



University Medicine Essen

08

**INNOVATIVE THERAPIES
IN PEDIATRIC ONCOLOGY**

Joint research efforts

24

THE AYA WARD

Holistic therapy for adolescents and
young adults with cancer

40

NEURO-ONCOLOGY

Innovative targeted treatments
of brain tumors

WEST GERMAN
CANCER CENTER
ANNUAL REPORT
2019

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cancer center essen

CONTENTS

03 Preface

EXCELLENT

- 04 Networking for the benefit of the patient
- 08 Innovative therapies in pediatric oncology – joint research efforts
- 10 A valuable gift for science
- 12 Genetic profile of a tumor
- 13 Meet our business office staff
- 14 Personal news and events

PERSONAL

- 20 Cancer is a burden on the soul as well; psycho-oncology may provide relief
- 22 Multi-level support
- 23 onko x – physical exercise for oncology patients
- 24 The AYA ward – holistic therapy for adolescents and young adults with cancer
- 28 Getting more done together – donations at work
- 30 The Clinician Scientist Program
- 32 Robot-assisted surgery
- 40 Neuro-oncology – innovative targeted treatments of brain tumors

INNOVATIVE

- 42 Excellence in numbers
- 44 Selected 2019 publications
- 47 Publishing information



West German
Cancer Center Essen
(WTZ)

PREFACE



Dr. Stefan Palm,
WTZ General Manager

Dear Reader,

it is in unprecedented times that we present to you the second edition of the annual report of the West German Cancer Center Essen (WTZ, Westdeutsches Tumorzentrum). At the time of writing, Germany is watching the ongoing development of the COVID-19 pandemic in awe, as it puts our health care system's ability to cope to the test. Challenging times like these make one thing absolutely clear: the close collaboration of many medical experts, effective communication, and extensive networking form the basis for supporting patients and their loved ones, even in unusually difficult situations.

Another challenge, one that has been with us for a long time, is also best met with excellent medical knowledge, perfectly coordinated services, and strong collaborators: being diagnosed with cancer is often not just a devastating turning point for patients, but also for their partners, children, parents, friends, and other loved ones. Today more than ever, they all rely on us for the best possible support. And that is why we continue to evolve here at the WTZ: today's cancer research forms the basis of tomorrow's excellent medical care. At the WTZ, we are committed to bringing the latest discoveries and therapies from the bench to the bedside so that our patients can benefit from them as soon as they become available.

To this end, 2019 was a special year for the WTZ: making the Cancer Center

of Münster University Hospital a part of the WTZ was a major milestone in further strengthening cancer care in our region and beyond (page 5). Another important focus for us is the support that our new Clinician Scientist Program offers early-career physicians and scientists who will eventually become the experts our patients can rely on. You can read about this program on page 30 of this report. Cancer care is not just medical care. Complementary services such as programs-delivering physical exercise instruction and psycho-oncological counseling are another important focus area we would like to tell you about (pages 23–24). Last but not least, I invite you to meet the team of our WTZ Office to get a better idea of who they are (page 13).

2019 was another year in which the WTZ laid the foundations for future developments that will evolve over the coming years.

I hope you will enjoy reading about all of them and more!

Sincerely, Dr. Stefan Palm

WTZ General Manager



NETWORKING FOR THE BENEFIT OF THE PATIENT

The collaborative agreements between the WTZ and the universities of Cologne and Münster are milestones in medical cancer care in North Rhine-Westphalia

New knowledge always comes with new challenges, and tumor research is no exception to this rule. Expectations for treatment options grow as the scientific knowledge and understanding of tumor characteristics and behaviors become ever more sophisticated. How can we make expert knowledge available for the benefit of our patients? How do we gradually turn new research knowledge into novel, evidence-based therapies that are also informed by clinical experience?

In order to meet these challenging tasks, the WTZ has formed networks with leading academic cancer centers in North Rhine-Westphalia, signing two collaborative agreements that can be considered milestones in medical cancer care in the state, as WTZ's Directors Prof. Dr. Dirk Schadendorf and Prof. Dr. Martin Schuler emphasized. These collaborations form the foundation for the NRW Center of Excellence in Cancer Medicine (Exzellenznetzwerk Krebsmedizin NRW) that will provide patients in Germany's most densely populated federal state with access to top-notch medical care. "Medical care that is science-based, quality-controlled, and needs-oriented," according to both directors. In January 2019, the WTZ signed a collaborative agreement with the Center of Integrated Oncology (CIO) at Cologne University. With this agreement, the two partner institutions formed a new entity, the Cancer Research Center Cologne Essen (CCCE), which is dedicated to joint research efforts, teaching, and continuing medical education in applied cancer medicine. Over the next five years, the state of North Rhine-Westphalia and the two University Hospitals will invest a total of 30 million euros in the CCCE. "We aim to become

one of the leading institutions in cancer research, both nationally and internationally," said Schuler.

In October 2019, the WTZ then entered a networking partnership with the Comprehensive Cancer Center Münster (CCCM) at the University of Münster, which is under the umbrella of the WTZ. The focus of this partnership is optimal patient care, and to achieve this, both partners will form closer ties between the University Hospital oncology sites in the Ruhr area and Westphalia. One of their first joint efforts is the DKH application to become part of German Cancer Aid's program for interdisciplinary Oncology Centers of Excellence (the WTZ Essen on its own has been recognized as such a Center of Excellence since 2009). "This partnership represents a visionary concept in cancer medicine," said Schadendorf. "Following the guiding principle of putting collaboration ahead of competition, two academic networking partners will work together for the benefit of all their patients."

THE CCCE: TWO SITES, ONE STRATEGY

The CCCE is scheduled to begin its project work in the first half of 2020. Its Essen and Cologne sites will each establish two professorships and junior research groups for the CCCE, which will coordinate their respective research projects.

In Essen, their research focus will be on applied data science and artificial intelligence as means of improving diagnostic and therapeutic options in oncology. The question at the center of these efforts will be: which medical computer science and computational biology solutions can be used to transform the existing treasure trove of medical data at the WTZ into immediate improvements in cancer patient care?

One of the problems that need to be solved is the fact that these data come from a variety of sources, including clinical exams as well as imaging studies and molecular analyses. Added to these is a huge repository of research knowledge and data from trials. How can all of this information be aggregated with the help of machine processing in a way that will yield new knowledge to support oncologists both during the diagnostic and the therapeutic phase of patient care?

Schuler said: "Currently, we are working on initial answers to these questions in the area of immunotherapy." The long-term goal is to provide machine-based solutions that one day will serve as decision-support systems for physicians and nurses in the WTZ network. Another approach is to study whether artificial intelligence can be used to generate completely new insights and understanding based on existing knowledge — completely independent of the traditional hypothesis-driven research methods.



WELCOMING MÜNSTER AS A WTZ NETWORKING PARTNER: DEVELOPING CONSISTENT STAND- ARDS TOGETHER

According to Schadendorf, by expanding the WTZ through bringing Münster into the network, two highly specialized oncology centers are combined, setting new standards in cancer medicine. The main goal of this collaboration is to achieve even better quality in patient care.

To this end, both institutions plan to first integrate their expertise and skills, and then to continue to develop them in joint processes. The first steps on this path were taken in 2019: Essen and Münster have already established a joint tumor board to improve the treatment of rare types of tumors. At regular intervals, members of the board hold video conferences to discuss highly complex medical cases.

Interdisciplinary work is an important part of the network's activities. Other benefits of networking include additional synergies generated in research,

INTEGRATING EXPERT KNOWLEDGE CREATES IMPORTANT SYNERGIES

education, and treatment. There are plans to gradually open up the network to additional regional partners as well. Continuing medical education for physicians in private practice as well as educational activities geared towards patients are also on the collaborative agenda for both centers.

"In the long run, we aim to establish consistent standards across the entire WTZ network. These would apply to diagnostics as well as to guideline-based and evidence-based cancer treatments that should always reflect the latest research results," Schadendorf said, explaining the rationale for this collaboration. But it is not only patients in the Ruhr metropolitan region and Westphalia who will benefit: the network also serves cancer patients from Lower Saxony and the adjacent Netherlands.

One main goal of the extended WTZ network is to accelerate scientific progress. Working together, the WTZ partners not only serve more patients, but they can also rely on more scientists for achieving this. By conducting joint clinical trials, they will have more



cases to research and will be able to produce more relevant results in shorter periods of time. Patients benefit: in particular those affected by rare cancers or who have complex cases gain access to innovative diagnostic and treatment methods, regardless of where they live. Oncologists benefit as well: "We can now evaluate examinations together and develop benchmarks," said Schadendorf.

Combining skills and expert knowledge means giving hope to thousands of cancer patients. "But it also requires a novel form of teamwork involving all partners and participating institutions," as both directors emphasize. "Information has to be shared in all directions."

