services specialists will work closely with clinics to establish their needs regarding workflow requirements, configuration, training, and so on. They will build close relationships to help ensure a smooth transition to RayCare and to add value to the clinic.

### WHICH CAPABILITIES ARE IMPORTANT?

An essential aspect is taking the customer from signing a contract to using the software and achieving its full potential for the clinic. This is something we have gained a lot of experience in from RayStation.

Training will be more important than ever. We have always prioritized this, so we have a firm foundation to build on. Customization will be key; we will need to tailor the training to a greater extent to meet the specific needs of each clinic, with even more focus on onsite training.

#### WHAT ARE YOUR PRIORITIES?

Customer insight is a key one. We've already started to measure feedback using an automated system. Our standards are high when it comes to performance and customer service. We aim to be in constant touch with customers and to attentively listen to their needs.

Helping our customers transition to using our products clinically is critical and will be an important focus. There will also be a higher number of functionality upgrades in the early period, requiring effective planning and organization.

#### WHICH STRENGTHS WILL ENSURE SUCCESS?

Flexibility has always been one of RaySearch's great strengths. We have an agile organization, with a proactive approach to support. As the company grows, we gain access to new expertise that contributes to better support. Geographical borders don't mean much to us; we work closely with colleagues around the globe, bringing together the precise blend of expertise and skills we need for each project and task. We understand how to set up effective multidisciplinary working routines worldwide, so I believe we are well positioned to take RayCare forward.

Today we have a support team that consists of more than 70 people worldwide, which will continue to grow. We are committed to sharing knowledge and working in close collaboration with customers and partners to get it right.

#### WHAT ARE YOU LOOKING FORWARD TO?

I enjoy the opportunities of this new era for our company, where we will be providing much broader support to clinics and working with the full spectrum of personnel. It means thinking differently and redefining the role of support. It's a challenge of course, but it's one we've been preparing for over the last years.

RayCare is already in clinical use, but this is just the beginning.

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## OUR SERVICE MISSION

We provide the best possible support to our customers and partners, through high quality training, fast support and knowledge transfer, for the benefit of the patient.

**11**  
COUNTRIES

**25**  
LANGUAGES

**11**  
OFFICES







As early adopters of RayStation in 2012, we now have tremendous experience and we value its many advanced features. Our radiation oncology team finds the sophisticated tools in RayStation to be user-friendly and well-integrated with our clinical workflow. This was critical due to our busy daily clinical workloads. Over the years, the RaySearch team has been a true partner and listened to our feedback to add new features to serve our patients even better within the boundaries of a community cancer center. We look forward to the next level of efficiency and quality using machine learning.”

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FIRAS MOURTADA, M.S.E.,PH.D., DABR, FAAPM,  
CHIEF OF CLINICAL PHYSICS,  
CHRISTIANA CARE HEALTH SYSTEM





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## WORK THAT MATTERS

RaySearch is a continuously growing company. Our people are committed to a common cause, and we work hard and passionately to fight cancer and save lives. This is how we make sure we attract the best people in the industry.



## NEW STRATEGIES IN RECRUITMENT

RaySearch continued its expansion throughout 2018, with staff recruitments to a variety of positions. A new strategy was established to attract young professionals. HR manager Lotta Larsson and HR specialist Freja Birkhammar share some insights from the recruitment process.

### WHY DO PEOPLE WANT TO WORK AT RAYSEARCH?

**FREJA** ▶ Because we are passionate about improving cancer care. Together we create very cool software and innovative new approaches to benefit cancer care worldwide. That makes all who work here proud of what they do, and it helps to attract some of the most talented and qualified people; 97 percent of RaySearch employees have a university education, and 18 percent of our R&D staff also hold a doctoral degree.

**LOTTA** ▶ We are surrounded by extraordinarily talented people who are excellent at what they do, and who love to share their knowledge. RaySearch is a place to learn and to discuss. It's a dynamic and diverse workplace, which comes from us being more than 300 employees from more than 20 nationalities. RaySearch enables us all to contribute to the fight against cancer, and that provides a meaningfulness that is hard to beat.

