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EXCELLENCE FOR THE PATIENT'S BENEFIT

Interdisciplinarity is key in tumor research, diagnostics and therapy at the WTZ

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FIRST-CLASS CANCER TREATMENT AND ONCOLOGICAL CARE

Three professions - one team:
Oncologists, specialized care nurses, and palliative care physicians

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IOP - THE IMMUNO-ONCOLOGY PROGRAM AT THE WTZ

Effectively fighting cancer by activating the immune system



WEST GERMAN CANCER CENTER ANNUAL REPORT 2018

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PREFACE



Dr. Stefan Palm,
WTZ Managing Director

Dear Reader,

we are pleased to present the first annual report of the West German Cancer Center (WTZ, Westdeutsches Tumorzentrum). Our eventful history all started with the foundation of the Essen Tumor Clinic (Essener Tumorklinik) in 1967. Since then, cancer medicine has evolved at an unforeseen pace. This rapid progress for the benefit of our cancer patients has also influenced the WTZ, the Tumor Clinic's successor. Founded in 1977, it recently celebrated its 40th anniversary. This special event and other milestones we have achieved are covered in this first annual report. In the fight against cancer, clinical research and medical excellence go hand in hand. The better we manage to combine both aspects, bringing the latest discoveries and treatments from bench to bedside, the more our patients benefit. The WTZ, therefore, is committed to continue its progress in both areas. Examples of the continued expansion of our clinical services include the recruiting of two excellent surgeons for the Sarcoma Center, where we treat rare tissue tumors, and the creation of a support program for young adults with cancer. Another example is our proton therapy center, where we

have treated more than 1,500 patients since the center's inception in 2014. At the same time, we have been expanding our research efforts, establish new professorships, and initiating translational cancer research initiatives, including a pioneering collaboration effort with the Cologne/Bonn Center for Integrated Oncology (CIO, Centrum für Integrierte Onkologie) to found the new Cancer Center Cologne Essen (CCCE). Our achievements success are our best motivators to tackle the many challenges ahead. This annual report is merely a snapshot of our organization, and will hopefully arouse your interest in what lies ahead of us. We hope you will enjoy reading.

WTZ General Manager

TAILORED FIRST-CLASS MEDICAL CARE

Scientific and technical excellence in medicine and personal, patient-centered care are by no means mutually exclusive, as this interview with Medical Director and Chairman of the Board of the University Medicine Essen, Prof. Dr. Jochen A. Werner, and the Director of the West German Cancer Center (WTZ, Westdeutsches Tumorzentrum) and of the Department of Dermatology, Prof. Dr. Dirk Schadendorf shows.

What sets the WTZ apart as an Interdisciplinary Oncology Center of Excellence?

PROF. DR. WERNER: *The Patient is always at the center of everything we do here. At University Medicine Essen we value the use of the latest medical therapies and technologies to treat our patients. One example from oncology is proton therapy, which is available at only a few sites throughout Germany. We have been treating patients at the West German Proton Therapy Center since 2013. These patients include children with cancer, but also adults with hard-to-treat tumors that are located in sensitive areas of the body, such as the head, the spine, or the pelvis. The services offered by our proton therapy center are in high demand, both in Germany and abroad. For example, our treatments are available to patients from the United Kingdom through a collaboration with the NHS.*

We are leaders in proton therapy, as well as in many other forms of treatment. Overall, we currently run more than 14 specialized therapy programs for different cancer entities. In addition, we are the Germany-wide leaders in the treatment of rare cancers.

PROF. DR. SCHADENDORF: *On Top of that our research. Our researchers and physicians mainly focus on the causes of cancer and the basic biological characteristics of the various cancer entities. Our strength lies in translational research, where we aim to bring new understanding from the bench to the bedside as quickly as possible, so that it may serve our patients.*

So, you are saying, the main benefits for patients treated at the WTZ are medical excellence and interdisciplinarity?

PROF. DR. WERNER: *Yes, our patients benefit from this immensely. The WTZ is a prime example of an interdisciplinary center of competence in oncological precision medicine. Interdisciplinary approaches to collaboration, however, are not limited to oncology, of course, but are practiced at all 32 departments of University Medicine Essen. Our "smart hospital" strategy explicitly requires that we avoid the traditional thinking within separate clinical "ivory towers" and replace it with close collaboration and communication. It is a prerequisite for the future of medical care.*

PROF. DR. SCHADENDORF: *Let's take a look at another WTZ example to see what this means in real life. Imagine a patient with a lung tumor. No medical expert knows the entire range of all medical disciplines, for the simple reason: no one is radiologist, pneumologist or surgeon at the same time. The WTZ boasts both the expertise and the experts from all of these disciplines, allowing us to offer each patient a personalized, interdisciplinary treatment program—tailored therapy. It starts at the WTZ outpatient center with its 73 treatment slots, which usually is the first point of contact for cancer patients at University Medicine Essen. It also accounts for most of our oncology care services. Here, everything is conveniently located within one building, facilitating interdisciplinary communication between specialists that immediately benefits our patients.*



Read more
about this on
pages 29-31.



Read more
about this on
pages 10-13.



Read more
about this on
pages 10-13.

Interdisciplinary Oncology Center of Excellence at the University Medicine Essen

The West German Cancer Center (WTZ, West-deutsches Tumorzentrum) is part of University Medicine Essen, where more than 70,000 inpatients and around 300,000 outpatients are treated annually. More than 8,300 experts from diverse disciplines work here in a total of 32 departments and 24 institutes, and oncology has been an important focus for over 50 years. The WTZ is one of the Interdisciplinary Oncology Centers of Excellence and awarded this status by German Cancer Aid for its comprehensive cancer care. It consolidates all of the tasks related to cancer treatment at University Medicine Essen. Physicians and scientists from 40 of the hospital's departments and institutes are involved in the interdisciplinary treatment programs at the WTZ. Their aim is to offer each patient optimized individual diagnostics and therapy. The WTZ regularly undergoes certification processes such as the OnkoZert audit that have repeatedly confirmed its high level of care.



West German Cancer Center (WTZ)

PROF. DR. WERNER: In terms of interdisciplinary communication, another important aspect is our close collaboration with specialists at other sites. This is true for all of University Medicine Essen, but in particular for the WTZ. WTZ experts are members of various working groups establishing standards for the harmonized and optimized care provided for cancer patients nationwide. Each of our patients, no matter where they live, should have the chance to receive the best treatment possible. One example is our close collaboration with the Interdisciplinary Oncology Center of Excellence at University Medicine Cologne. In January 2018, we signed a declaration of intent for WTZ and CIO Cologne to establish a center of excellence in academic cancer medicine in North Rhine-Westphalia and to form the Cancer Center Cologne Essen (CCCE). This endeavor is supported by the North Rhine-Westphalian Ministry of Culture and Sciences, with Minister Isabel Pfeiffer-Poensgen. In February 2019, the CCCE was officially launched. This collaboration allows us to consolidate our skills and expertise, improving medical cancer care in North Rhine-Westphalia, while pursuing our main goal: developing model solutions for certain pressing



challenges, solutions that will extend far beyond our two centers. Examples of these challenges are the structured processing of data and various research topics.

What strategy are you pursuing to expand the WTZ's first-class medical care?

“One example is our close collaboration with the Interdisciplinary Oncology Center of Excellence at University Medicine Cologne.”

PROF. DR. SCHADENDORF: Our Sarcoma Center is a good example of our strategy. Sarcoma surgery has always been an important core competence at University Medicine Essen, and we have developed it into one of the largest centers for the treatment of bone and soft tissue sarcomas in all of Europe. This success is due largely to the successful recruitment of Prof. Dr. Jendrik Harges and Prof. Dr. Arne Streitbürger, two highly specialized orthopedic oncology and sarcoma surgeons. They head the Sarcoma Surgery Section and play a crucial role in shaping the further development of the Sarcoma Center. At the same time we were able to recruit Prof. Dr. Uta Dirksen, a qualified specialist in the treatment of sar-



Read more about this on pages 18-19.

comas in children and adolescents. With its strong team of radiation oncologists, radiologists, pathologists, as well as internist and sarcoma specialist Prof. Dr. Sebastian Bauer, the spokesperson of the Sarcoma Center, this WTZ center offers a unique treatment program fueled by excellent expertise.

What are the prerequisites for the WTZ to maintain and hone its performance level?

PROF. DR. SCHADENDORF: All of us are committed to being one of the globally outstanding medical institutions in oncology research and teaching. The WTZ is structured as a Comprehensive Cancer Center following the US model, it has been internationally audited as an Interdisciplinary Oncology Center of Excellence more than once, and it is recognized worldwide. In addition, we are part of a network of national and international research units with whom we collaborate at the front lines of scientific development.



Network of Interdisciplinary Oncology Centers of Excellence

PROF. DR. WERNER: A pioneering spirit and passion for innovation are deeply ingrained in all of us, as evidenced by our guiding principle of a “smart hospital.” Briefly put, the idea behind this principle is that of a digitized hospital of the future, where university level medical treatment and the human side of care converge. To us, digitization is not an end in itself; whether for oncology or other disciplines. Its purpose always is to serve patients, for example, through novel diagnostic opportunities and innovative therapies inspired by the latest research. Our employees, too, will benefit from a “smart hospital” in which digitized processes relieve the staff of administrative, non-patient-facing tasks, freeing up their time so they can provide even more personal care for those entrusted to us.