To ensure that this sharing of information happens, the partners have committed to providing all the data generated as part of this collaboration to the network, both for quality assurance purposes and for joint research projects. The IT networking between all participating hospitals and institutions in Essen, Cologne, and Münster, as well as an infrastructure of joint databases that are required to achieve the network's goals, are currently under construction.

INNOVATIVE THERAPIES IN PEDIATRIC ONCOLOGY: JOINT RESEARCH EFFORTS

In children, many cancers can be cured, but there are also those pediatric patients for whom traditional treatments do not work. They may choose to participate in early-stage clinical trials, known as phase I/II clinical studies. If they do, they may receive innovative investigational treatments under tightly controlled conditions. Essen University Hospital's Department of Pediatrics III is part of the clinical trial group for Western Germany (Studienverbund West) of the German Association for Pediatric Oncology and Hematology (Gesellschaft für Pädiatrische Onkologie und Hämatologie, GPOH). Prof. Dr. Dirk Reinhardt, Head of the Department of Pediatrics III, is the group's spokesperson.



PHASE I/II CLINICAL TRIALS STUDY THE SAFETY AND EFFICACY OF NEW TREATMENTS

"In children, unlike in adults, there are very few cases of cancer that do not respond to standard treatments or in which there is a recurrence of the cancer," explained Prof. Dr. Reinhardt. "That's why it is so important to conduct phase I/II studies across a group of several hospitals. On the one hand, this approach ensures that there are sufficiently large numbers of cases that allow for statistically valid conclusions. On the other hand, involving more hospitals also provides better access to optimum treatment for all patients in a given region."

GPOH's Studienverbund West includes a total of 12 North Rhine-Westphalian pediatric oncology centers, and the WTZ is one of them. Since 2015, it has been accredited as a study site by the European Innovative Therapies for Children with Cancer (ITCC).

If clinical trials fail, the program provides a molecular genetic analysis of the tumor in question which "forms the main basis for selecting an appropriate innovative therapy as part of a clinical study," as Reinhardt explained. The spectrum of clinical research here is as wide as the range of treatment options offered. "Our past and ongoing phase I/II studies have addressed all types of tumors," said Reinhardt (the QR code on this page will take you to a list of all disease entities for which there currently are ongoing phase I/II pediatric oncology studies).

In a phase I trial, treatments that have been developed and tested in the lab are studied in humans for the first time. One of their purposes is to determine how well the body tolerates the new therapy. The efficacy of the new treatment (its proof of concept) and the dose finding for new drugs does not happen until the phase II trial.

"At our institution only patients for whom conventional therapies have failed may enter these trials," explained Reinhardt. "Often the patient's parents see participation in a clinical trial as a last chance for their child."

"Participating in a phase I and II clinical study is a chance for patients who have not responded to conventional treatment."

Prof. Dr. Dirk Reinhardt, Head of the Department of Pediatrics III (Pediatric Oncology)

The department of pediatric oncology at the WTZ Essen is one of the biggest in all of Germany. The WTZ treatment program in pediatric hematology/oncology allows for the treatment of all cancers occurring in children and adolescents. If conventional thera-



Current WTZ phase I/II studies in pediatric oncology



A VALUABLE GIFT FOR SCIENCE

THE WEST GERMAN BIOBANK ESSEN (WBE) HOLDS MORE THAN 40,000 BIOLOGICAL SAMPLES FOR RESEARCH

The more we know about cancer, the more sophisticated the questions are that are addressed by research in the field. To confirm their hypotheses, scientists need data as well as biological samples suitable for their research projects. Researchers at the WTZ, and within its network, have access to such samples through the WBE.

The biobank holds more than 40,000 biological samples to be used in academic research that have been donated, among others, by Essen University Hospital patients. Samples include tissues, blood, cerebrospinal fluid, and urine. "These samples are valuable gifts for science," as Dr. Katharina Jockers explained. She is the head of the West German Biobank and promised: "Our donors can trust us to treat these gifts in a most responsible manner."

The samples are so-called residual materials that were taken while testing patients during diagnosis and treatment, and that were not completely used for the original testing purpose. If a patient has consented before sampling to donating such residual material, the samples are stored at the central lab and at the Institute of Pathology of the University Hospital, as well as at the Ruhrlandklinik.

When obtaining consent for sample donation, physicians inform patients of the biobank's purpose and of how their data will be protected. Samples and data are stored separately. Personal data are coded and will only be provided in pseudonymized form, preventing users from finding out who donated a specific sample.

Access to the samples themselves is also tightly regulated and follows a specific protocol. Materials are primarily provided to scientists at the University of Duisburg-Essen, who include researchers at the WTZ and within its network. One of the groups working with biobank materials is the German Cancer Research Center's (DKFZ) translational neuro-oncology department established at the WTZ. In order to obtain biobank materials, researchers have to apply in writing with a detailed description of their intended research. They also have to provide approval from their institution's ethics committee. For every application approved by the biobank's scientific advisory board, the researchers are obligated to report the outcome of their research to the biobank so that it may publish their findings.

GENETIC PROFILE OF A TUMOR

ONCOLOGISTS, PATHOLOGISTS, HUMAN GENETICISTS, AND COMPUTATIONAL BIOLOGISTS COME TOGETHER IN THE MOLECULAR TUMOR BOARD TO ANALYZE TUMOR CHARACTERISTICS

For cancer therapy, interdisciplinary collaboration has proven to be very effective, as evidenced by the well-established and certified general tumor boards. Since July 2019, the WTZ has taken this collaboration one step further with its Molecular Tumor Board. "This committee brings together all of our molecular medicine experts," as Prof. Dr. Jens Siveke described it. Siveke is the director of the Institute for Developmental Cancer Therapeutics at the WTZ and head of the Translational Oncology of Solid Tumors research group within the German Cancer Consortium (DKTK) network. Molecular medicine is one of the most innovative fields in medicine. It applies findings from molecular genetics, genomics, and related medical research to medical practice. Molecular medicine aims to develop treatment options that allow physicians to address certain diseases at their molecular root cause.

The Molecular Tumor Board brings together oncologists, pathologists, human geneticists, and computational biologists who collaboratively analyze tumors to find genetic changes that might be therapeutically addressed by targeted treatments. Another focus of their analyses includes genetically altered tumors, cancers that show an unusual progression, and rare tumors in general. Currently, the Board and the WTZ networking partner Münster discuss up to ten cases per week. In addition, hospitals and physicians from the region present patient cases to the Board via the WTZ website. "From the very beginning we wanted to follow this open concept that allows as many colleagues as possible access to our molecular expert knowledge and potentially also to clinical studies for their patients," as Siveke emphasized. This approach allows other physicians to learn about novel therapeutic approaches in molecular medicine and to benefit from

the experts' state-of-the-art knowledge. Patients benefit as well, as they gain access to meaningful clinical studies covering a range of diseases that allow them to receive novel treatments.

All of the patients discussed by the Board have already passed an oncological tumor board and many of them have already exhausted all therapies approved for their treatment. The Molecular Tumor Board's mission is then to take a detailed look at both their clinical history and the tumor's molecular profile in order to recommend possible additional diagnostic and therapeutic options.

STARTING POINT FOR PERSONALIZED THERAPY

In recent years, our knowledge and understanding of molecular profiles of tumors as well as of genetic alterations that can be addressed with targeted

therapies has grown immensely. This includes useful information about suitable diagnostic approaches, courses of treatment, and potential outcomes, but making sense of all of these options requires highly specialized knowledge. "Such specialized knowledge can make a huge difference for diagnosis and treatment," said Siveke. At the same time, he emphasized: "Our current job, however, is to apply this specialized knowledge in a measured manner, taking into account the existing evidence and always considering the explicit benefits of any diagnostic or therapeutic approach for the individual patient, while respecting the current realities of care."

In the long term, the Board aims to give evidence-based recommendations for therapies that are closely coordinated with important partners such as health insurance providers and patient advocates. "Such recommendations pave the way for individualized personal tumor therapies, a goal that we continue to strive for," said Siveke.



Clinical studies at the WTZ

MEET OUR OFFICE STAFF

The WTZ Office's responsibilities are diverse and include the coordinating and optimizing of the interdisciplinary and cross-departmental aspects of the WTZ, as well as coordinating with central departments of the University Hospital and assisting the WTZ Directors. The Office is the point of contact for all organizational needs in these areas.



Dr. Stefan Palm
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WTZ General Manager

Stefan Palm has been the WTZ's General Manager since September 1, 2010. In his previous position he headed the administrative unit of quality management of the Tübingen University Hospital. Stefan Palm holds a doctoral degree in medicine and an MSc degree in health care management.



Wibke Bomholt
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Coordinator of collaboration and reporting

A trained occupational therapist (BSc) and health systems manager (MA), Wibke Bomholt has been the contact for all questions on collaborations since 2017 and is also responsible for reporting activities relating to trials and external funding.