### WHAT IS IT LIKE TO WORK HERE?

**LOTTA** ▶ We have a well-established company culture that offers a healthy work-life balance through benefits such as private health insurance, flexible working hours, centrally located offices, wellness contributions and much

more. All of which helps us provide the right environment for our employees to perform their best. Our low staff turnover—8.6 percent for permanent employees in 2018—shows that we have succeeded with our initiatives to retain people. In 2018, our workforce grew by 11 percent.

### WHAT IS RAYSEARCH'S RECRUITMENT STRATEGY?

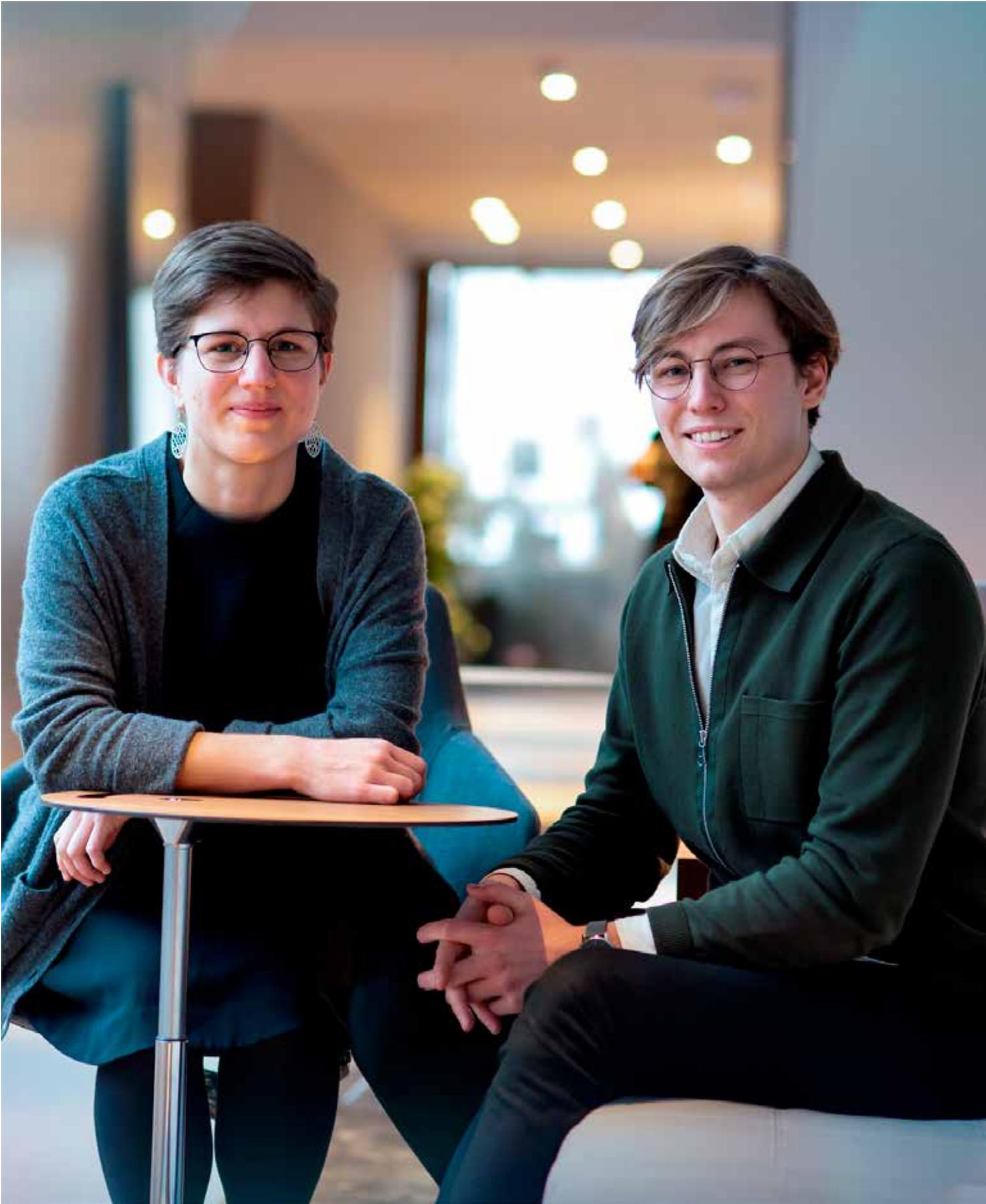
**FREJA** ▶ We want to continue recruiting people with outstanding qualifications. We believe in cross-functional teams and employ people with and without MedTech experience, specialized in multiple fields and at different experience levels.