Prof. Dr. Jochen A. Werner, Medical Director and Chairman of the Board of University Medicine Essen

PROF. DR. JOCHEN A. WERNER Ear, Nose, and Throat Specialist

- 1993 Habilitation at Kiel University, Germany
- 1995 Senior Physician
- 1998 Professor of Ear, Nose, and Throat medicine and head of the ENT department at Philipps-Universität Marburg, Germany
- 2011 Medical Director and member of the Board of University Medicine Gießen-Marburg
- 2015 Medical Director and Chairman of the Board of University Hospital Essen

Werner's research interests include the lymphatics of the head and neck region, lymphogenic metastasis formation, malformations of the lymph and blood vascular system, as well as trans-oral surgical procedures for the treatment of cancers of the oral cavity, throat, and larynx. His more than 300 publications make him one of the leading specialist authors in his field. As the Medical Director and Chairman of the Board of the University Medicine Essen, Werner is intensively involved in the hospital's transformation to a “smart hospital.”

Aren't those contradictory concepts: Patient-centered care and digitization?

PROF. DR. WERNER: No, quite the contrary. Digitization will mean more time for patient care. Take, for example, electronic patient records that will allow nurses to provide patients with even higher quality care. The future will see the use of tablet computers and selected robotics as standard practice. We also will relieve physicians of more and more of their administrative burden by providing them with physician support systems. At the same time, they will benefit from digitization when it comes to diagnostics and treatment planning. We are also planning to increase our use of telemedicine. It is important to us that all patients know that we see them as individuals with their own needs and concerns, and not just as yet another case to treat. And we are not leaving that to chance. Back in September 2017, we founded Germany's very first Institute of Patient Experience



Prof. Dr. Dirk Schadendorf,
WTZ-Direktor

(IPE). The Institute provides interdisciplinary consultations and support for all departments and areas of University Medicine Essen, especially in the context of its digital transformation into a "smart hospital". We want to raise and renew awareness in all of our employees for the fact that our patients are at the center of care. When patients feel well cared for in all aspects of their stay with us, this motivates not only them, but also their loved ones and our employees. Whenever someone seeks help in a hospital, they are in an exceptional situation. It is important for us to be able to win their trust. We want to welcome them as guests, alleviate their fears, and provide them with the information they need, quickly and comprehensively.

Where will the WTZ be in 10 years?

PROF. DR. SCHADENDORF: The West German Cancer Center (WTZ) has highly qualified specialists who contribute every day to oncology's rapid advancements. In 10 years, the treatments, for which researchers at centers of excellence such as ours are developing the foundations, will be commonplace. Research and clinical care will become even more interconnected. Interdisciplinary approaches are the lifeblood of oncology research and patient care even today. Rapid digital data processing and the analysis of huge amounts of data will become central to both science and patient care. In the coming years, the various centers will become ever closer and collaborate even more than is the case already today. We will see structures develop in which Interdisciplinary Oncology Centers of Excellence, such as the WTZ and partners from all areas of research and care forge alliances for establishing standards, that will open up new opportunities in oncology and continue to improve our patient care.



Read more about this on pages 29-31.



Institute of Patient Experience at the University Medicine Essen

PROF. DR. DIRK SCHADENDORF

Dermatology and Venereology Specialist

- 1995 Habilitation Humboldt-Universität zu Berlin, followed by a DFG-funded Heisenberg Fellowship
- 1997 Head of a Research Group at the German Cancer Research Center (DKFZ) in Heidelberg and at the University Medical Center Mannheim
- 2008 Director of the Department of Dermatology at University Hospital Essen
- 2013 Director of the West German Cancer Center at University Hospital Essen

Prof. Dr. Schadendorf is a renowned specialist for skin cancers, in particular for malignant melanoma. He is the most-cited cancer researcher in Germany with numerous journal publications.

Patient-centered care

What constitutes the ideal patient experience? To find out, the Institute of Patient Experience surveyed cancer patients and support groups at the WTZ's first ever cancer patient information day on June 23, 2018. The seven items listed most frequently were the following:

1. Easy to understand and empathic communication
2. Respect, compassion, attentive care, time
3. Quick reporting of follow-up results
4. Patient-friendly information and reports
5. Welcoming inclusion of family
6. Uniformly structured organization processes
7. Comfortable and pleasant waiting areas and patient rooms

70.000
inpatients at University
Medicine Essen



Read more about this on pages 20-21.

New pathways: The "smart hospital"

"Smart hospital" is the keyword for hospitals addressing the upcoming global issue of digitization. University Medicine Essen is one of the first hospitals in Germany to accept this challenge. According to Prof. Dr. Werner, this means disrupting outdated patterns of behavior and old-fashioned models of communication and leadership. "Becoming a 'smart hospital' means being ready to change and willing to adapt, always focusing on people."

Therefore, introducing electronic patient records was only a first step, as the Medical Director and Chairman of the Board of University Medicine Essen explained. "Soon, virtual reality technology and robotics will support both medical and nursing activities. Artificial intelligence will take over routine tasks and less demanding jobs. When doing rounds, we'll be working with tablet computers more and more often."

A new patient portal will allow patients to share data with their attending physician via a patient diary app. In an emergency, patient data can be transmitted live from the ambulance to the emergency department, so that the emergency room team will have it available even before the patient arrives. If all the data is collected in a uniform IT system, more comprehensive understanding will be available as a basis for diagnostics and treatment, resulting in better patient care and fewer risks.

"The 'smart hospital' will also play a decisive role in training and continuing education", said Prof. Dr. Werner. "E-learning and blended learning approaches using audiovisual and interactive elements open up entirely new forms of teaching medical knowledge. At the same time, open education and social learning via the internet provide modern opportunities for sharing and passing on knowledge."



Digital transformation at University Medicine Essen

EXCELLENCE FOR THE BENEFIT OF THE PATIENT

As an internationally recognized Comprehensive Cancer Center (CCC) and partner site of the German Cancer Consortium (DKTK), the WTZ's own research means that patients have access to many clinical studies and novel treatment procedures. Close integration of tumor research, tumor diagnostics, and tumor treatment as well as the excellent interdisciplinary approach practiced at the WTZ drive the competence and expertise the center has built over decades.

The success of the WTZ is rooted in perfectly coordinated processes and structures across all University Medicine Essen sites. Examples of the milestones in tumor medicine achieved by the WTZ include the translational research conducted as part of its disease-oriented clinical program 1 (DCP1) in tumors of the gastro-intestinal tract, as well as the holistic therapeutic approach practiced at the WTZ lung cancer center in the DCP2 in pulmonary and thoracic tumors.

Interdisciplinary and translational: Tumor research at the WTZ

Pancreatic cancer is among the most dangerous types of cancer. Its causes are not yet fully understood, and chances of survival are poor. Many patients quickly develop resistance to the chemotherapy agents, making this form of treatment ineffective. Prof. Dr. Jens Siveke, German Cancer Consortium (DKTK) professor and head of the "Translational Oncology of Solid Tu-

mors" department at the WTZ is studying the reasons for this resistance developing. He is working with a team of medical specialists and biologists in a national research alliance funded by German Cancer Aid. "Our ultimate goal is to funnel our research results into the development of medicines addressing the plasticity of these tumors, re-programming the tumor in a way that makes it less aggressive and susceptible to chemotherapy and, possibly, immunotherapy as well," said Prof. Dr. Siveke.



Prof. Dr. Jens Siveke, DTKK Professor at the Department of Internal Medicine (Tumor Research), head of the Translational Oncology of Solid Tumors research group

At the core of their investigation are regulatory proteins controlling chromatin (packaged DNA) and the reading of genes inside cells, thus playing a crucial role in their plasticity (ability to change). In laboratory studies, the team has successfully blocked two proteins, slowing down tumor growth. Their next step will be to use these results to develop new drugs and innovative treatment strategies that in turn will be studied in clinical trials.

*From left to right:
Prof. Dr. Clemens Aigner, Director of the Department of Thoracic Surgery and Endoscopy
Prof. Dr. Martin Stuschke, Director of the Department of Radiotherapy
Prof. Dr. Martin Schuler, Director of the Department of Internal Medicine (Tumor Research) and Deputy Director of the WTZ
Prof. Dr. Dirk Theegarten, Head of the Pulmonary and Infection Pathology working group*



Dr. Barbara Grüner, head of the Molecular Tumorpathology junior research group at the Department of Internal Medicine (Tumor Research)



Molecular Tumorpathology junior research group

The oncologists are supported in their endeavors by the WTZ's Molecular Tumorpathology junior research group headed by Dr. Barbara Grüner. This junior research group was established at the WTZ by the German Cancer Consortium (DKTK) and was accepted into the renowned Emmy Noether Program of the DFG (German Research Council). It rapidly became an established interdisciplinary part of the WTZ. Dr. Grüner's research focuses on the role that lipids and lipid-modifying enzymes

play in pancreatic tumor development, metastasis, and treatment response. Her research group has developed a high-throughput screening method specific to pancreatic cancer that allows the parallel testing in complex models of hundreds of substances and their effects on metastasis. Currently, Dr. Grüner's team is studying mechanisms of treatment resistance using innovative bar code technology.