Birgit Drews
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Cooperation and Organizational Officer

Following her university studies of languages and economics, she worked in London, UK, as an international marketing and fundraising manager and subsequently as senior medical editor. She then completed a distance learning course in health management and took a project management position at the Münster University Hospital in 2011. Since 2018 she has been responsible for WTZ strategy, outreach, and activities at the WTZ.



Leonard Engert
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Project assistant in event management

A trained event management assistant, Leonard Engert joined the team in 2019 and is responsible for planning, realization, and continuing development of event activities within the WTZ network.



Anete Matisa
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Coordinator of tumor documentation

Having completed degrees in biology (BSc) and Environmental Sciences and Management (MSc), Anete Matisa coordinated and headed several state and EU-funded environmental programs, including one on drinking water and wastewater management in Latvia. Since October 2012, she has been working at the WTZ Essen and is currently the coordinator for the tumor documentation team.



Raya Rausch
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Coordinator of funding programs

Raya Rausch holds an MSc degree in medical biology and is working on her doctoral degree at the Department of Psychosomatic Medicine and Psychotherapy. Since 2015, she has been in charge of coordinating funding programs at the Office. She coordinates the project management.



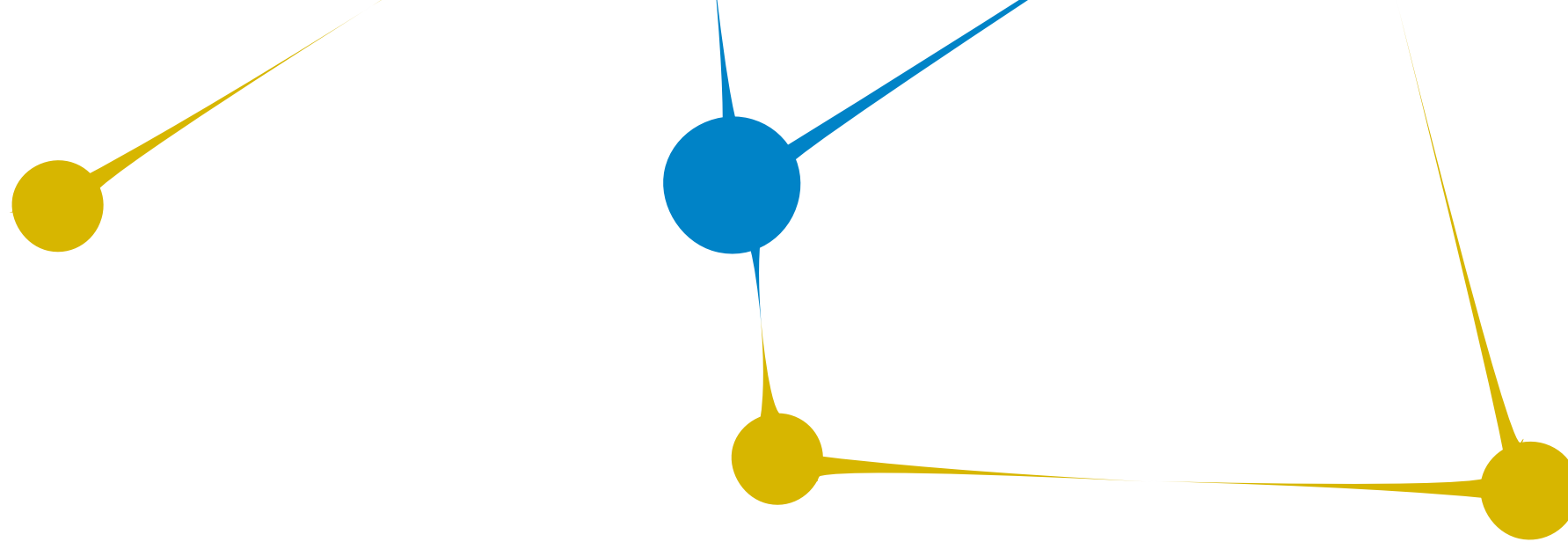
Nina Reckert
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Project assistant and secretary

A certified medical assistant, Nina Reckert has been a project assistant with the office since 2017. She is responsible for secretarial tasks, various project tasks, including quality management tasks, and is a first contact for questions directed at the WTZ.



Janine Scholz
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Officer for communications and patient strategy

Following her university studies in the humanities and a traineeship and other positions in corporate communications and content marketing, both with agencies and corporations, Janine Scholz joined the WTZ Business Office in June 2018. She is responsible for internal and external communications, which includes the website, working with the press, marketing, and patient communication activities.



STAFF NEWS AND EVENTS

A YEAR FILLED WITH SPECIAL MOMENTS

The past year, like previous years, saw many unforgettable moments and events. Here, we look back at various successes that have been made possible solely by the ambition and commitment of our employees. These include not only the WTZ cancer patient day, but also an impressive list of awards. A number of physicians and scientists have demonstrated excellence in their work. There were also important events such as the Sarcoma Tour that enabled us to collect major donations for various projects.

03 Scientists of the German Cancer Consortium (DKTK) at the Medical Faculty of the University of Duisburg-Essen (UDE) discovered a new biomarker for an aggressive type of skin cancer.

01 North Rhine-Westphalia supported the establishment of the Cancer Research Center Cologne Essen (CCCE) with 20 million euros.

07 The "2nd Essen Translational Oncology Symposium" was held at the WTZ and attended by 140 participants from 24 departments and institutes.



JANUARY



FEBRUARY

11 The oncology center of Essen University Hospital at the WTZ continues to be certified by the OnkoZert certification office of the German Cancer Society (DKG).

15 The Breast Center I at the WTZ received certification for the first time by Ärztekammer Westfalen-Lippe (ÄKZert).

21 The "1st Essen Oncology Nursing Symposium" was held at Essen University Hospital and attended by 140 trained nurses from all over Germany.

STAFF NEWS AND EVENTS



02 Scientists at TU Dortmund University, of the German Cancer Consortium at the Medical Faculty of the University of Duisburg-Essen, of the West German Cancer Center Essen at the Essen University Hospital, and at Ruhr-Uni Bochum, elucidated the mechanism of action of borussertib, a novel inhibitor of pancreatic cancer.

05 The WTZ hosted the “7th Symposium on Palliative Medicine” of the palliative care working group from the Network of Interdisciplinary Oncology Centers of Excellence with 70 attendees from palliative medicine, hospice and social work, psychooncology, and nursing, as well as oncology patients and their families.

10 WTZ ImmunoOncology Day was held, an interdisciplinary case-based continuing medical education event covering current trends in immunotherapy for cancer, focusing on gastrointestinal oncology, thoracic oncology, uro-oncology, dermatology and biomarkers.

23 WTZ experts delivered information on various types of cancer during our patient information day on sarcoma and GIST, held at the Teaching & Learning Center of Essen University Hospital.

24 For our Sarcoma Tour, 269 participants rode their bikes around Lake Baldeney in Essen to raise funds for charity.



MARCH

APRIL

MAY

JUNE

JULY

AUGUST

27 The Sarcoma Center at the WTZ was certified by OnkoZert on behalf of the German Cancer Society (DKG).

17 Prof. Dr. James Nagarajah was awarded a prize for his research on the treatment of RAIR thyroid carcinomas by the Klüh Foundation for the Promotion of Innovation in Science and Research.

29 The West German Biobank Essen (WBE) became a partner of the German Biobank Alliance (GBA) to jointly provide biological samples for medical research to accelerate the development of new therapies.



27 A new digital positron emission tomography/computed tomography (PET/CT) scanner was set up at the West German Proton Therapy Center Essen (WPE). The state-of-the-art PET/CT system Biograph Vision delivers more precise images in a quarter of the time required by traditional PET/CT scanners. The scanner will be jointly operated by the Department of Nuclear Medicine (NUK) and the Institute of Diagnostic and Interventional Radiology and Neuroradiology (RAD).

25 The Summer School in Molecular Pathology of the Federal Association of German Pathologists was held from August 25–30 and attracted early-career pathologists from all over Germany. Participants studied real-world cases to learn when to use molecular tests and how to interpret their results.

28 The 2nd Day of Oncology Nursing was held at the WTZ for employees of the Essen University Hospital.

STAFF NEWS AND EVENTS

21 An international symposium on T cells and T cell lymphomas with high-caliber experts, headed by Prof. Dr. Ralf Küppers, was held in Essen in conjunction with the DFG research group FOR 1961 on Mature T Cell Lymphomas / Mechanisms of Perturbed Clonal T Cell Homeostasis.

13 The 1,000th child was treated at the West German Proton Therapy Center Essen (WPE).

SEPTEMBER

21 PD Dr. Wolfgang Fendler of the Department of Nuclear Medicine was awarded the research and innovation prize in urological oncology.