### HOW WILL RAYSEARCH ATTRACT YOUNG PROFESSIONALS?

**FREJA** ▶ Part of our strategy is to attend student exhibitions, mainly in Sweden. There is usually great interest in RaySearch at these kinds of events, which is exciting. People are passionate about what we do, and they want to be a part of our journey. Being able to offer a career to some of these young professionals is very rewarding.

Another important part of our approach is to work through our current employees. They are our best ambassadors, and staff referrals often make the best candidates.





## YOUNG PROFESSIONALS AT RAYSEARCH

During 2018, RaySearch set a strategy for hiring young professionals. Young recruits Signe Sidwall-Thygesen and Harald Melin discuss their experience of working at RaySearch.

### WHY DO PEOPLE WANT TO WORK AT RAYSEARCH?

**HARALD** ▶ When I was looking for places to work during my time as an engineering physics student, I was searching for businesses in medtech with a strong culture and values, and I came across RaySearch. I did some research and found out that this was exactly what I was looking for: a technically advanced company that contributes to the fight against cancer, and a place where I could apply my education. It was a perfect match. I have also found RaySearch to be very social and a place where teamwork is appreciated.

**SIGNE** ▶ The combination of doing something good for other people and working with advanced technology makes RaySearch a workplace I can be proud of.

### WHAT DO YOU DO AT RAYSEARCH?

**SIGNE** ▶ I work in the RayCare team as a system developer. My team is responsible for the patient-specific data in RayCare, as well as the integration with other hospital systems, such as making the connection with RayStation run smoothly.

**HARALD** ▶ I'm a test engineer for RayStation. My job is to test our product to make sure it functions properly at the clinics. This involves understanding both the application and the details of the product. Currently, I am working with our new test automation framework.

### WHAT INSPIRES YOU?

**HARALD** ▶ To work with something that matters is still an inspiration, and it's very important for everyone here. The first few months were a training process for me, but the more I learn, the more responsibility I get, which is very rewarding and a motivation to keep learning. I remember the day someone came to me to ask for my advice. Before that, I had been the one asking the questions. That's when I started to feel I was really participating in our fight against cancer.

**SIGNE** ▶ The context in which we work – that what we create can help cure cancer – is the real inspiration. The teamwork here, working together towards a goal and solving problems together is also highly motivating.

### WHAT IS THE TEAM CULTURE LIKE?

**SIGNE** ▶ In the beginning, I felt a bit awed by the skill and educational level of many of my coworkers. But people are very humble and there's no shame in asking questions. It's essential to build that knowledge as we are creating products that are used to treat patients.