Another unit investigating the mechanisms responsible for tumor responses—or lack thereof—to targeted therapies and radiation is the Molecular Oncology Laboratory. Prof. Dr. Alexander Schramm, head of the Laboratory, focuses his research on two tumor types: non-small-cell lung cancer, the main cause of death in men, and tumors of the upper digestive tract. He and his group are mainly interested in interactions of the tumor with the immune system, in metastasis, and in tumor metabolism. To address these issues, they closely collaborate with other research groups, identifying differences and shared properties of various tumor disorders.

Lung cancer is one of the most common tumors in Germany. Nationwide, every year more than 50,000 men and women develop tumors of this type. More than 2,000 lung cancer patients seek out the WTZ's lung cancer center. The team treating them there includes oncologist

Lung cancer treatment: multidisciplinary and individually tailored to patients' needs



The WTZ as a German Cancer Consortium (DKTK) partner site

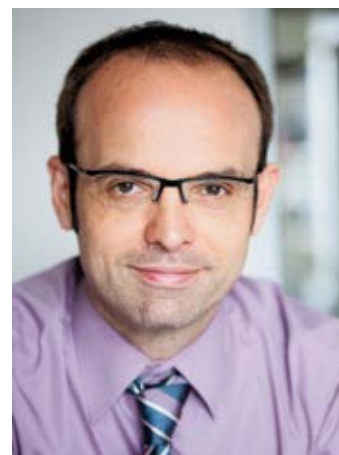
and WTZ Vice Director Prof. Martin Schuler, thoracic surgeon Prof. Clemens Aigner, pulmonologist Prof. Christian Taube, radiation specialist Prof. Martin Stuschke, and pathologists Prof. K. W. Schmid and Prof. Dirk Theegarten. Treatment is provided at the University Hospital Essen and the Ruhrlandklinik. In cases where no cure is possible for a lung tumor, the palliative care team of University Medicine Essen is called in.

"We combine the latest diagnostic methods with innovative treatments to offer tailored therapies for every patient," as Prof. Schuler explained. "This approach is complemented by a wide range of clinical

"Our aim always is to remove the tumor in its entirety, while sparing as much healthy lung tissue as possible."

studies that patients have access to." Providing these options allows the Department of Internal Medicine (Tumor Research) to significantly improve patient quality of life even in complex cases, such as stage III and IV cancers, and in many cases also to prolong patient survival.

A decisive factor in this success is the interdisciplinary collaboration of the various expert teams that begins at the time of diagnosis. In addition to imaging studies, biopsy findings from the pathology department contribute to tumor staging. Patients benefit from the fact that only relatively small tissue samples are needed for microscopic evaluation.



Prof. Dr. Alexander Schramm, head of Molecular Oncology at the Department of Internal Medicine (Tumor Research)



Read more about this on pages 38-39.



Read more about this on pages 36-37.

"With endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) we are able to take very small samples from the lungs. Based on these tiny biopsies, we make important decisions on patient care," explained Prof. Theegarten, head of the Pulmonary and Infection Pathology research group at the WTZ. The pathology findings reported to the cancer registry—more than 1,300 malignant lung tumors in 2018—set the stage for individualized treatments. Based on the tumor stage and the patient's general condition, these may include surgery, radiation, chemotherapy, and immunotherapy.

Operations can be performed by the thoracic surgeons at the lung cancer center, where they have all state-of-the-art techniques at their disposal. These include a range of methods, such as minimally invasive procedures best suited for early stage tumors, complex precision excisions using cautery or laser instruments, as well as enhanced resection techniques for later stage tumors. "Our aim always is to remove the tumor in its entirety, while sparing as much healthy lung tissue as possible," explained Prof. Aigner, Director of the Department of Thoracic Surgery and Endoscopy.

The German Cancer Society (DKG) requires a clinic to perform a minimum of 75 operations per year to be certified as a lung cancer center. The WTZ's highly specialized surgeons greatly exceed this number, performing roughly 350 lung tumor resections per year. Their experience contributes to the center's status as one of the largest and most important sites for lung cancer treatment not only in Germany, but also in Europe.

Radiation therapy offers an opportunity to selectively control lung tumor growth, causing a relatively minor burden to the patient, and to destroy the tumor in the treated volume, increasing the chances of a cure. Headed by Prof. Stuschke, the Director of the Department of Radiotherapy, the WTZ's radiation experts harness the progress offered by image-guided intensity modulated radiation therapy. "With this treatment method, the tumor is exactly localized and tracked via computed tomography, x-ray images, and electromagnetic transponders throughout the entire course of radiation therapy. Respiratory-gated radiation is delivered with extremely high precision and only when the current position of the tumor matches its target position," explained Prof. Stuschke.



Dr. Bernhard Mallmann, Palliative Care Officer at University Medicine Essen

But the experts at the radiation center also employ other innovative treatment procedures. One research group at the center studies how findings from tumor biology can be used to improve radiation therapy, for example, by increasing a tumor's radiation sensitivity by treating it with molecularly targeted drugs that exploit mutations in the tumor. Another one research group directed by Prof. Stuschke wants to make proton therapy accessible for patients with very large volume lung tumors. "We are using dedicated prospective clinical studies to evaluate the potential of intensity-modulated proton therapy to improve patient outcomes within the wide range of methods offered at the WTZ," said Prof. Stuschke.

The medical care portfolio of the Department of Internal Medicine (Tumor Research) is rounded out by the palliative care provided by WTZ4, the palliative ward of the University Medicine Essen, located in the WTZ ward building. The palliative ward is headed by senior physician Dr. Jörg Hense. Palliative care is already understood as an integral component of oncological care. To further the presence of palliative care throughout all of University Medicine Essen, Dr. Bernhard Mallmann was made its Palliative Care Officer in May 2018. As Dr. Mallmann sees it, "palliative medicine has become a quality characteristic for all departments. Quality of life is at the heart of our work with all palliative patients."



Section of Translational Oncology of Solid Tumors at the WTZ's lung cancer center



Lung cancer center at the WTZ



Dr. Jörg Hense, Senior physician of the palliative ward of the Department of Internal Medicine (Tumor Research)



Read more about this on pages 34-35.

1967 2018

A SOLID
FOUNDATION
FOR THE
FUTURE

51 years of excellence

A dedicated clinic for patients with cancer that pools the expertise of a number of different medical specialties? In October 1967, the Essen Tumor Clinic is the first clinic of this kind to open in Germany. It also is the beginning of what later would become the West German Cancer Center (WTZ) that today offers 14 treatment programs in oncology and has been recognized a Comprehensive Cancer Center following the US model.



1967-2018

51 YEARS



Grand opening of the Essen Tumor Clinic, consisting of the Department of Internal Medicine, the Policlinic (Tumor Research), and the Department of Radiotherapy. Headed by **Prof. Dr. Carl G. Schmidt** and **Prof. Dr. Eberhard Scherer**, the Director of the Department of Radiotherapy, this **first collaborative institution** in the country is dedicated exclusively to the diagnosis and treatment of tumor diseases. At the same time, a new professorship is established at Essen's Medical Faculty.



A dedicated clinic for **bone marrow transplants** is established (one of Europe's biggest allogenic stem cell transplant institutions).

NETZWERK ONKOLOGISCHE SPITZENZENTREN

German Cancer Aid recognizes the WTZ as an Interdisciplinary Oncology Center of Excellence.

The Institute of Cell Biology (Tumor Research) is **established** as one of the first German university medicine institutes dedicated to **basic cancer research**.

The WTZ establishes one of the first German **positron emission tomography (PET)** centers.

Appointment of **Prof. Dr. Jürgen C. Becker** to the WTZ. Becker becomes the first of three German Cancer Consortium (DKTK) professors at University Medicine Essen. He heads the section of **Translational Oncology with a focus on skin cancer research** in association with the Department of Dermatology.

Initial certification of the WTZ as an Oncology Center by OnkoZert.



The West German Proton Therapy Center Essen (WPE) **treats its first patients**.



December 7: Oncology surgeon **Prof. Dr. Alexander Eggermont**, General Director of Gustave Roussy, Europe's largest cancer center, is awarded an **honorary doctorate** by the Medical Faculty of the University of Duisburg-Essen.

Prof. Dr. Björn Scheffer is appointed as the second German Cancer Consortium (DKTK) professor at the WTZ. He heads the section Translational Oncology with a focus on Neurooncology. The third DKTK professor is **Prof. Dr. Jens Siveke**. He is the new professor of Translational Oncology with a focus on Thoracic and Visceral Oncology.

Commissioning of the **fourth treatment room (gantry)**. The WPE now is the **largest proton therapy center** at any university medicine in Germany.

Pilot certification of the Pediatric Oncology module by OnkoZert.

First ever treatment with **genetically-modified CAR T cells** at the WTZ.

1967 1975 1977-1987 1988 1991 2007 2008 2009 2010 2012 2013 2014 2015 2016 2017 2018

Prof. Dr. Ulrich W. Schaefer conducts the first **bone marrow transplant**.



Mildred Scheel, First Lady and founder of German Cancer Charity, 1976 in UK Essen.

New treatment options become available as the transplant program is **expanded** to include liver transplants.

In 1979, Collaborative Research Centre (SFB) 102 on **Experimental Leukemia and Tumor Research** is founded.



In 1977, the **West German Cancer Center (WTZ)** is **founded** to serve as an interdisciplinary network in cancer research and treatment at the University Medicine Essen.