04 Essen University Hospital and the Medical Faculty of the University of Duisburg-Essen founded the Institute for Developmental Cancer Therapeutics.

14 Early-stage malignant melanomas respond well to treatment, as long as the cancer has not become metastatic. In a retrospective study, a research team from the Medical Faculty of the University of Duisburg-Essen and from Essen University Hospital found that female patients with lung metastases that are less than 2 cm in diameter benefit the most from surgical treatment of lung metastases.

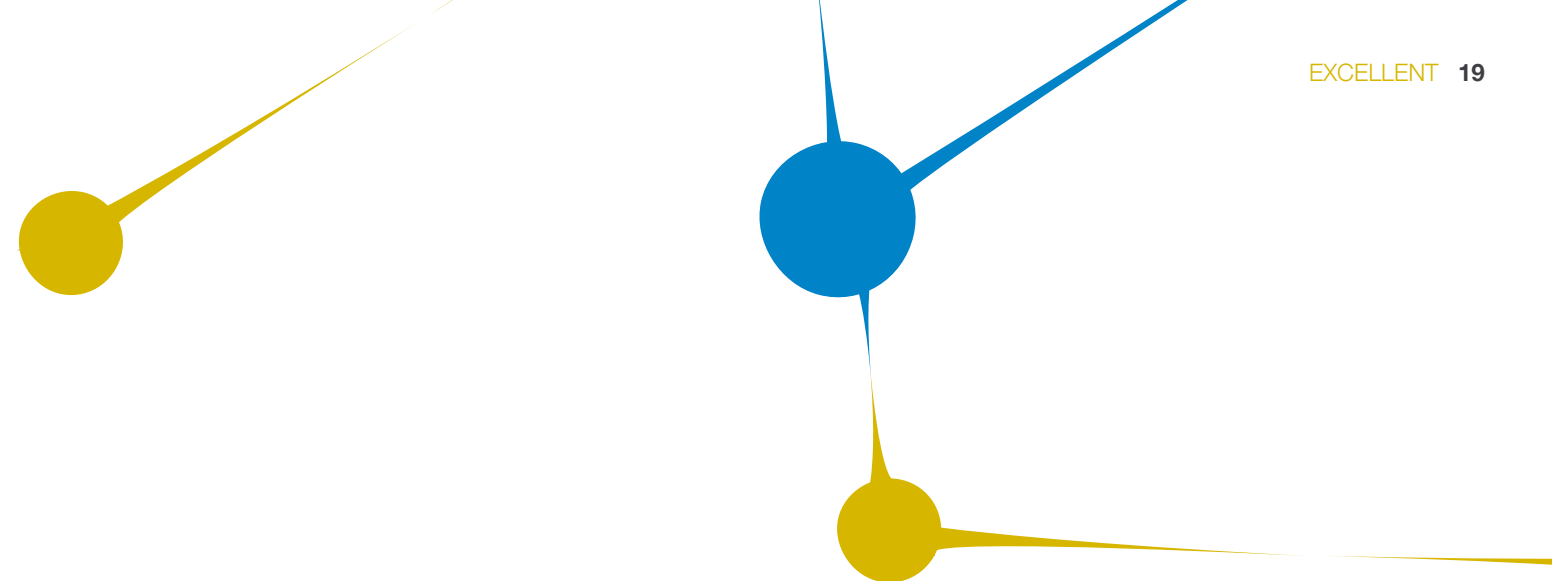
15 Essen University Hospital and Münster University Hospital signed a cooperation contract.

OCTOBER



15/16 During a visit from delegates from Kazakhstan, a memorandum on a future collaboration in establishing a cancer center in Astana, Kazakhstan, was signed.

15 A team of researchers from the University of Duisburg-Essen was able to demonstrate, for the first time, a cancer-promoting effect of neutrophil granulocytes.



14 The magazine "Laborjournal" named Prof. Dr. Dirk Schadendorf, Prof. Dr. C. Jürgen Becken, and Antje Sucker as very frequently quoted authors in its publication analysis in the field of skin research for the years 2008 to 2017.

14 A BD cell sorter was set up at the Institute of Cell Biology of the University of Duisburg-Essen with support from the DFG (German Research Foundation).

NOVEMBER



DECEMBER

13 Oncology and cardiovascular medicine at Essen University Hospital were ranked as excellent at the national level and place highly in an international comparison by U.S. News Best Global Universities Ranking.

23 The European Neuroendocrine Tumor Society (ENETS) Center of Excellence at the Essen University Hospital was recertified and praised by endocrinologist and auditor-in-chief Prof. Dr. h. c. Steven Lamberts, who stated that its work set a great example for other ENETS centers.



CANCER IS ALSO A BURDEN ON THE SOUL: PSYCHO-ONCOLOGY MAY PROVIDE RELIEF

A professional attitude, expert knowledge, and reliability – those are the expectations Marie-Christin has for her psychological care at the WTZ. She is a breast cancer survivor and praises her therapist: “She addresses my personal needs in exactly the way that works for me.”

“When cancer occurs, it brings mental and psychological burdens not only for patients but also for their families,” said Prof. Dr. Martin Teufel, Director of the Department of Psychosomatic Medicine and Psychotherapy/Psycho-oncology. “These may include fears, desperation, and anxiety, but also fatigue and depression.”

“We support patients with cancer in coping with their new reality on their own terms.”

Prof. Dr. Martin Teufel

As part of the interdisciplinary treatment programs at the WTZ, the Department of Psycho-oncology provides patients with psychotherapeutic help in many forms, ranging from short-term therapies to couples’ counseling, mindfulness coaching, and art therapy.

All these programs are tailored to the individual’s needs because everyone reacts differently to their disease. “I don’t want sympathy. That just

doesn’t do it for me,” said patient Marie-Christin. When she met with a psycho-oncologist for the very first time, immediately after her first lymph node surgery, right after she had learned of her diagnosis, she was not open to counseling yet. Too much was going on that was distracting her. “They wanted to help me and introduced me to the psycho-oncology service and offered counseling, but for me, the timing wasn’t right.” But the initial contact had been established, and once Marie-Christin completed her tumor treatment and the subsequent rehabilitation, she found Dr. Mingo Beckmann, head of the psycho-oncological services at the WTZ.

Now she schedules sessions with her whenever she needs them. “All in all, I am fine. But I have become a much more emotional person, and that includes worrying more,” said the 37-year old, who continues to work in her job and is very ambitious. “Dr. Beckmann, with all her professional skills, has been able to explain to me that these changes are normal given my situation. Another thing that is almost as important to me is that we are able to laugh together.”

MULTI-LEVEL SUPPORT

A cancer diagnosis is often a major turning point in not only the patient's life, but also in the lives of their family and friends, drastically disrupting their everyday activities, as cancer comes with many consequences. We counsel and support patients and their loved ones so they do not have to face these consequences on their own. Multiple services are available to help them deal with the mental and practical challenges a malignancy poses. In doing so, we tailor our offerings to the individual needs, which differ from patient to patient. Addressing mental health issues, providing social support, and spiritual counseling are the three main components that can support healing and may increase the quality of life for those affected by cancer. We ensure continuous human support, which is likely one of the most important components in the fight against cancer.



Contact persons and information for these services

Psycho-oncological counseling and treatment

For many patients, cancer will bring psychosomatic complaints along with physical discomfort. If that happens, it is important to activate the own coping mechanisms as efficiently as possible. The purpose of psycho-oncological counseling and treatment is to reduce the psychological burden for patients and their loved ones.

Social services

Social services will support patients and their families in all matters related to the disease and its treatment. Together, they will look for the necessary assistance in a given personal situation. Social services offer individualized counseling on various topics.

Physiotherapy

Physiotherapy treatments can support cancer patients with targeted exercises in gaining or maintaining a higher quality of life. Exercises aim to improve endurance, strength, and coordination. Specially trained therapists will assess the initial situation and offer ongoing treatments.

Palliative medicine

The WTZ offers palliative counseling, examinations, and treatments on an outpa-

tient basis. Patients are supported by a team of palliative medicine experts, palliative nurses, psychologists, social workers, and hospice service providers.

Outpatient hospice services

Trained hospice care providers offer individual support to patients. Their focus is on making the final phase of life as comfortable as possible in the patient's familiar surroundings. Qualified volunteers and full-time care providers are available to assist patients during this time.

Hospital pastoral services

During a hospital stay, many patients find themselves doubting their religious beliefs. Hospital pastoral services that include personal visits on the ward as well as services in the chapel are available to address these doubts while respecting a patient's individual spiritual needs and desires.

Oncology nursing

The new multimodal therapies for the treatment of cancer require interdisciplinary collaboration and highly specialized knowledge of everything involved. Specialized oncology nurses provide counseling and training in relation to oncology nursing care to patients and their families. They support them with advice on how to cope best with the disease and its consequences.