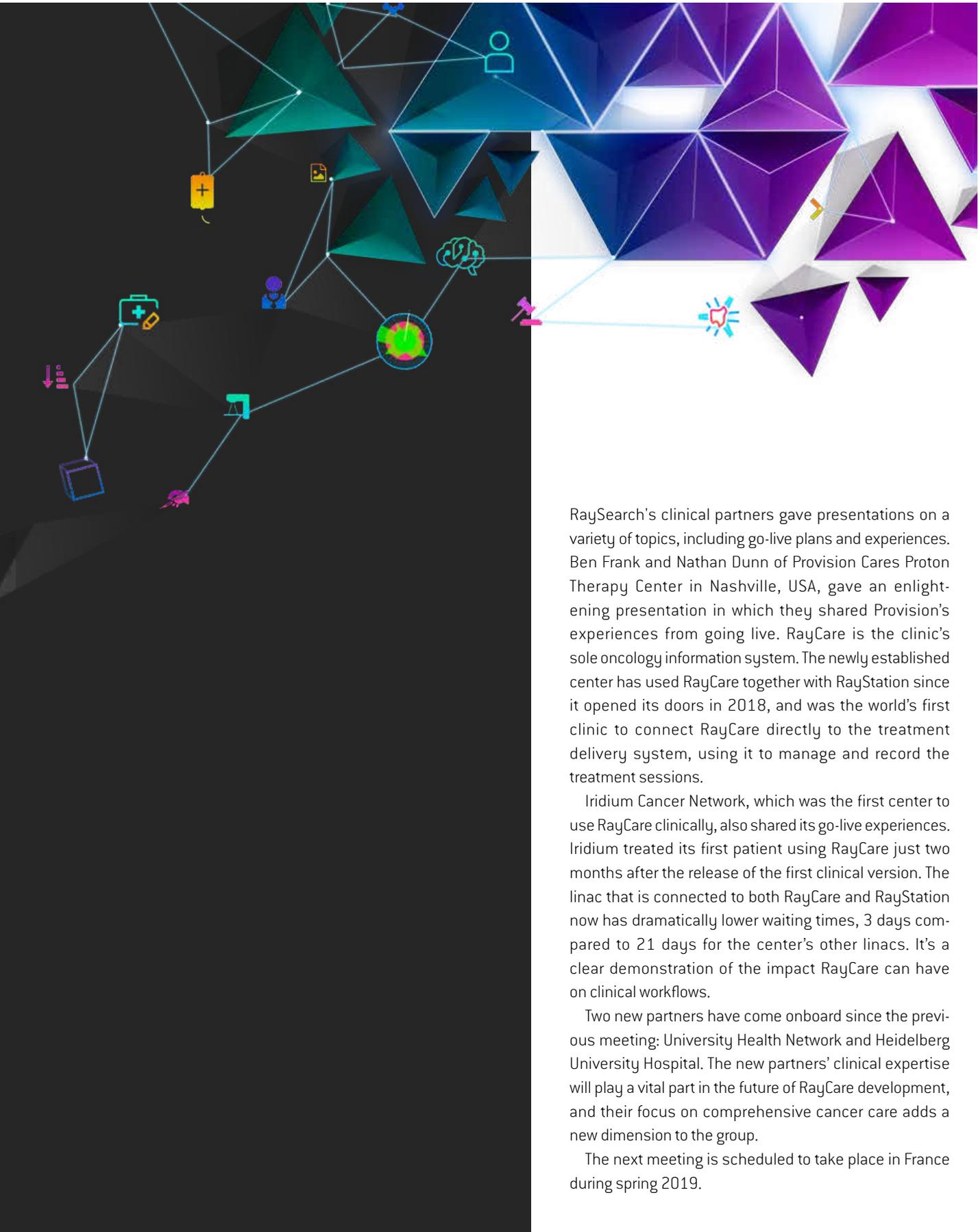
**HARALD** ▶ Development at RaySearch is characterized by discussion, questioning and collaboration over personal prestige, which creates a non-hierarchical work environment. When I first got here, I knew I would have to learn a lot, and my colleagues respected that. It takes time to figure out the job, and everyone does their best to help in that process. I've learned that at RaySearch, everyone wants to help each other and share knowledge.

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# RAYSEARCH CLINICAL ADVISORY BOARD

The third meeting of the RaySearch Clinical Advisory Board took place in November 2018, in Miami, Florida. The meeting led to a variety of excellent feedback, new ideas and inspiration for the future of oncology software. The clinical advisory board was formed in 2017 to steer the development of RayCare.





RaySearch's clinical partners gave presentations on a variety of topics, including go-live plans and experiences. Ben Frank and Nathan Dunn of Provision Cares Proton Therapy Center in Nashville, USA, gave an enlightening presentation in which they shared Provision's experiences from going live. RayCare is the clinic's sole oncology information system. The newly established center has used RayCare together with RayStation since it opened its doors in 2018, and was the world's first clinic to connect RayCare directly to the treatment delivery system, using it to manage and record the treatment sessions.