The head of the Essen hematology section, **Prof. Dr. Günter Brittinger**, becomes the head of the first **hemato-oncological study group in Germany** (Kiel Lymphoma Group).

Grand opening of the WTZ outpatient center as the central point of contact for cancer patients.



The WTZ is **restructured** as a Comprehensive Cancer Center (CCC) following the US model.

The first **patient with prostate cancer** is treated at the WPE.



Dedication of the newly built West German Cancer Center – Wards (in-patient center).

Induction of the WTZ into the German Cancer Consortium (DKTK) as **one of eight such centers** in Germany.

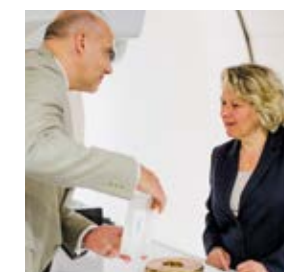


Celebration of the **50th anniversary** of the Tumor Clinic and of the **40th anniversary** of the WTZ.

A milestone at the WPE: Treatment of the **1,000th patient**.

Restructuring and expansion of the **Essen Sarcoma Center**.

First WTZ **cancer patient information day** in June 2018, conducted jointly with various support groups.



Dedication ceremony of the **West German Proton Therapy Center** with Svenja Schulze, North Rhine-Westphalia's Minister for Innovation, Science and Research, officiating.

MILESTONES

At the West German Cancer Center Essen (WTZ), cancer patients are treated exclusively by renowned experts and specialists. Two new specialists in the areas of uro-oncology and gastrointestinal oncology joined the center last year: Prof. Dr. Viktor Grünwald and Prof. Dr. Stefan Kasper-Virchow. The Sarcoma Center also has expanded its staff: Prof. Dr. Jendrik Hardes, Prof. Dr. Uta Dirksen and Prof. Dr. Arne Streitbürger bring many years of top-level expertise to the department.

Carolus Professorship of Uro-Oncology

Towards the end of the year, University Medicine Essen welcomed **Prof. Dr. Grünwald** to its staff, a highly specialized uro-oncologist. The Carolus endowed professorship for Interdisciplinary Uro-Oncology was announced on the occasion of the celebration (March 10/11, 2017) of the 50th anniversary of the founding of the Tumor Clinic. Prof. Dr. Grünwald, formerly the Senior Physician at the Department of Hematology and Oncology at Hannover Medical School, took up this professorship on



Prof. Dr. Viktor Grünwald

October 1, 2018. He will be involved in establishing an interdisciplinary research program between the Department of Internal Medicine (Tumor Research) and the Department of Urology and will also actively participate in the German Cancer Consortium (DKTK) at the University Hospital Essen.

Prof. Dr. Grünwald's main task will be to represent and further the field of interdisciplinary care of patients with cancers of the urogenital tract. His activities will span the areas of research, teaching, and drug-based treatment in patient care.

This experienced specialist will collaborate with Prof. Dr. Boris Hadaschik, the Director of the Department of Urology at the University Hospital Essen. Hadaschik specializes in the urinary bladder, kidneys, and prostate and anticipates important advances in the diagnostic realm in the near future. He currently studies the use of artificial intelligence and the latest nuclear medicine tracers to make prostate carcinoma imaging so precise, that in the not too distant future no more biopsies will be needed.

The endowed professorship thus brings together the fields of urology and oncology to the benefit of the patients concerned.



West German Gastrointestinal Center Essen

A Gastrointestinal Oncology Specialist

As a new professor of Medical Oncology, **Prof. Dr. Kasper-Virchow** has focused on gastrointestinal oncology since June 1, 2018. He addresses the optimization of the treatment of tumors located in the liver, colon, or stomach. Prof. Dr. Kasper-Virchow has been a senior physician at the Department of Internal Medicine (Tumor Research) at the WTZ since 2012. His work focuses on the verification and identification of biomarkers that may indicate early therapeutic success in patients with advanced cancers of the gastrointestinal tract who are undergoing chemotherapy, immunotherapy or targeted therapy. He has won various awards for his work, including the Research and Innovation Award of the German Society for Hematology and Oncology.



Prof. Dr. Stefan Kasper-Virchow



From left to right: Prof. Dr. Jendrik Hardes, Prof. Dr. Uta Dirksen, Prof. Dr. Arne Streitbürger



Pediatric Oncology at the Department of Pediatrics III



Section of Tumor Orthopedics and Sarcoma Surgery



Read more about this on pages 32-33.

These three professors are shaping the future of the Sarcoma Center

Prof. Dr. Hardes contributes his expertise to the further development of the Sarcoma Center, the only of its kind in Germany. As head of the section of Tumor Orthopedics and Sarcoma Surgery, he has been working to research and optimize existing and new treatment methods since April 2018.

Before his appointment to the WTZ, Prof. Dr. Hardes was at University Medicine Münster, where he also was involved in scientific research. Developing tailored treatment concepts makes up a significant part of this work as head physician. Another focus is the interdisciplinary provision of long-term follow-up in collaboration with specialists from other fields.

Prof. Dr. Dirksen is the Deputy Director of the Department of Pediatrics III and heads the pediatric sarcoma unit. She has been an endowed professor of Pediatric Oncology of the "Stiftung für krebserkrankte Kinder" (Foundation for Children with Cancer) and the Medical Faculty of the University of Duisburg Essen since June 1, 2017. In addition, she is currently establishing a new WTZ section for the study of sarcomas and other solid tumors in adolescents and young adults.

Prof. Dr. Dirksen is an award-winning expert, head of the international Ewing Sarcoma Study Group of the Society for Pediatric Hematology and Oncology, and the coordinator of the largest study of this rare cancer worldwide. She uses prognostic biomarkers to identify sarcomas more precisely.

Prof. Dr. Streitbürger, together with his colleague Prof. Dr. Hardes, founded the section of Tumor Orthopedics and Sarcoma Surgery on May 1, 2018, resulting in significant advancement of the surgical treatment of patients with sarcomas. As section head, he counsels patients on the most effective therapy options available to them.

Prof. Dr. Streitbürger also is a member of the Musculoskeletal Tumors section of the German Society for Orthopedics and Orthopedic Surgery (Deutsche Gesellschaft für Orthopädie und Orthopädische Chirurgie). He is passionate about sharing his knowledge with young physicians in the field of sarcoma surgery, and he actively researches new treatment methods, seeking to establish them in clinical practice. Another focus of his work is testing the effectiveness of common procedures in his field.

FIRST WTZ CANCER PATIENT INFORMATION DAY

On June 23, 2018, the stage was set at Deichmann Auditorium Essen for experts to answer questions from patients with cancer and their families. The first ever cancer patient information day at the WTZ was dedicated to the exchange of information and experiences. It offered the visitors a varied and helpful program that enabled extensive knowledge transfer. Top-level medical experts provided information on cancer treatment and follow-up in presentations and workshops. They answered many questions, not only on medical specifics, but also regarding finances, organization, and administration. Visitors had a chance to learn key information about the most innovative and modern treatment methods and were able to connect with support groups.



From left to right: Dr. Stefan Palm, Prof. Dr. Dirk Schadendorf, Monja Gerigk, Prof. Dr. Martin Schuler, Prof. Dr. Jochen A. Werner

Answers to Pressing Questions Provided By Top-Level Medical Experts

One of the experts answering questions was Prof. Dr. Dirk Schadendorf. As the Director of the West German Cancer Center (WTZ), he was one of the most sought after contacts at the cancer patient information day. His presentation informed visitors about the most relevant aspects and medical facts about the topics of targeted therapies and immunotherapy. Getting this information out to those affected by the diseases and

those interested in learning more, is a top priority for him. "For everyone involved, our first WTZ cancer patient information day was an important event with lots of implications for the future. We were happy to see the information provided so well received, and to be able to have renowned medical experts as well as support-group representatives available to answer questions," said Prof. Dr. Schadendorf.

"For everyone involved, our first WTZ cancer patient information day was an important event with lots of implications for the future."

With the introduction of the cancer patient information day, the WTZ has reached another milestone in its history. At this first interdisciplinary Tumor Center in Germany, ongoing progress is top priority. "This priority means that we are committed to working hard on our further development," seconded Prof. Dr. Jochen A. Werner, Medical Director of University Medicine Essen. "Part of this development is to focus even more on the needs and wants of our patients and their families, which is why I am so pleased with this first cancer patient information day at the WTZ. It sends an important signal."

Innovative developments and years and years of experience make the WTZ a top-level center for cancer treatment and research. The last few years alone



The first WTZ Cancer Patient Information Day

have been many new cancer drugs developed here. As the Director of the Department of Internal Medicine, Prof. Dr. Martin Schuler described it: "Many innovative cancer drugs, such as targeted inhibitors and immune therapies have been introduced into patient treatments at the West German Cancer Center (WTZ). They complement proven chemotherapies that also have become much better tolerated and effective than they were 50 years ago. Most of them are administered on an outpatient basis."

"Many innovative cancer medications have been introduced at the West German Cancer Center in recent years."