Family care services

After a patient has been discharged, our family care services are available for support. They can train families and care givers in nursing routines, helping them overcome any fears and insecurities related to caring for the patient. They also refer patients and families to care networks and support groups.

Support groups

Cancer patients often seek support from other people living with cancer to share their experience and feel understood. Support groups allow them to meet others who are going through similar challenges and to get helpful tips for dealing with everyday issues.

Diet and nutrition planning

Diet and nutrition planning provides patients with counseling and advice on all questions related to their nutrition, taking into account their specific disease, current treatment, and personal issues.

ONKO X: PHYSICAL EXERCISE FOR ONCOLOGY PATIENTS

It is particularly important for patients undergoing oncological treatments to avoid physical decline. Targeted exercise therapies may help with this. onko x is a new program at the WTZ, offered jointly with fitness chain FitX and class x.



Physicians, physiotherapists, and coaches worked together to develop a gentle exercise program that can be customized to fit any patient's physical abilities. This allows everyone to participate, no matter which type of cancer they have. onko x was developed by taking important medical information into account and provides significant value for patients. It consists of 60-minute units with aerobic, balancing, and stepping exercises. They provide a welcome physical counterpart to everyday life in the hospital. What makes this program special is the fact that it is tailored specifically to fit the participants' needs and that it is offered in convenient locations near their homes. The coaches teaching these classes have been specifically trained in this program and know how to prevent anyone

from overexerting themselves in class. Patients who wish to participate need to be cleared by their doctor before they can join.

A 12-week pilot project was a great success, with men and women with different cancers participating. Because of the COVID-19 pandemic, an online class is in preparation. More information will be available soon at www.wtz-essen.de

THE AYA WARD: HOLISTIC THERAPY FOR YOUNG CANCER PATIENTS

Receiving a diagnosis of cancer is devastating for anyone, but in adolescents and young adults it may trigger particularly profound crises. In the opinion of Prof. Dr. Uta Dirksen, head of the pediatric sarcoma focus group at the WTZ Essen and Vice Director of its Department of Pediatrics III, this is true in particular for patients with bone sarcomas and certain soft-tissue sarcomas. "These rare tumors mostly affect young people, drastically changing their lives," she said.

Depending on how far the disease has progressed when it is first diagnosed, there is often only a slim chance of being cured. And even when their prognosis is good, young people will, in many cases, have to live with prominent scars or artificial joints for the rest of their lives. Young men are often at risk of becoming sterile.

An additional consideration is the length of therapy: it takes about a year, which means that any plans the young patients had for their lives or careers will be upended. They will often find that after such a long break it is not easy or even possible to simply continue on their chosen educational path. "I have often seen young people who never managed to return to a situation that would allow them to seek employment, forcing them to apply for disability benefits early in their lives," said Dirksen about the non-medical side effects of the disease.



For all of these reasons, the WTZ will offer a new ward for young sarcoma patients beginning in 2020: its Adolescents and Young Adults (AYA) ward.

The AYA ward will have six to eight beds for inpatient chemotherapy treatments that the patients have to undergo before and after their surgeries. To receive these treatments, they will come to hospital for a few days a time every two to three weeks, for a treatment period of several months in total.

A number of supportive measures will be made available on the AYA ward in addition to the medical treatment that is provided as part of the WTZ's treatment program "bone

and soft tissue tumors (sarcomas).” These measures are specifically targeted towards young patients in order for them to receive a holistic treatment. “These are measures designed to help young patients develop strategies for coping with their crisis,” as Dirksen explained. In her opinion, sharing experiences and ideas with peers who find themselves in a similar situation may also improve a patient’s personal coping mechanisms. “Another hope we have is that these measures will promote treatment adherence in patients,” Dirksen added. Sticking to the treatment goals formulated by physicians and patients together is a top priority on the ward.

In order to ensure that the new ward would match the expectations and needs of young patients, their input was sought in a co-creation workshop. The results: Flat-screen monitors and free Internet access in all the rooms that let patients video chat with their friends; virtual-reality relaxation programs, and a common room that looks more like a lounge than just another hospital space and that fits the patients’ lifestyles more than a traditional hospital would. Talk therapy, exercise sessions such as weight lifting, physiotherapy, and non-traditional activities such as body painting are available on an individual basis. “We want to help our patients reconnect with their bodies because the disease often impacts how they feel about their physical selves,” explained the oncologist.

Not only is the AYA ward unusual in its look and feel and what it can offer patients, it also relies on unusual sources



of funding. The Essen University Hospital Foundation (Stiftung Universitätsmedizin Essen) actively raises funds for any projects that go beyond what is strictly necessary from a medical point of view. The foundation has been asking for donations for the ward since 2019. “Within only a few months our donors have already given a six-figure sum,” Prof. Dr. Karl-Heinz Jöckel, the chairman of the foundation’s board, reported. “We are extremely grateful for their commitment,” he added, as this amount has not only made it possible to equip the ward with electronics and the cozy lounge, but also pays for the running costs of special treatment measures all throughout 2020. Which makes one thing obvious: the AYA ward will continue to rely on funding pro-

“We want to help young patients in crisis to improve their physical well-being through exercise, body painting, and other physical activities.”

Prof. Dr. Dirksen



vided by the foundation. “We hope that our donors will continue to support us,” said Dirksen. AYA wards have become well established in the UK, in France, and in the US, but they are still fairly new in Germany. The only other similar project currently exists in Halle, Saxony-Anhalt. This novel approach means that physicians and nurses at WTZ Essen need to attend continuing medical education to prepare them for new tasks. “We are in touch with the University College of London and hope that we will be able to send some of our staff to London for this purpose,” said Dirksen.

TOGETHER WE ACHIEVE MORE – DONATIONS AT WORK

Everyone can contribute to cancer research. One way to help is via the Essen University Hospital foundation (Stiftung Universitätsmedizin Essen). The money it raises from donors helps fund important projects for improving cancer diagnostics and treatment. But that's not all. The charitable foundation provides funding for projects in all areas of academic medicine, including research, patient care, and teaching. "One way we do this is by accepting donations from former patients or their families and then providing the money to the WTZ for specific projects," explained Prof. Dr. Karl-Heinz Jöckel, chairman of the board of the foundation, which was established in 2006. Another one of the foundation's goals is to further enhance oncological patient care. It funds projects that are not covered by basic health insurance funds.

Thanks to its many donors, the foundation can look back on a number of successes. It has made it possible to upgrade technical equipment at the WTZ and to initiate new research projects. Donations collected at its numerous charity events also go towards research funding. One example is the annual Sarcoma Tour, an event in which participants ride their bikes around Lake Baldeney in Essen. The 2019 tour alone raised roughly 60,000 euros for sarcoma research. The Sarcoma tour is a joint project by the WTZ and the charity Das Lebenshaus e.V. and there are other projects to support cancer patients in various ways.

ART THERAPY, HOSPITAL CLOWNS, AND THERAPY DOGS PROVIDE DIS- TRACTIONS

Art therapy for children has been offered since 2010. It allows these young patients to deal with their emotions through painting and gives them an opportunity to discuss their experiences with peers or trained art therapists. Hospital clowns serve a similar purpose: they visit children and adolescents in their hospital rooms and make them smile by performing tricks for them, while lending a trained ear or offering empathic comfort. These activities benefit from donations that pay for art supplies and training sessions for the staff. Therapy dog Hannibal is another donation-funded "project". Hannibal regularly comes to visit with younger patients in the hospital. With some of them, he even plays games to help with their dexterity and coordination. As Prof. Dr. Jöckel recalls, the idea of bringing Hannibal, a trained therapy dog, to the clinic arose while working with pediatric patients. A pediatric oncology team is supervising and evaluating the project. The black Labrador Retriever has unusual skills: he senses the needs of the sick chil-

dren and responds to them empathetically. The dog's attention not only distracts them from their daily hospital experiences but also helps them relax. Even children who are too weak to play with Hannibal while they are on chemotherapy often benefit from the presence of the smart and friendly therapy dog.

According to Jöckel, all of the foundation-funded projects come with personal success stories: "It's wonderful to see how the donors' support makes a difference when we get positive feedback from patients. It makes our work meaningful."

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THE CLINICIAN SCIENTIST PROGRAM

Early-career support for medical researchers

Translational research is at the heart of the WTZ's scientific activities and is also the main focus of the early-career support system at this oncological center of excellence. The numerous research and treatment programs offered by various departments of the WTZ provide ample opportunity for young clinician scientists to conduct research while practicing medicine at the hospital.

Financial support for this research comes, for example, from the institution's internal IFORES program that pools funds from the different departments, clinics, and the Medical Faculty to which the WTZ belongs, and then allocates them to specific projects and researchers.