Iridium Cancer Network, which was the first center to use RayCare clinically, also shared its go-live experiences. Iridium treated its first patient using RayCare just two months after the release of the first clinical version. The linac that is connected to both RayCare and RayStation now has dramatically lower waiting times, 3 days compared to 21 days for the center's other linacs. It's a clear demonstration of the impact RayCare can have on clinical workflows.

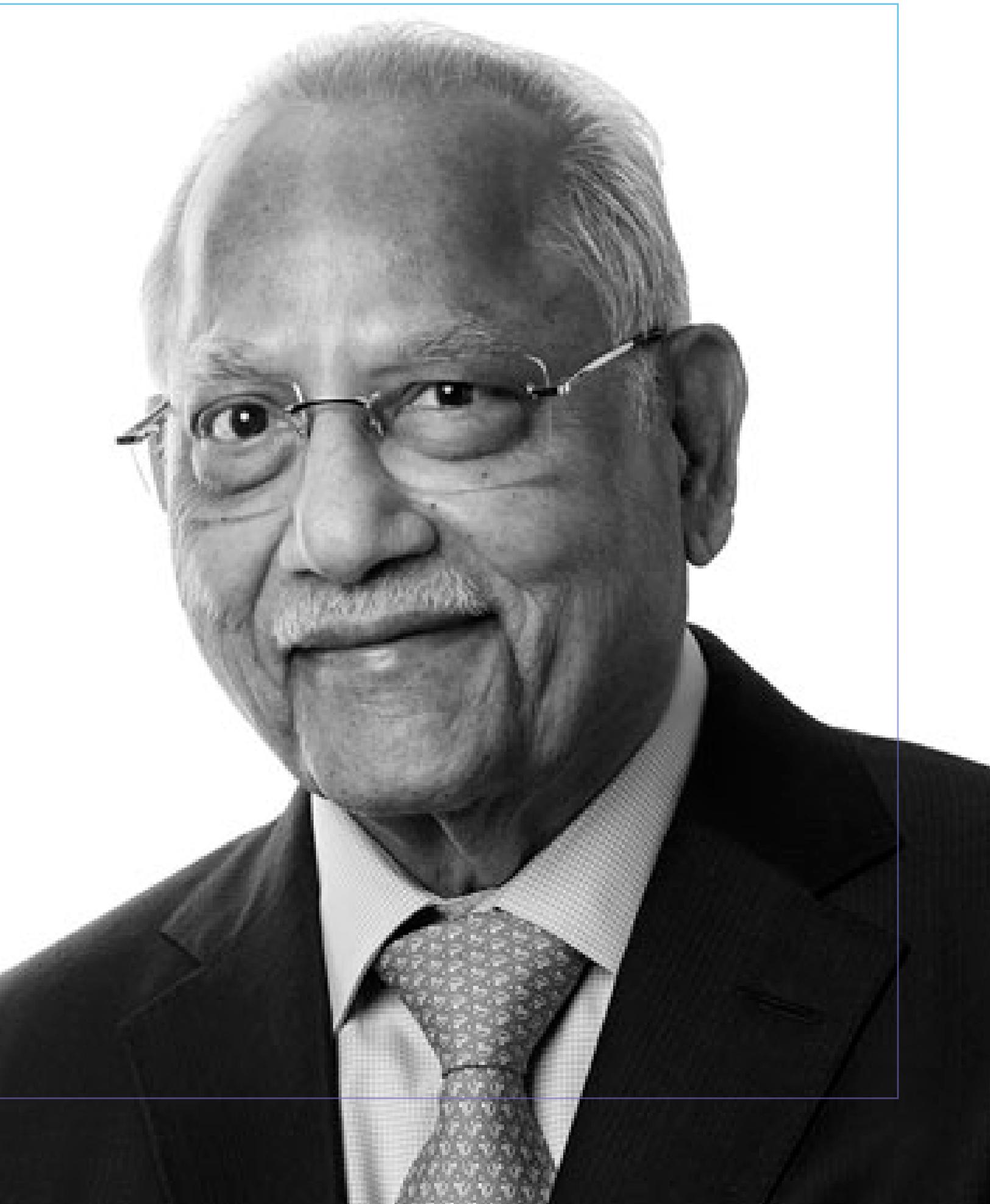
Two new partners have come onboard since the previous meeting: University Health Network and Heidelberg University Hospital. The new partners' clinical expertise will play a vital part in the future of RayCare development, and their focus on comprehensive cancer care adds a new dimension to the group.