One important partner in hosting this event is the Institute of Patient Experience that, together with the WTZ, made the cancer patient information day possible. The Institute is a non-profit organization that focuses on the process of transitioning to a more patient-oriented practice. Monja Gerigk, Head of the IPE, sees the patient information day as an excellent opportunity for fostering an exchange between patients and experts: "The WTZ cancer patient information day is ideally suited to bringing together competent specialists, patients, and advocacy and support



Program booklet for the 2018 WTZ Cancer Patient Information Day



Visitors were provided with lots of information

groups, creating an intensive on-site experience. The event also makes some of the participants more approachable. Working on the event created new networks between those involved, creating a new sense of community that radiates inward and outward!" Also present was Markus Wartenberg, WTZ's Vice Director of Patient Support and Patient Advocacy. He too, took and answered questions from cancer patients and their families. He emphasized the importance of having support and advocacy groups that can offer help and advice to patients and their families in all sectors of healthcare: "Support groups and advocacy groups are an important sector of the health care system, providing what hospitals and doctors simply cannot. It is wonderful to see so many of you here today," he said, addressing the audience. Many others shared this sentiment. The presence of representatives from support groups and advocacy groups resonated positively with patients and interested parties alike.

Successful Fundraising for a Support Group

Together, the Stiftung Universitätsmedizin foundation, the WTZ, and the Institute of Patient Experience appealed to the event's attendees to donate. The proceeds of the sale of a "piano cake" went to the purchase of a new piano for a group dedicated to singing as a patient support activity. The results were impressive: Enough money was collected to be able to buy the piano and present it to Christine Poensgen from the association Frauenhilfe nach Krebs LV NRW e.V., which is dedicated to helping woman who survive cancer.

Save the date: The second cancer patient information day at the West German Cancer Center (WTZ) will take place on January 18, 2020.

STAFF NEWS AND EVENTS

FEB **First German Cancer Consortium (DKTK) Site Symposium ETOS (Essen Translational Oncology Symposium)** at University Medicine Essen on current results and plans for the development of new diagnostic and therapeutic approaches in cancer. Professor Dr. Martin A. Teufel was appointed as the new medical head of the Department of Psychosomatic Medicine and Psychotherapy (*LVR-Klinikum Essen*). He will establish **psycho-oncological screenings** for WTZ patients.

APR Enhanced reporting of oncology benchmarks via the Centricky platform.
Prof. Dr. Christian Taube became the new Director of the Department of Pulmonology, (Ruhrlandklinik Essen, West German Lung Center at the WTZ).

MAI The Molecular Tumorpathology junior research group established at the WTZ by the German Cancer Consortium (DKTK) headed by Dr. Barbara Grüner was accepted into the renowned **Emmy Noether-Program** of the DFG (German Research Council).
New **Merkel cell carcinoma research results** from the translational skin cancer research group at the WTZ headed by Prof. Dr. Jürgen Becker (DKTK) are supporting the use of immunotherapy for skin cancer.

JUL The Department of Endocrinology and Metabolic Disorders was re-certified as **ENETs Center of Excellence**. Antje Sucker and her colleagues from the Molecular Tumorimmunology research group at the WTZ's skin cancer center, working under Prof. Dr. Annette Paschen, identified mechanisms of resistance in **melanoma immunotherapy**. The research team headed by Prof. Dr. Jens Siveke (DKTK) at the WTZ, TU Dortmund University, and at MGO Bochum was awarded **Funke Mediengruppe's MERCUR Prize** for the team's research on the treatment-resistance related Ras gene.

SEP The Sarcoma Tour organized by the WTZ, *Das Leberenshaus e.V.* and the *Stiftung Universitätsmedizin* foundation generated more than **54,000 euros in donations for sarcoma research** at the WTZ. Kristin Schimank (from the WTZ's bone marrow transplant program) is awarded the **Pflegepreis der Konferenz onkologischer Kranken- und Kinderkrankenpflege (KOK)** for her thesis on psycho-neuro-immunology and its role in oncology. This is an oncology nursing related award given by a German Cancer Society (DKG) working group.

JAN Dr. Barbara Grüner became the head of the **Molecular Tumorpathology junior research group of the German Cancer Consortium (DKTK)** at the WTZ.

MAR The **Neurooncology section** headed by Prof. Dr. Martin Glas was established at the WTZ.
Prof. Dr. Boris Hadaschik (research focus on urogenital tract cancers) became the new Director of the Department of Urology at University Medicine Essen.

JUN The **WTZ hosted the Mildred Scheel Lectureship** and successfully recruited leading international cancer researcher Prof. Dr. Mina Bissell (University of California, Berkeley, USA) for a lecture series.
Dr. Stefan Kasper-Virchow, **a medical oncology specialist focusing on gastro-intestinal oncology** at the WTZ's Department of Internal Medicine (Tumor Research) was appointed professor.
The WTZ Sarcoma Center expanded its pediatric and adolescent cancer expertise by engaging **endowed professor of pediatric oncology** Prof. Dr. Uta Dirksen.

OKT **2017 OnkoZert Audit**
Pilot certifications: Sarcoma Center
Initial certifications:
Liver Tumor Center and Stomach Cancer Center
Re-certifications/monitoring audits: Oncology Center, Breast Cancer Center, Gynecological Cancer Center, Pediatric Oncology Center, Head and Neck Tumor Center, Lung Cancer Center, Neurooncological Center, Pancreatic Cancer Center, Prostate Cancer Center
Another step towards treating moving tumors at the WTZ: For the first time ever, patients at the West German Proton Therapy Center were treated with **double scattering (DS)** radiation.

NOV **Most-cited cancer researcher:** WTZ Director and skin cancer researcher Prof. Dr. Dirk Schadendorf logged more than 17,000 citations, making him Germany's top-cited cancer researcher.
The West German Proton Therapy Center signed a **contract with major company health insurance providers**. Siemens BKK and Heimat BKK now provide hassle-free access to proton therapy for those insured with them.

The **1,000th patient** was treated at the West German Proton Therapy Center.
Launch of the **BluStar.NRW project** (an association for typing potential blood and stem cell donors among refugees and migrants in North-Rhine Westphalia). One of the partners in this association is the West German Donor Center (WSZE).

JAN Collaboration between the WTZ and the Cologne/Bonn Center for Integrated Oncology (CIO): The state of North Rhine-Westphalia is supporting the new **Cancer Center Cologne Essen (CCCE)**.
The second **Essen Translational Oncology Symposium (ETOS)** took place at the WTZ: 150 participants discuss current activities in translational oncology.

MAI Major expertise comes to the WTZ Sarcoma Center: Prof. Dr. Jendrik Hades and Prof. Dr. Arne Streibbürger established and now head the **section of Tumor Orthopedics and Sarcoma Surgery**.
Prostate cancer: **Apalutamide is a new drug** intended to improve treatment and to ensure longer survival without developing metastatic lesions. It was approved in Europe in 2019, but certain patients at the Department of Urology at the WTZ received the drug prior to that.
Prof. Dr. Nikolaos E. Bechrakis (main work areas: oncology of the eye, retinal detachment, and vitrectomy) became the new Director of the Department of Ophthalmology at University Medicine Essen.

JUN A well-received premiere **of the WTZ cancer patient information day** in association with support groups.
SEP The **fundraising activities by the WTZ, the Stiftung Universitätsmedizin foundation, and the Institute of Patient Experience** at the first WTZ cancer patient information day enabled a support group to buy a new piano for its singing group.
The **2018 Sarcoma Tour** outdid its 2017 edition with over 68,000 euros raised for sarcoma research at the WTZ.

OKT **2018 OnkoZert Audit**
Initial certifications: Sarcoma Center
Re-certifications/monitoring audit: Oncology Center, Breast Cancer Center, Gynecological Cancer Center, Skin Cancer Center, Pediatric Oncology Center, Head and Neck Tumor Center, Liver Tumor Center, Lung Cancer Center, Stomach Cancer Center, Neurooncological Center, Pancreatic Cancer Center, Prostate Cancer Center
On Oct. 1, 2018, Prof. Dr. Viktor Grünwald was appointed the **Carolus endowed professor of interdisciplinary uro-oncology** at the WTZ.
Frank Kreymann became the first **specialized palliative care nurse** to start working at University Medicine Essen while earning his Bachelor's degree.

FEB The West German Proton Therapy Center (WPE) partnered with the English National Health Service (NHS) and began **treating patients from the United Kingdom**.
The Department of Radiology at University Medicine Essen installed the world's most modern **2 level angiography system "Artis Q"**. It is used in cancer therapy, in particular for (metastatic) liver cancer.

MAR **Prof. Dr. Heiner Wedemeyer** (focus on liver cancer, chronic inflammatory liver diseases, and chronic infections) became the new Director of the Department of Gastroenterology and Hepatology at University Medicine Essen.
The **Precision study** in which the Department of Urology at the WTZ, headed by Prof. Dr. Boris Hadaschik, plays a leading role, demonstrated that a combination of MRI studies followed by targeted fusion biopsy alone provides more precise results than conventional ultrasound-guided biopsies.

JUL **CARE for CAYAs** program for physical and mental late treatment effects: A **prevention program for Children, Adolescents and Young Adults (CAYAs) after cancer** is coordinated by WTZ Vice Director Prof. Dr. Uta Dirksen.
At the WTZ's Department of Hematology, the first patient was treated with **genetically modified CAR-T cells**.