In 2018 the Medical Faculty also established the Universitätsmedizin Essen Clinician Scientist Academy (UMEA) with support from the DFG (German Research Foundation). Every year, UMEA enables 14 physicians, who are interested in research, to enhance their scientific qualifications while receiving their clinical training. They are relieved of 50 percent of their clinical duties to free up time for research, and are required to attend a qualification program.

Multidisciplinary research in three cross-sectional fields forms the core of UMEA. One of these fields is onco-immunology.

“Every year, UMEA enables 14 physicians who are interested in research, to enhance their scientific qualifications.”

Dr. Sied Kebir

Onco-immunology addresses one of the main issues of current tumor research at the WTZ, namely the interactions between cancer cells and the immune system.

The main focus is how these interactions will affect immuno-oncological treatments – will they enhance treatment efficiency or could they cause resistance?

One of the researchers seeking to answer this question is Dr. Johanna Falkenhorst. A junior doctor at the Department of Internal Medicine, Falkenhorst has been a member of the translational sarcoma research group since she obtained her doctoral degree. In a collaborative project with the molecular tumor immunology group of the Department of Dermatology, she is currently studying the interactions of tumor and defense cells in gastrointestinal stroma tumors. She began her work as a clinician scientist in October 2019 and is continuing her residency training as well.



“Being a clinician scientist allows me to combine research and clinical practice in a way that I would like to continue throughout my professional future,” said Falkenhorst. “Our scientific findings help us understand tumors better, resulting in better medical care for our patients.”

According to Falkenhorst, the UMEA's biggest benefit is that junior clinician researchers are mentored both by scientists and clinicians and are offered flexible hours in the lab. Clinician scientists and department heads make decisions together on how many days per week should be dedicated to research activities.

Awards for clinician scientists

Dr. Sied Kebir is a good example of the ways in which working as a clinician scientist can promote a career in science. While doing his neurology specialization at the Department of Neurology, he also spent one year as a clinician scientist working on a project on glioblastomas in translational neuro-oncology (mentored by Prof. Dr. Martin Glas and Prof. Dr. Björn Scheffler, www.translationale-neuroonkologie.org). In December 2019, he won the Top Young Science Best Paper Award from the Medical Faculty for the publication of his research results.



ROBOT-ASSISTED SURGERY

Robotic surgery originated in the 1980s with a project by the California-based research institute SRI International, which led to the establishment of Intuitive Surgical, Inc., the corporation that developed the Da Vinci surgical system. In 1997, SRI International went public and later merged with its competitor Computer Motion, Inc. At the WTZ Essen, robotics-assisted surgery has been practiced since 2010.

The Da Vinci system is not a robot that replaces the surgeon. Rather, it is a four-armed remote manipulator that performs surgeon-directed motions with maximum precision inside the patient's body. The system is used for minimally invasive procedures that the surgeon controls from a console, while a second surgeon may participate in the procedure from a second console. The system is equipped with 3-D imaging, autonomous camera and instrument controls, seven degrees of freedom for instrument maneuvers, infrared lasers with a detection system, and connections for image and data transfers. It adds a digital dimension to surgeries that not only opens up new possibilities in precision surgery, but also in telemedicine and other fields.

Intuitive Surgical Inc.'s monopoly in the field is currently being challenged by the introduction of new robotic systems by compa-

nies such as Medtronic, Cambridge Medical Robotics, Tita Medical, Verb Surgical, and Transenterix. Their competition will lead to even more possibilities, accelerate system developments, and lower prices. These developments will lead to a rapid adoption of robot-assisted surgeries in all major surgical centers, which will make robotic surgery the new standard for a number of surgical procedures.

While originally most robot-assisted procedures worldwide were performed in gynecology, in recent years general surgery has outpaced both gynecological and urological operations.

Robotics in gynecological oncology

In Germany, one of the pioneering centers in robotics-assisted surgery is the Department of Gynecology at the Essen University Hospital headed by Prof. Dr. Rainer Kimmig. It is the center that has performed the highest number of robotics-assisted gynecological procedures across the German-speaking countries. The department has also been the source of many scientific articles, book chapters, and presentations. Currently, Kimmig also serves as president of the Society of European Robotic Gynecological Surgery (SERGS).

At the WTZ, gynecological oncology is using robotics-assisted surgery in groundbreaking ways to perform compartment-oriented lymph node dissections as part of its “gynecological tumors” treatment program. Compartment is the term used to describe the tissue that ontologically is associated with a given organ system. Modern surgical methods aim to remove these at-risk tissues completely while sparing the surrounding structures.

From a therapeutic viewpoint, this approach provides an alternative both to the purely diagnostic removal of so-called sentinel lymph nodes and to the systematic, complete removal of lymph nodes located in the pelvic region and near the aorta. In publications in international journals, Kimmig has presented this method as an alternative approach, associated with much lower morbidity, for treating endometrial cancers as well as early-stage ovarian cancer.

Robotics-assisted surgery also allows minimally invasive procedures in challenging situations like complex operations due to patients with comorbidities or a high body-mass index. For the treatment of endometrial cancers, minimally invasive surgical approaches have already become well-established, and they are more frequently being used to treat early-stage

ovarian cancer as well. Minimally invasive techniques are well suited for the exploration and, if necessary, the removal of recurrent disease.

There is no doubt that minimally invasive procedures are associated with lower rates of morbidity and mortality than open surgeries, on which basis open surgery should be a thing of the past by now.

Studies have shown that for endometrial cancers, minimally invasive operations are associated with lower rates. A recent Danish population-based study even shows a significantly higher overall survival rate among minimally invasively treated patients, and this benefit was the greatest in the group that had robotics-assisted surgery.

For cervical cancer, it has been assumed until recently that minimally invasive surgery yielded similar outcomes as open surgery. So far, this belief has only been challenged by a single prospective randomized study, the LACC study. A prospective randomized study tests a pre-formulated hypothesis by randomly assigning the participant to different treatment groups. According to the LACC study, in the case of early-stage cervical cancer, open surgery is associated with a survival rate that is up to five percent higher than that associated with minimally invasive surgery. Older data collected based on national cohorts of patients that have been published since seem to show a similar effect. On the other hand, two large population-based studies from Sweden and Denmark did not show any disadvantages of the minimally invasive approach. To shed more light on this situation, new prospective randomized studies will be needed.

Robotics in ENT medicine

In modern head and neck surgery, one of the most important tasks is the clinical application of endoscopic robotic systems as well as the research needed to advance this technology. Headed by Prof. Dr. Stephan Lang, the Department of Ear, Nose, and Throat (ENT) medicine of the Essen University Hospital is one of the leading institutions in this field worldwide. Studies conducted at the institute and as part of a European multicenter study have shown this technology to be safe and effective. The robotics program at the ENT Department is headed by the department's deputy director, Prof. Dr. Stefan Mattheis, who has been offered a position of W2 professor of robotics at the Medical Faculty of the University of Duisburg-Essen.

A newly constructed innovative surgery center at the ENT Department of Essen University Hospital will utilize the most advanced developments in medical technology. “In addition, we are also integrating robotics, big data, machine learning, and artificial intelligence in our practices,” said Mattheis. At the national level, the Department collaborates with partners such as Prof. Dr. Ing. Andrés Kecskeméthy, professor of mechanics and robotics at the University of Duisburg-Essen, and at the international level with the University of Pittsburgh Cancer Institute, to name but one.

Robotics in thoracic surgery

The Department of Thoracic Surgery at the Ruhrlandklinik of the Medical Faculty of the Essen University has been working with the Da Vinci surgical system since 2014. “Robotics-assisted surgery is the newest addition to a growing range of minimally invasive methods,” explained Prof. Dr. Clemens Aigner, director of the department. “It comes with benefits such as high-resolution 3-D imaging with six-fold optical magnification and a wide range of motion of the instruments.”

For the treatment of early-stage thymus tumors, robotics-assisted surgery has become the standard of care. Other major indications for which it can be used include tumors of the mediastinal pleura, the treatment of myasthenia, anatomical lung resections, diaphragm surgery, esophageal surgery, and localized tumors of the costal pleura.



At the Ruhrlandklinik, the experts of the German Cancer Society (DKG)-certified lung cancer center (LWTZ) collaborate with specialists from the Department of



Internal Medicine (Tumor Research), the Department of Pulmonology, the Department of Radiotherapy, the Institute of Pathology, and the Institute of Diagnostic and Interventional Radiology and Neuroradiology in the WTZ's multidisciplinary treatment program for pulmonary and thoracic tumors. Their joint purpose is the delivery of high-quality innovative diagnostic and therapeutic approaches in the treatment of tumors of the chest.

According to Aigner, this will include “robotic systems that provide an ideal platform for the use of future technological enhancements such as bioluminescence and augmented-reality applications.”