The next meeting is scheduled to take place in France during spring 2019.

Our resolute commitment is to make cancer conquerable. Apollo has a twenty-five year legacy in cancer management and innovative technologies have been a hallmark of our cancer care modalities for our patients. At Apollo Proton Cancer Centre, our association with RayStation reaffirms our continued investments in the best available care for our patients.”

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DR. PRATHAP C REDDY  
CHAIRMAN, APOLLO HOSPITALS GROUP



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# THE FUTURE IS COLLABORATIVE

Throughout history, the world's problems have been solved by people working together for a common goal. Cancer is no different. Treatment is moving forward at a rapid pace; every day there are significant new developments that improve outcomes and make life better for patients around the world. But the fact is that no one can do it alone. The greatest innovations come from collaboration, when clinics, universities and industry share knowledge, inspire each other and form partnerships to find new possibilities.

RaySearch is committed to collaboration and knowledge sharing. We work with clinics, manufacturers, technology companies and cross-industry groups to do the best we can to conquer cancer. By working on different aspects and sharing what we know, we can make it happen.

We make a firm commitment to our partners, which includes a promise to ensure ongoing compatibility, for example by supporting hardware developments and new features into the future.

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## CLINICAL PARTNERS

### **UNIVERSITY MEDICAL CENTER GRONINGEN (UMCG)**

UMCG was the first hospital in the Netherlands to provide proton radiation therapy in addition to advanced photon irradiation techniques. The new proton center is equipped with IBA's ProteusPLUS two-gantry room configuration, including pencil beam scanning and cone beam CT capabilities. UMCG was the first clinic to join the RayCare partnership in 2015 and helped to lay the foundation for RayCare.



### **THE UNIVERSITY OF CALIFORNIA, SAN FRANCISCO (UCSF)**

UCSF became a RayCare partner in 2016. RayCare will support complex procedures and analyses at UCSF that are out of reach with current information management systems. An aim of the partnership is to develop a comprehensive approach to data infrastructure for clinical decision support. RayCare will enable UCSF to optimize resources and personalize patient care.



### UNIVERSITY OF WISCONSIN-MADISON

The Department of Human Oncology at the University of Wisconsin-Madison became a RayCare partner in 2017. RayCare will support the department's strong multidisciplinary approach to cancer care and its focus on cutting-edge techniques. The University, which has long tradition of radiation therapy treatment, has also implemented RayStation as its treatment planning system.



### PROVISION HEALTHCARE

Provision, located in Knoxville, Tennessee, became a RayCare partner in 2017. Provision was formed in 2005 with the aim of developing innovative healthcare solutions. In 2014, the Provision Cares Proton Therapy Center, Knoxville, became the first center in the world to use RayStation for clinical proton treatments. In 2018, the center started to use RayCare clinically and is the first center to only use RaySearch software. The Provision team continues to push the frontiers of radiation therapy.



### IRIDIUM CANCER NETWORK

The Iridium Cancer Network is a close collaboration between all seven hospitals in Antwerp, Belgium. The network shares a radiation therapy department. Iridium Cancer Network became a RayCare partner in December 2015 and became the first to use RayCare clinically to manage its treatment planning workflows, just two months after the clinical release of the system.



### HEIDELBERG (HIT) AND MARBURG (MIT) ION BEAM THERAPY CENTERS

HIT and MIT in Germany are both operational with proton and carbon ion therapy. RayStation was selected jointly by clinicians and researchers at HIT, MIT, Heidelberg University Hospital and the German Cancer Research Center (DKFZ), and the system will be used across the four centers. RaySearch will develop support for helium ion planning\* in RayStation and the new functionality will be validated jointly with HIT. Heidelberg University Hospital became a RayCare partner in 2018.



\*Subject to regulatory clearance in some markets.