NOV Dr. Sied Kebir assumed the **first ever position of Clinician Scientist** newly created at the Department of Neurooncology at the WTZ. During his residency, the brain researcher was supported by the DKFZ section of Translational Neurooncology at the WTZ, by the section of Clinical Neuro-Oncology and the Department of Neurology (Prof. Dr. Christoph Kleinschnitz).
Timo Gottlieb started his work at the WTZ as the **first advanced practice nurse in oncology holding a Master's degree**.

DEZ Oncology surgeon **Prof. Dr. Alexander Eggermont**, General Director of Gustave Roussy, Europe's largest cancer center, was awarded an **honorary doctorate** by the Medical Faculty of the University of Duisburg-Essen.
Scientific Advisory Board 2018: Six renowned external oncologists, chaired by Prof. Dr. Klaus-Michael Debatin (Department of Pediatric and Adolescent Medicine at the Ulm University Medical Center), evaluated the WTZ.
Inaugural symposium at the Sarcoma Center at the WTZ, one of the most prestigious such centers in Europe.

DIGITIZATION STRENGTHENS THE WTZ

The West German Cancer Center Essen (WTZ) has an advantage over many other medical institutions thanks to its innovative developments and a strong network. Thorsten Kaatzte would agree. Having worked at University Medicine Essen since 2010, and as the Commercial Director, a member of its Board since 2016, he sees the continuous renewal process and a consistent focus on the role of digitization for the WTZ's specialist work as key factors in its success. Here, he puts the ongoing developments at the WTZ into context, both in terms of digitization and infrastructure.

Mr. Kaatzte, how important is the West German Cancer Center, the WTZ, as part of the University Medicine Essen's portfolio?

THORSTEN KAATZTE: The WTZ plays a pivotal role in our portfolio. As a university medicine we provide maximum care, meaning that all our departments offer top-level university medical services. But of course there are additional high-performance structures within this premium environment. Here at Essen, those structures are found in the areas of transplant medicine, cardiovascular diseases, and in particular in oncology. As is characteristic for university medicines, the borders between medical care, research, and teaching are extremely fluid. Across all fields, our patients benefit immediately from the latest research findings, and this applies in particular in the areas of oncology and tumor research. Patients with cancer not only receive comprehensive diagnostic services; they are also given an opportunity to be included in special studies, giving them access to the latest therapeutic procedures. The WTZ is one of the largest cancer centers in Germany and has been recognized

as an Interdisciplinary Oncology Center of Excellence since 2009. With this medical advantage also comes a business advantage, because the WTZ's reputation reflects well on the entire University Medicine Essen. But I would also like to stress that the WTZ is not a stand-alone unit: At the WTZ, all of University Medicine Essen's departments involved in oncology patient care, collaborate and that is how the WTZ has been set up and continues to operate.

So interdisciplinarity is the key to success?

THORSTEN KAATZTE: Absolutely. As an economist I am always in favor of planning and working in an interdisciplinary fashion across all our sites because this allows us to optimize our performance within our group of hospitals, create synergies, and establish structured, efficient processes. Patients benefit the most from such an approach, and it also helps with allocating tight financial resources effectively. Medical research and care, patient-centered care, and cost-efficiency all go hand in hand. Just like in other industries, cost-efficiency is also important for

2009

Recognition as Interdisciplinary Oncology Center of Excellence by German Cancer Aid



Thorsten Kaatzte, Commercial Director of the University Medicine Essen

the complex system of a hospital. That is why I am pleased that the WTZ carries this idea of joint success in its DNA, so to speak. It is also why we have been so successful at the WTZ, and in many fields are national or even international leaders.

Where do you see the main challenges in the future?

THORSTEN KAATZTE: Oncology covers an unusually wide clinical field. First, there are the more classical,

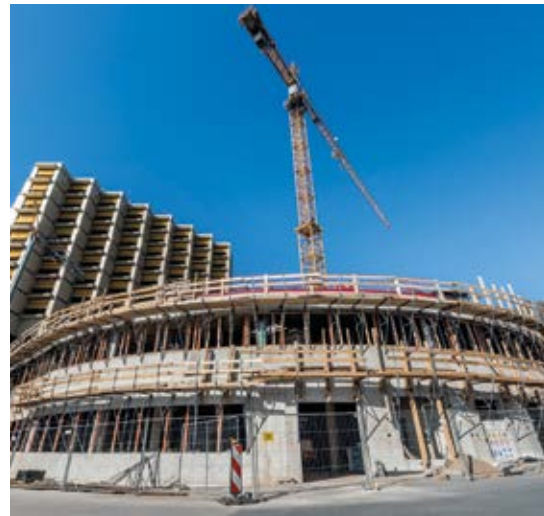
“The WPE also is home to the largest program in pediatric proton cancer therapy in all of Europe.”

traditional treatment approaches such as surgery and chemotherapy. These forms of treatment have been around for a long time, although their quality and the level of care have significantly evolved and improved in recent years.

Then there are innovative treatment methods such as immunotherapy, for which cost-efficiency is a consideration. And finally, at the West German Proton Therapy Center (WPE) here in Essen we have an internationally recognized facility that allows for treatment of tumors, particularly in the head, spine, and pelvic regions, that is especially easy on the patient. The WPE also is home to the largest program in pediatric proton cancer therapy in all of Europe. Proton therapy, therefore, is a big opportunity for us, because our size makes us a special player in the market. At the same time, proton therapy comes with high costs and scientific complexity, making it also a challenge for University Medicine Essen. As the Commercial Director, it is my responsibility to ensure the economic viability of all our sites, as only economic viability guarantees medical operability. Only if we operate on a solid economic basis will we be able to make the future investments necessary to provide our oncology patients as well as all other patients with excellent quality in their treatment and care. This is true even though Germany is a difficult environment for maximum care providers, and we here at Essen have additional burdens to bear. But we are headed in the right direction...



Aerial photo of University Hospital Essen



Expansion of the ENT and eye clinic building

... and you would like to continue in this direction in the future as well?

THORSTEN KAATZE: We are committed to further strengthening our outstanding cancer center, the WTZ. That is a goal we focus on, and I am convinced that the WTZ will continue to play an outstanding role in oncology in Germany. Our status as a university medicine supports this: Pre-clinical research results are translated into clinical practice quickly and efficiently, thus benefiting our patients. But we are also making ongoing investments in our other disciplines. Some specific examples of these investments are our current construction projects, such as the expansion of the ENT and eye clinic, the new construction of the pediatric clinic, of the buildings housing the departments of nuclear medicine and radiopharmacy. University Medicine Essen is changing its profile, and excellence in medicine is always accompanied by change and renewal.

What role will digitization play in all of this?

THORSTEN KAATZE: When it comes to the "smart hospital", we here in Essen are no doubt trailblazers. This will significantly contribute to further expanding the leading role of the WTZ in oncology and to promote even more networking with the other specialties.

"University Medicine Essen is changing its profile, and excellence in medicine is always accompanied by change and renewal."

Take imaging technologies, for example, where artificial intelligence allows us to extract so much more information from the available data. We have developed applications that allow us to take a much deeper look at a tumor's biology than has been previously possible. Using complex algorithms, this allows us to offer our patients tailored strategies for prevention, early detection, and treatment in oncology. These medical aspects and perspectives are described in this annual report, along with the important role of digitization when it comes to relieving our employees of some of their work load. From an economic view point, our strategy of building a digitized "smart hospital" forms the basis for the symbiotic relationship between first-class medicine and cost-effectiveness. We view every single investment into our digital infrastructure as part of a bigger strategic objective. Where we used to make individual economic decisions, we now follow a prudent plan of building a fully networked university medicine that will benefit all specialties, and in particular the interdisciplinary oncology specialties that are collaborating closely at the WTZ.

WTZ'S AWARD-WINNING PERFORMANCE

The WTZ came out on top in a survey in the healthcare special edition of "Focus", a leading German weekly news magazine, with a total of seven awards in various fields in the "2018 National Hospital" category. The survey took into account important criteria such as patient satisfaction.



"Focus" magazine gives specialists' work top rating

Every year "Focus" magazine publishes a list of hospitals for which it compares more than 1,000 institutions in Germany. Renowned experts rate the hospitals based on significant criteria such as patient satisfaction, specialist and general staff qualifications, and technical equipment. Other important aspects include clinical quality management and clinical risk management, as well as standards of hygiene. The survey covers a total of 16 medical fields, with the WTZ winning awards in 2018 in areas such as brain tumors, radiation therapy, intestinal cancer, and breast cancer. Since 2014, the ranking has also in-

cluded the results of an analysis of the quality reports issued by the hospitals to inform their readers about topics such as staff size, focal areas of care, and the state of their technical equipment. Additionally, more than 15,000 primary care physicians, specialists, and senior physicians in private practice are surveyed by the Institut Munich Inquire Media independent market research company to find out which hospital they would recommend most strongly.



FOCUSED CANCER TREATMENT

Proton therapy destroys cancer cells in a very targeted, precise manner and reduces (long-term) damage to healthy tissues. The West German Proton Therapy Center Essen (WPE) is one of only six facilities in Germany currently offering this cutting-edge technology. At the same time, it is the largest such facility at a university medicine. Despite its size, the WPE is committed to making patients feel well taken care of.

Europe-wide, the WPE has the largest pediatric treatment program, with nearly 60 percent of the WPE's patients younger than 18. In 2018, 250 children were treated at the WPE, most of them for a brain tumor or sarcoma.