Robotics in urology

In the uro-oncological treatment program for tumors of the urinary tract and reproductive organs at the WTZ, robotics-assisted surgical procedures have become the standard of care for localized tumors of the prostate and kidneys. Advantages of robotics-assisted surgery include less blood loss and a faster return to everyday life for patients. With the Da Vinci Xi system that is used in Essen, two surgeons can look at a three-dimensional image of the surgical field simultaneously. They can magnify this image as well as overlay it with live ultrasound images, which allows them to resect tumors precisely while sparing the surrounding healthy tissues. In partial resections of the kidney, the system also allows the use of fluorescent dyes to visualize the organ's perfusion.

Robotics in visceral surgery

At the Department of General, Visceral, and Transplant Surgery of the Essen University Hospital, the state-of-the-art Da Vinci Xi system is used for many complicated surgical procedures, including sphincter-sparing rectal surgeries, liver operations, procedures involving the stomach or the esophagus, and living donor operation (of the liver or kidneys). These procedures are performed with high precision and require only a few small incisions, allowing for easier recoveries for the patients.

The system's camera not only provides a high-resolution three-dimensional image, it also allows the surgeon to magnify this view up to ten-fold. This is helpful in particular for a precise visualization of vessels, nerves, and surrounding structures. Minimally invasive surgeries have been shown to be associated with less pain and faster patient recovery.

The department is part of the West-German Cancer Center (WTZ), where patients are treated for tumors of the esophagus, stomach, intestine, liver, bile ducts, and pancreas. The WTZ treatment program for gastrointestinal tumors brings together experts in internal medicine, oncology, gastroenterology, visceral surgery, radiation therapy, pathology, radiology, and nuclear medicine.

WTZ promotes the development of innovative methods

Complex surgeries, tiny incisions: these are the hallmarks of robotics-assisted surgery. Minimally invasive procedures using the Da Vinci surgical system come with obvious advantages for patients: less pain, less blood loss, shorter hospitalization, faster return to daily routines, all while providing similar or potentially better clinical outcomes than other surgical approaches. The Department of Gynecology at the Essen University Hospital was the first department to routinely use the Da Vinci system for surgeries as early as 2010. In 2014, a second system was installed at the Department of Thoracic Surgery at the Ruhrland-klinik, the West German Lung Center of the Essen University Hospital.

The oncological surgical departments at the West German Cancer Center Essen (WTZ) continue to drive the research-based further development of robotics-assisted surgery. They do so in joint projects with partners such as other member sites of the German Cancer Consortium (DKTK).

The combined use of modern imaging, molecular genetic analyses, excellent pathological services, and so much more forms the basis that enables precise surgical procedures on the brain, head, and neck, as well as thoracic and abdominal surgeries. Patients at the WTZ benefit because the experts from various disciplines are present on-site and collaborate in multidisciplinary treatment programs to achieve the best possible outcomes.

Joint research efforts: four examples

The following pages are dedicated to four areas of research in which WTZ Essen specialists are working hard to take robotics-assisted precision surgery even further:

- A project studying intraoperative imaging using PSMA tracers with involvement of urology and nuclear medicine specialists.
- Research and clinical practice in gynecological oncology focusing on tissue-targeting in robotics-assisted precision surgery as well as ontogenetic cancer field surgery.
- A planned addition to the high-tech equipment of the Department of Neurosurgery: a robotic X-ray unit funded by the DFG (German Research Foundation) that will enable intraoperative X-ray imaging.
- The innovative methods for the surgical treatment of head and neck tumors developed by the Department of ENT Medicine at the West German Cancer Center Essen.



DKTK & DFG joint research project in urology and nuclear medicine

The purpose of our joint research project involving the DKTK (German Cancer Consortium) and the DFG (German Research Foundation) is to evaluate the feasibility and precision of novel imaging techniques in prostate surgeries.

Positron emission tomography (PET) using ligands of the prostate-specific membrane antigen (PSMA) has recently become established as routine diagnostic procedure for detecting metastatic cancer during primary staging and/or recurrences in prostate cancer patients.

Radical prostatectomy is a procedure that aims to completely remove prostate tumors while preserving continence and sexual potency as much as possible. Intraoperative radioguidance helps the surgeon to better distinguish positive surgical margins and lymph node metastases, increasing surgical precision and improving oncological outcomes.

This joint research project will study intraoperative molecular imaging using PSMA tracers, both in vitro in 3-D printed prostate models and in clinical studies that will combine data from imaging and pathology.

“Imaging-guided minimally invasive surgeries are integral to urology and will become even more frequent in the future thanks to the advances we are seeing in radiology, nuclear medicine, and computer science.”

*Prof. Dr. Boris Hadaschik,
Director of the Department of Urology*

Ontogenetic cancer field surgery

As part of the WTZ's "gynecological tumors" treatment program, the team surrounding Prof. Dr. Rainer Kimmig, Director of the Department of Gynecology at the Essen University Hospital, performs surgeries based on the latest research findings regarding the mechanisms of tumor spreading. Their approach is known as ontogenetic cancer field surgery and is based on long-term studies conducted at Leipzig University Hospital. Over many years, those studies have shown that malignant tumors of the cervix, the vagina, and the vulva do not spread to the surrounding tissues in unpredictable ways as had long been believed. Instead, they infiltrate precise, anatomically defined areas of tissues. These so-called cancer fields depend on the early embryologic development, also called the ontogenetic history, of the tissue from which the tumor arises.

By determining the ontogenetically programmed area to which a given tumor will spread, surgeons are able to completely remove malignancies and associated metastases in the lymph nodes. As Kimmig explains: "Compared to conventional treatment with adjunct radiotherapy, cancer field surgery without adjunct radiotherapy will improve five-year survival for cervical and vulva carcinomas by 10 to 30 percent while cutting in half treatment-associated mortality."

"At the Department of Gynecology and the WTZ, we are currently establishing a center for cancer field surgery in gynecological oncology as a joint venture with Prof. Michael Höckel, Director of the Leipzig School of Radical Pelvic Surgery," said Kimmig. The center will be fully operational by the end of 2020, but important steps have been completed in 2019 as well:

- The instruments and devices required for cancer field surgical treatments of carcinomas of the lower female genital tract were procured and installed.
- A prospective clinical study of the treatment of vulvar carcinomas using vulvar field resection and the therapeutic surgical removal of lymph nodes was presented to and ruled on by the Essen University Hospital ethics committee.
- A concept for collecting and analyzing data on the clinical management of vulvar carcinomas under study conditions was developed.
- Physicians at the Department of Gynecology were instructed in ontogenetic cancer field theory and ontogenetic vulvar anatomy. They also learned about the surgical techniques of vulvar field resection, anatomical reconstruction, and therapeutic lymph node resection.
- A clinic was set up where patients with vulvar carcinomas can be first seen and followed up with.
- Information about the basics of cancer field surgery and its application in the treatment of vulvar carcinomas was added to the website of the Department of Gynecology.

Within the context of the joint project involving the Essen and Leipzig University Hospitals, the techniques for compartment-oriented surgical treatments of endometrial and cervical cancers as introduced by Prof. Dr. Kimmig several years ago will continue to be refined.

Precision surgery of the brain

Via the neuro-oncological treatment program at the WTZ, brain tumor patients benefit from the latest drug treatments, state-of-the-art radiation therapy, and robotics-assisted precision surgery.

At the Department of Neurosurgery and Spinal Surgery, headed by Prof. Dr. Ulrich Sure, the high-tech equipment of the four operating rooms features computer-assisted neuronavigation methods. Neuronavigation is a technology in which a computer compares intraoperative stereo infrared images with previously obtained 3-D MRI images. "Positions are then calculated via triangulation, using a similar technique as the one the navigation system in your car relies on — but at a precision of fractions of a millimeter," explained PD Dr. Karsten Wrede, deputy director of the department.

In addition to its existing ultrasound scanner, the neurosurgical department will soon be equipped with a robotic X-ray unit for intraoperative imaging. "A computer directs the unit automatically to specific preprogrammed positions, which allows us to obtain new images from exactly the same viewpoints during different phases of the surgery," said Wrede. This technology allows surgeons to see changes in the anatomy of the brain (known as brain shift) that are caused when tissue is removed.



Function-sparing precision surgery of the head and neck

One of the major applications of precision ENT surgery is the surgical cancer therapy offered as part of the WTZ treatment program "head and neck tumors," which is tailored specifically for each individual patient. Gentle, function-sparing surgical procedures are made possible by innovative methods such as robotics-assisted surgery, minimally invasive procedures, and the latest laser technology.

Prof. Dr. Stephan Lang is the Director of the Department of Ear, Nose, and Throat Medicine at the Essen University Hospital and also serves as the head of the WTZ Center for Head and Neck Tumors, which has been a German Cancer Society (DKG)-certified center since 2014. As part of the Comprehensive Cancer Center (CCC), it offers innovative top-quality diagnostics and treatment of ENT tumors.