### UNIVERSITY HEALTH NETWORK

RaySearch has a successful and longstanding relationship with University Health Network's Princess Margaret Cancer Centre in Toronto, Canada. In July 2018, we also joined forces to further develop RayCare. Princess Margaret is one of the largest comprehensive cancer treatment facilities in the world. The center recently made a major expansion of its RayStation platform and is on the way to being one of the biggest RayStation installations in the world.



### THE UNIVERSITY OF TEXAS MD ANDERSON CANCER CENTER (MDACC)

MDACC and RaySearch formed a strategic alliance in February 2018 to create a new standard of care in radiation therapy by building new software components, enabling adaptive radiation therapy on a larger scale. We will focus on integrating advanced imaging into the treatment planning process to improve definition of tumor targets. The combination of RayCare and RayStation will provide a novel opportunity for more personalized treatment.



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## INDUSTRIAL PARTNERS

### PHOTON THERAPY

#### ACCURAY

Accuray and RaySearch have a long-term collaboration agreement to develop and market fully integrated solutions combining RayStation and RayCare with the TomoTherapy, CyberKnife and Radixact treatment delivery systems. This partnership enables greater flexibility in clinics with multiple treatment machines. Integration with RayCare brings the additional advantage of an independent OIS.



#### UNITED IMAGING HEALTHCARE (UIH)

One of RaySearch's latest strategic collaborations is with UIH, founded in 2011 in Shanghai, China. UIH has developed the world's first medical linear accelerator with fully integrated diagnostic-quality CT imaging, designed from the ground up to support adaptive therapy planning. As part of the collaboration, RaySearch will adapt RayStation and RayCare to UIH's CT linac and standard linac.




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### PROTON THERAPY

#### IBA

RaySearch and IBA, the global leader of proton therapy solutions, have a long-term strategic alliance since many years back. As part of the collaboration, RaySearch has customized RayStation and RayCare for IBA delivery solutions, and together we supply a complete solution for all software and hardware to deliver outstanding adaptive proton therapy treatment. This allows clinics worldwide to make better use of the strength of IBA's treatment machines for a large number of clinical indications.



#### PRONOVA

ProNova Solutions, LLC. provides proton therapy solutions for cancer treatment worldwide. Its ProNova SC360 proton therapy solution uses superconducting magnet technology in the cyclotron and treatment gantry to reduce the size, weight and power required to deliver proton therapy treatment. The company was incorporated in 2011 and is based in Knoxville, Tennessee.



#### MEVION MEDICAL SYSTEMS

Mevion Medical Systems is a leading manufacturer of compact proton therapy systems. As part of the ongoing collaboration, RayStation development incorporates support for the latest features of Mevion treatment systems, such as HYPERSCAN technology.



#### ADVANCED ONCOTHERAPY PLC (AVO)

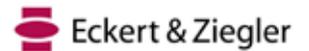
AVO is a UK-based developer of proton therapy technology. The LIGHT system is a modular proton therapy system developed in a collaboration with CERN in Geneva, Switzerland. The system is using a linear accelerator that enables narrower beams, with features including multiple spot sizes and fast energy switching time. RayStation, RayCommand and RayCare will fully support the LIGHT system.



## BRACHYTHERAPY

### ECKERT & ZIEGLER BEBIG

Eckert & Ziegler BEBIG is a European supplier of products for brachytherapy: a radiation therapy technique in which a small radioactive implant is inserted into the patient's tissue, directly into the tumor or close to it. Brachytherapy is most commonly used in treating prostate cancer but can be applied to many other areas, including cancers of the brain, eye, lung and skin. Both RayStation and RayCare will be integrated with the Eckert & Ziegler BEBIG brachytherapy systems.



## IMAGING

### CANON

Canon Medical Systems Corporation develops diagnostic imaging systems including CT, MRI, ultrasound, X-ray systems and clinical laboratory systems. Our collaboration will generate products to enable a more efficient workflow in the process of virtual simulation. These imaging and planning tools will assist clinicians in deciding how and where patients should be treated, determining size and location of the tumor, planning beam directions and calculating isocenter locations.