How does proton therapy work? A proton is part of an atomic nucleus, a positively charged particle. Using magnetic fields, a cyclotron, a 200 ton installation in the WPE's basement, accelerates these particles to a speed of 180,000 kilometers per second, equivalent to 60 percent of the speed of light. Another steel construction, also weighing tons, directs the proton beam precisely to the tumor.

"I was able to continue working as usual."

While traveling through the body, the protons give off very little energy, which is why the beam barely damages healthy tissues. But once the beam reaches its target, the tumor, it suddenly releases its energy, destroying mostly cancer cells, with the healthy tissue behind the tumor remaining almost intact.

For WPE patient Frank Berghaus, proton therapy was an ideal option. He had a tumor the size of a table-tennis ball inside his sphenoid sinus, one of the sinus cavities. Both the carotid artery and the optic nerve run through the side wall of this cavity. As Berghaus recalls, "In a previous operation, only about 80 percent of the tumor could be removed," leaving him with proton therapy as his only chance for a lasting improvement of his condition. The aim of the therapy was to destroy the residual tumor tissue, while sparing the sensitive areas near it as much as possible.

Just like many other patients at the WPE, Berghaus did not even have to miss work during his six-week treatment period. "I was able

to go to work as usual," said Berghaus, who works as the deputy managing director of a dental laboratory. That is possible because proton therapy is generally well tolerated by patients.

Truly impressive is what goes on behind the scenes during the radiation period. During the treatment, patients lie on a table inside a radiation unit that can be rotated by 360 degrees. This is the gantry, that directs the proton beam at the patient. The actual radiation takes only a few minutes. During this time patients need to remain as still as possible. For patients who receive radiation in the head or neck region like Berghaus did, medical-technical radiology assistants (MTRAs) prepare an individualized plastic mask and a special pillow to support the head and shoulders. These aids help position the head optimally, with the tumor always in the exact same location where it is best accessible to the treatment beam. "That was unpleasant, but bearable," recalled Berghaus.



Ines Butanowitz, one of WPE's MTRAs



From left to right: Jürgen Höing, team leader of the WPE outpatient center with patient Frank Berghaus



West German Proton
Therapy Center Essen



Interview with Frank
Berghaus, former WPE
patient

80%



of children with cancer can
be cured.

Remaining absolutely still motionless is difficult, and even more so for children. Stuffed animals, audiobooks, and music can help them relax, but for some kids, especially very young ones, this is a challenge they are not yet up to. At the WPE, they are, therefore, treated while sedated and asleep.

In Germany, about 1,800 children develop cancer every year, and around half of them are treated with radiation therapy. Today, roughly 8 in 10 children with cancer survive the disease.

Because children are not yet fully grown, any radiation affecting healthy tissues may cause additional problems for them, such as growth disorders or other long-term side effects. And as in adults, ionizing radiation may cause secondary tumors.

Therefore, a major goal of proton therapy involves reducing these risks through highly targeted, spatially limited radiation effects. Current research projects at the WPE are studying the quality of life of the affected children, both during the treatment and following the conclusion of their therapies. So far, follow-up periods have not been long enough to make any reliable statements. "However, our preliminary experiences are promising," said Prof. Dr. Beate Timmermann, the Medical Director of the WPE. "We are pleased to be able to offer something to the most vulnerable patients that allows us to better balance effects and side effects."

In 2017, as the first hospital in Germany, University Medicine Essen established an Institute of Patient Experience with the aim of making sure that young and older patients alike would feel well taken care of. As the head of the institute, Monja Gerigk explained: "Whenever someone is being treated at a hospital, they are in an exceptional situation. That makes it all the more important to gain their trust, welcome them as guests, and alleviate their fears."



Monja Gerigk, head of the Institute of
Patient Experience

Frank Berghaus remembers being admitted to the WPE without having to wait around. "Then I was immediately able to speak to the nurses, and I learned everything I needed to know about the daily schedule and issues of hygiene during the treatment." Afterwards, his attending physician informed him about the examinations that would be done the next day.

Berghaus especially values the organizational aspects and the atmosphere at the WPE: "All of the nurses always were very friendly. They always had something positive to say and answered all of my questions." Over the several weeks of a treatment course every patient will speak at least once a week to the responsible radiotherapist, and is counseled by nurses about possible side effects of the treatment. The WPE's team is always ready to respond to questions or problems, even outside scheduled appointments.

While treatment is still underway, patients are talked to about follow-up care; their first check-up will be three months after the proton therapy has ended.

"We are pleased to be able to offer something to the most vulnerable patients that allows us to better balance effects and side effects."

At the check-up, it is determined whether any side effects that may have emerged under the treatment have been resolved. Adult patients are offered annual check-ups for five years, while children can be followed for up to ten years.

When their proton therapy is finished, all patients have the opportunity to mark this occasion with a special ritual: They are allowed to ring the large brass bell in the WPE's lobby. Those are significant moments during which everyone stops for second to acknowledge them. Family members, doctors, and nurses gather around to celebrate the conclusion of a treatment phase with the ringing of the bell. Often, tears are shed during these emotional moments. Other patients, whose treatment is still ongoing, will hear the sound of the bell as well, and take it as a token of encouragement. Soon, they know, it will be their turn to ring the bell.

Which types of cancer are treated at the WPE?

- Tumors of the central nervous system (mainly primary brain tumors)
- Bone and soft tissue sarcomas in the head and at the base of the skull, in the spine, and in the pelvis
- Tumors of the head and neck
- Prostate cancer
- Pediatric tumors
- Tumors of the eyes

Most recently, moving tumors in the breast and liver have been added to the list of tumors that can be treated with proton therapy at the WPE.

FIRST-CLASS CANCER TREATMENT AND ONCOLOGICAL CARE

For some types of cancer, even with excellent medical care, the chances of a cure are still very poor. One example of this type of cancer is sarcoma. The treatment provided at the WTZ utilizes the most sophisticated treatment options, with successful outcomes for at least half of the patients with high-risk sarcomas. For patients whose disease is so severe that all medical measures have been exhausted, the palliative care ward offers special care that offers palliative nursing expertise for first-class care.

Sarcomas are a very rare type of tumor disease, with only 1,000 to 2,000 newly diagnosed per year in Germany. As Prof. Dr. Sebastian Bauer, the WTZ's Sarcoma Center spokesperson explained, "Sarcomas are malignant tumor diseases that may arise from precursor cells in the supporting and connective tissues. They can occur anywhere in the body, and patients usually require in-patient surgical treatment." A rough distinction can be made between bone sarcomas and soft tissue sarcomas, with more than 150 different subgroups of these. Their treatment depends on the subgroup they belong to as well as on specific characteristics determined by pathologists. Leiomyosarcomas, liposarcomas, and undifferentiated sarcomas are among the most common types.

For bone sarcomas, the most common subgroups are Ewing sarcomas and osteosarcomas. The prevalence of sarcomas varies strongly in line with patient age. "Many patients on the WTZ wards are between 25 and 40 years old, which poses a big emotional challenge for doctors and nurses alike, as the members of the treating team tend to also be in that age group," observed Bauer.

The members of the oncology nursing team across all wards rise to this challenge however. With their expertise, often many years of nursing experience, and additional qualifications in oncology nursing, the team members guarantee high-quality nursing care. In addition, advanced practice nurses ensure that

high standards of care are met. Rita Bodenmüller-Kroll has been the oncology advanced practice nurse in the special unit for research and development in nursing at University Hospital Essen since 2011. As she put it, "In oncology nursing, working with patients is particularly challenging, especially during patient consent consultations. Most patients with cancer are very unsure about their situation. They are very grateful for the way our nursing staff shares tips and information for coping in their everyday lives in the face of cancer." According to Bauer, typification of the cancer is important for all phases of therapy planning. For some sarcomas, surgery alone nearly always leads to a cure. The rating of a tumor's malignancy and operability also determines whether radiation therapy, alone or in combination with chemotherapy, may be



Rita Bodenmüller-Kroll,
Oncology advanced practice nurse

useful. "For other sarcomas, chemotherapy has been conducted before any operation because the chances of healing otherwise would be greatly reduced. Fortunately, with bone sarcomas, most therapies will be successful, thanks to the combination of chemotherapy and surgery. We see most patients again and again over many years during our outpatient follow-up. For us physicians, those times are highlights of our daily lives. Unfortunately, the nursing teams that cared for the patients during their toughest and most exhausting times on the ward only rarely receive positive feedback from the patients. We really should be doing the follow-up visits on the ward," Bauer said, regretfully.

When asked what he likes best about his work, he said, "The Sarcoma Center at the WTZ is one of a kind in Germany, thanks to the many years of structured treatment offered by a team of physicians and other healthcare professionals. The heads of the department made a conscious decision to find specialists who have made a long-term commitment to the center and are focused exclusively on the treatment of patients with sarcomas.

"For some sarcomas, surgery alone almost always leads to a cure."

In addition to the highly specialized surgeons and oncologists, we also use other technologies in treating sarcomas that are available only here or at a few other centers in Europe. These technologies include proton therapy, tomotherapy, but also isolated limb perfusion as well as studies of the latest drugs. Within those studies, we can supply patients with medications that will not be officially available until three or four years



Sarcoma Center at
the WTZ



Prof. Dr. Sebastian Bauer,
Spokesperson of the WTZ's Sarcoma Center

"The WTZ's Sarcoma Center is one of a kind in Germany."

down the road. This is something that may increase their chances for a cure and will give them hope."