Transoral robotics-assisted surgery (TORS) is gaining more and more importance in the surgical treatment of head and neck tumors. The Department of ENT Medicine in Essen is a worldwide leader in flexible transoral robotic surgery using the Flex Robotic System. In many cases, this endoscopy system, in combination with a range of flexible instruments, allows surgeons to remove tumors from the throat and larynx using minimally invasive laser techniques while preserving complex functions such as speaking and swallowing.

NEURO-ONCOLOGY: INNOVATIVE TARGETED TREATMENTS OF BRAIN TUMORS

The WTZ network of specialists brings top-notch expertise to the Center of Neuro-oncology of the Essen University Hospital. The center is jointly headed by Prof. Dr. Martin Glas (Department of Neurology with a focus on clinical neuro-oncology), Prof. Dr. Björn Scheffler (translational oncology with a focus on neuro-oncology), and Prof. Dr. Ulrich Sure (Department of Neurosurgery and Spinal Surgery), and combines clinical experience with translational lab research.

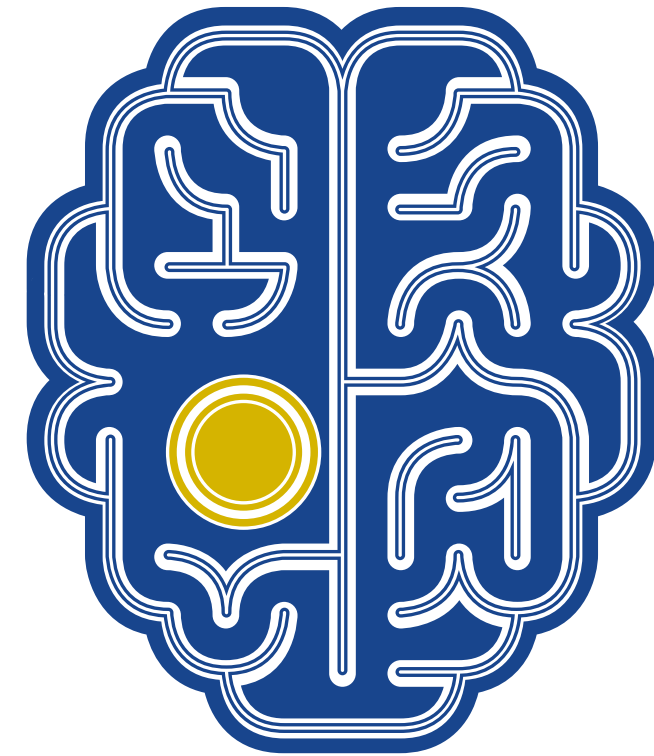
“Here, science and clinical practice go hand in hand.”

Prof. Dr. Martin Glas, head of the neuro-oncology division of the Department of Neurology

The WTZ treatment program “neuro-oncology” serves patients with benign and malignant tumors of the brain and the spinal cord, and with metastatic brain cancer from other primary tumors. Patients benefit from top-level medical care and the multidisciplinary expertise of the WTZ. Prof. Dr. Glas: “Our specialists closely collaborate to meet every possible requirement.”

These specialists include not only those from the division of clinical neuro-oncology of the Department of Neurology, but also those from one of the largest neuro-surgical departments in all of Germany. The department houses four operating rooms equipped with the latest surgical microscopes that allow fluorescent tumor imaging, with units for permanent neurophysiological monitoring, and with an intraoperative ultrasound device.

Patients with brain tumors benefit from the latest in diagnostics and treatment thanks to the interdisciplinary collaboration with other departments. The division of clinical neuro-oncology of the Department of Neurology (headed by Prof. Dr. Glas) and the department of translational neuro-oncology of the German Cancer Research Center (DKFZ) at the WTZ (headed by Prof. Dr. Scheffler) bridge the gap between clinical practice and basic research. In these departments, clinician scientists and medical scientists work together in the lab to develop modern clinical applications for the treatment of cancer.



Networking for research and therapy

The most recent research results relating to brain tumors are continuously translated into treatment to provide patients with the best possible diagnostic and therapeutic options. What this means for patients: they have access not only to established brain tumor treatments, but also to new treatment and diagnostic strategies that are developed and improved in clinical, scientific, and experimental research projects and individually tailored to suit each patient's needs.

One example is the administration of a novel chemotherapy regime for the treatment of the most malignant brain tumor there is, the glioblastoma. This treatment is suitable for patients with a specific genetic variation. For them, and for the first time in 15 years, the consortium has succeeded in significantly extending the patient's life. Patients of the neuro-oncology center can now also receive this treatment outside of clinical studies.

Another example is the treatment of glioblastoma patients with alternating electrical fields administered by the team around professors Glas, Stuschke, and Scheffler.

For this treatment, the tumor is exposed to rapidly alternating electrical fields via ceramic plates applied to the head. These fields disrupt tumor cell proliferation, and the researchers are currently conducting a clinical study to improve the efficacy of the treatment. At the same time, they are running laboratory studies to help understand the mechanism of action of this therapy better, in the hope of being able to help patients in an even more targeted way.

Another neuro-oncological study at the WTZ also aims to break new medical ground by utilizing the extraordinary tools available here. As the WTZ offers both photon therapy and proton therapy, it is ideally suited for studying the efficacy of these two forms of treatment for hard-to-treat gliomas, and to study their effects on brain performance in the first study of this kind that has ever been conducted in Europe.

The center also participates in national and international research collaborations. The German Cancer Consortium (DKTK) is another neuro-oncological research entity in which the WTZ is involved. Together

with the Heinrich Heine University Düsseldorf and the Düsseldorf University Hospital, the University of Duisburg-Essen and the Essen University Hospital form one of only eight DKTK partner sites in Germany. “The consortium is where leading German University Hospitals combine their clinical and scientific experience to bring basic research findings from the bench to the bedside more quickly,” said Scheffler.

“But no matter how invested we are in science and state-of-the-art therapies, our patients' needs are always at the center of what we do,” added Glas and Sure. The neuro-oncological center offers patients not only tumor-specific treatments, but also psycho-oncological support. The center also explores other options of patient support groups, most recently in close collaboration with the first digital support group.

EXCELLENCE IN NUMBERS

ESSEN UNIVERSITY HOSPITAL

	2018 CCC SITE ESSEN
Number of departments and institutes	29/25
Employees	8,000
Beds	1700
Hospitalized patients	44,006
Outpatients	158,955
Surgery patients	22,403
Oncology inpatients	8,003
Oncology outpatients	20,845

ONCOLOGY

	NUMBER OF PATIENTS 2018 CCC SITE ESSEN
Surgical oncology	3,025
Radio-oncology	3,806
Hemato-oncology	4,215
Medical oncology	17,306
Pediatric oncology	1,486

CANCER PATIENTS

	2018 CCC SITE ESSEN
Newly diagnosed patients	5,659
Total number of cancer patients treated at the center	23,007

CLINICAL STUDIES % OF PATIENTS PARTICIPATING IN CLINICAL STUDIES IN 2018

	Therapeutic (Phase 1 to 3)	Therapeutic & supportive services	All studies
Pediatric neoplasms (<18 y.o.)	63%	72%	426%*
Hemo-lymphoid neoplasms (adults only)	23%	57%	87%
Solid tumors (adults only)	10%	28%	93%

* Number of cancer patients newly included into prospective clinical studies as compared to the number of newly diagnosed patients

EXTERNAL FUNDING

	CCC SITE ESSEN*
Newly approved in 2018	11,128,994.26 million EUR
Total amount available in 2018	14,235,623.60 million EUR

* Only for one CCC consortium

LOCAL FUNDING

Financial support (in EUR)	2018 CCC SITE ESSEN
Federal State of NRW	36 million EUR
University Hospital	1 million EUR (WTZ Essen)
Medical Faculty	800,000 EUR (Biobank)

TUMOR BANK/BIOBANK*

	Tissue samples	FFPE samples	Liquid samples	Living (organoid) samples
CCC Site Essen	3,084	2,115	12,129	252

* Total number of cancer patients with samples stored in the biobank

ONCOLOGY-RELATED BIOBANK REQUESTS

	Number of requests*	Number of approved requests	Number of successfully completed requests
2016	55	53	50
2017	43	43	41
2018	38	38	37

* Irrespective of the type of biological material

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PUBLISHING INFORMATION

Published by:

Essen University Hospital
Westdeutsches Tumorzentrum / West-German Cancer Center Essen (WTZ)
Hufelandstraße 55 | 45147 Essen | Germany

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Editing, graphics, digital imaging, and final artwork:

ENGELMANN & KRYSCHAK
Werbeagentur GmbH | Düsseldorf

Printing:

WOESTE DRUCK + VERLAG GmbH & Co. KG | Essen

Photo credits





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