## BORON NEUTRON CAPTURE THERAPY (BNCT)

### SUMITOMO

Sumitomo Heavy Industries, Ltd., based in Tokyo, Japan, has developed the world's first accelerator-based system for clinical BNCT – an advanced form of radiation therapy that targets cancer at the cellular level, destroying tumor cells with minimal damage to adjacent healthy tissue. Users of BNCT will have access to the full range of advanced functionality in RayStation.



### NEUTRON

Neutron Therapeutics is a global company with locations in the US and Finland. The company has developed a complete single-room solution for BNCT, including an accelerator-based neutron source, treatment room equipment, and a dose engine interface to RayStation. The first installation of the system will be at Helsinki University Hospital.



## QUALITY ASSURANCE

### IBA DOSIMETRY

IBA Dosimetry is a subsidiary to IBA and a leading supplier of advanced dosimetry and quality-assurance solutions for clinical and industrial applications of radiation physics. In 2006, RaySearch signed a long-term development and licensing agreement with IBA Dosimetry regarding a suite of products for quality assurance in IMRT and adaptive therapy. The agreement represented an important expansion of RaySearch's business and products from the partnership are marketed under the COMPASS® brand.



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# THE FRONTRUNNERS' CHOICE

2018 has been an exciting year with some major orders and partnerships to advance cancer treatment. Here is a selection of some of this year's most significant orders.

## LEEDS CANCER CENTRE

Leeds Cancer Centre, a part of Leeds Teaching Hospitals NHS Trust, is one of the biggest cancer centers in the UK. The center has state-of-the-art imaging and treatment equipment and is dedicated to updating the technology regularly. RayStation was chosen to replace existing treatment planning systems, a decision based on its outstanding functionality.



## INSTITUT DE CANCÉROLOGIE DE BOURGOGNE

Institut de Cancérologie de Bourgogne consists of three privately owned centers, located in Auxerre, Dijon and Chalon-sur-Saône. RayStation has been selected as the sole TPS for the whole group. The factors for choosing RayStation include its capabilities for adaptive therapy and automation features. Other important qualities were the ability to optimize the treatment planning process, high speed, and the calculation accuracy and an outstanding user experience.



### APOLLO HOSPITALS

Apollo Hospitals in Chennai, the first proton therapy center in India, has chosen RayStation as its TPS. The center is equipped with IBA's Proteus®PLUS treatment delivery system in a multi-room configuration. The choice of RayStation was motivated by its comprehensive functionality and support for all major treatment delivery systems, as well as RaySearch's world-leading position in proton therapy treatment planning.



### CHU DE QUÉBEC-UNIVERSITÉ LAVAL

RayStation was chosen as the TPS for all external beam planning at the new center in Québec, Canada. CHU de Québec-Université Laval chose RayStation due to its adaptive and automation capabilities, as well as the flexibility to include additional treatment machines in future expansions. RayStation is used together with Varian's TrueBeam linacs.



### HEIDELBERG ION BEAM THERAPY CENTER

### MARBURG ION BEAM THERAPY CENTER

RayStation was selected jointly by clinicians and researchers at Heidelberg Ion Beam Therapy Center (HIT), Marburg Ion Beam Therapy Center (MIT), Heidelberg University Hospital and the German Cancer Research Center (DKFZ), and the system will be used across the four centers. That means that all carbon ion centers in Europe have selected RayStation.

### HEIDELBERG UNIVERSITY HOSPITAL

### GERMAN CANCER RESEARCH CENTER



### EMORY PROTON THERAPY CENTER

RayStation was chosen as the TPS for the new Emory Proton Therapy Center while it was under construction in 2018. The center is equipped with Varian's ProBeam proton system and will treat approximately 1,800 patients per year. Motivating factors for choosing RayStation included advanced functionality such as Monte Carlo dose optimization, 4D optimization, and multi-criteria robust optimization.



# MEET OUR MANAGEMENT TEAM



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HENRIK FRIBERGER  
DIRECTOR OF  
DEVELOPMENT

PETRA JANSSON  
GENERAL COUNSEL



**“We make the  
cancer care of  
tomorrow  
possible today.”**

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JOHAN LÖF  
CEO AND FOUNDER



# ADVANCING CANCER TREATMENT

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