WHEN THE FINAL PHASE OF LIFE BEGINS

In January 2012, a palliative ward was established for the first time at University Medicine Essen, as part of the Department of Internal Medicine (Tumor Research) in the WTZ in-patient building. The ward has twelve patient beds in single-patient rooms that also accommodate family members who wish to stay overnight. Cheerful colors, an impressive roof-top terrace, and a big living room with an aquarium add to the homey atmosphere on the ward. Patients treated on the palliative ward have life-threatening diseases for which there is no cure. The care provided here by a multidisciplinary team aims to improve or at least maintain their quality of life and their independence. Team members include physicians, nurses, physio-

therapists, social workers, pastors, art therapists, and volunteers from the hospice service, and they all work to alleviate a wide variety of symptoms – physical, mental, spiritual, and social – caused by either the disease itself or the treatment. Most of the team members have acquired specialized palliative care skills. If needed, wound and stoma care as well as

“It is not about adding days to your life, but about adding life to your days.”

Cicely Saunders, founder of the modern hospice movement and palliative care

therapists, social workers, pastors, art therapists, and volunteers from the hospice service, and they all work to alleviate a wide variety of symptoms – physical, mental, spiritual, and social – caused by either the disease itself or the treatment. Most of the team members have acquired specialized palliative care skills. If needed, wound and stoma care as well as



Palliative Care Essen

When you have so much to offer but still cannot make the biggest wish come true

It takes a special staff to be able to offer holistic care for patients and their families in their extreme personal situation and to attend to them individually. Open visiting hours, group activities such as concerts in the living room, joint meals, and small art exhibitions are part of this care and support as much as are memorial ceremonies held for families. Frank Kreymann was the leader of the palliative ward team until October 2018 and is now a palliative advanced practice nurse. As he says, “No one on the nursing team is here by chance. Every single one of them made a conscious choice to work on the palliative ward. Thanks to the diversity of the team, patients have a chance to find that special someone among them with whom they can develop a deeper trust during their extreme personal situation. Together we strive to give our patients as much quality of life in the “here and now” as we possibly can.”

Kreymann added that his wish for the future was to see more of the basic attitude of palliative care in other areas of hospital life as well. In his new position as advanced practice nurse for palliative care he has joined efforts with Dr. Bernhard Mallmann, MBA, the Palliative Care Office at University Medicine Essen to establish a palliative medicine consulting service spanning all areas of the hospital.

First-class treatment quality and nursing standards

No matter which ward patients are treated on or cared for: The pooled expertise at the WTZ ensures first-class treatment quality for them. All resident physicians in oncology specialist training must spend six months working as doctors on the palliative ward. Rita Bodenmüller-Kroll described her responsibilities when asked how the WTZ ensures its high oncology nursing standards: “My job as an oncology advanced practice nurse encompasses three main areas: First, I make sure that oncology nursing rounds take place. Secondly, I deal with oncology nursing consultations.



Frank Kreymann, advanced practice nurse in palliative care, with Roland Jusu Allieu, nurse on palliative ward WTZ 4

And my third responsibility is to support Bernadette Hosters and her team in the special staff unit for research and development in nursing in their networking efforts in nursing science, for example by conducting nursing symposia on oncology.”

This spring, we will bid farewell to Bodenmüller-Kroll as she enters her well-deserved retirement. At the same time, we will welcome Timo Gottlieb as Advanced Practice Nurse (APN) in Oncology. He will be the first advanced practice nurse with a Master’s degree at University Hospital Essen, and he will be responsible for coordinating the various nursing departments in oncology.

The WTZ Outpatient Center

Whether exams and treatments are done in an outpatient or in-patient setting depends on various factors. These include the type and duration of drug therapy, a potentially necessary monitoring after a diagnostic procedure or treatment, and also on the patient’s general physical condition. The WTZ outpatient center, opened in 2008, is considered to be the heart of the West German Cancer Center and usually serves as the point of entry into the various treatment options at the center. The outpatient center team makes the administrative arrangements for diagnostics, patient-doctor consultations, and chemotherapy sessions. Patients receive comprehensive care in an interdisciplinary and multiprofessional manner. The center also offers a wide array of informational and educational materials and opportunities.



Nursing service at University Hospital Essen

“To achieve optimum care in oncology, we not only need specialist oncologists but also oncology advanced practice nurses.”



Andrea Schmidt-Rumposch, Director of Nursing at University Hospital Essen, Member of the Board at University Medicine Essen

“At our institution this care is provided by nurses with specialist oncology training together with highly qualified advanced practice nurses. New research results from nursing science are immediately implemented in our daily practice. This process is supported by digital aids such as our electronic documentation that also increases transparency and, ultimately, patient safety.”

OPTIMIZED TISSUE ANALYSES THROUGH DIGITAL PATHOLOGY

Digital pathology plays a key role in providing optimum patient care and safety. As early as five years ago the Institute of Pathology at University Medicine Essen decided to standardize interfaces, data collection, and reporting, and it continues to steadily expand the automation and digitization of its processes.

A pathologist's task is to formulate precise diagnoses based on the analysis of tissue samples. These diagnoses form the basis for therapeutic decisions in cancer and other diseases. Pathologists also contribute immensely to the development of innovative therapeutic procedures. They study how genes, messenger molecules, and proteins interact by analyzing tissues at the molecular level. Wherever possible, the pathology experts at Essen employ automation.



Silke Skottky, nNGM site manager Essen (head of administration at the Institute of Pathology)

The Institute of Pathology is one of five reference institutes in all of Europe to have been given a single slide stainer for tissue sections, which provides the currently highest possible level of standardization in hematoxylin and eosin (H&E) staining. The pathologists use digitization to optimize their workflows. Adding a computer-readable bar code to all tissue samples has become standard. "This allows us to trace all samples back to their origin," explained Silke Skottky, head of administration/QM/risk management/controlling at the Institute of Pathology.

Soon, all microscopic images are to be provided digitally. They are complemented by morphological annotations and biological molecular data, and providing all of this information together is called "structured reporting". An advantage of structured reporting is that data are presented in a way that makes them available at any time and allows for international comparisons. For complex diagnoses and for research purposes they can readily be shared with other oncology centers. This way, patients may come to the WTZ for their diagnosis, but receive treatment at their place of residence.

The national Network Genomic Medicine (www.nngm.de/en/), a German national network of 15 university sites focusing on lung cancer, aims to build a national database. As a nNGM site manager, Silke Skottky works on establishing uniform standards for molecular pathology exams. Specialists such as WTZ Deputy Director Prof. Dr. Martin Schuler and the Director of the Institute of Pathology, Prof. Dr. Kurt Werner Schmid, enable access to innovative drugs through clinical studies for nNGM patients with metastatic lung cancer.

The WTZ contributes its expertise from its Precision Oncology Program and the Immun Oncology Program. As Schuler said: "We are pleased to contribute our innovative diagnostic and therapeutic skills to research aimed at improving patient well-being."



National Network Genomic Medicine



The Institute of Pathology



Digital workstation for the production of tissue sections



Read more about this on pages 38-39.



Thorsten Jung, MTLA at the Institute of Pathology. He is specialized in operating the Ventana HE600 fully automated H&E staining system.

EFFECTIVE STRATEGIES FOR TREATING LUNG CANCER

Stage IV lung cancer: These four words used to devastate patients who had to hear them as their diagnosis. Today, the WTZ is able to offer patients with this severe disease individualized treatment that improves their quality of life and, in many cases, will also prolong their lives.

Stage IV means that unlike in earlier stages of the disease, the tumor can no longer be surgically removed and has become metastatic. Because the WTZ is able to apply the latest research results in its practice, it can offer patients therapies that may be able to slow tumor growth even at this advanced stage. The innovative drugs used are personalized to match the profile of the patient's individual tumor. They may either be immunotherapy or targeted inhibitors of tumor growth. Treatment will also take into account the patient's wishes and general condition, as patients may often have additional health issues. Another important advantage of these therapies is that they can be administered strictly as outpatient procedures.

"The long-term outcomes prove that our individually tailored treatment concepts are successful."

Two programs at the WTZ address these patients: The Precision Oncology Program (WTZ-POP) is the entry point, and it is supplemented by the Immun Oncology Program (WTZ-IOP). For these programs, the center pools all its specialist knowledge of molecular pathology and targeted cancer treatments. The WTZ-POP and the WTZ-IOP offer patients access to all approved therapies, but also to the latest drugs available only in clinical research studies. One type of such drugs are inhibitors that enter tumor cells and suppress their abnormal growth sig-



Prof. Dr. Martin Schuler, head of the Department of Internal Medicine (Tumor Research)

nals. Most of these drugs can be administered in tablet form. In immunotherapy, antibody drugs are used that are administered as well-tolerated short-term infusions at intervals of one to four weeks. These antibodies are genetically engineered proteins that stimulate the body's own immune system to produce a defense reaction against tumors and metastases. Depending on the needs of the individual patient, immunotherapy is applied either alone or in combination with traditional chemotherapy to enhance their effectiveness.

As part of the WTZ-POP or WTZ-IOP, oncologists will obtain the most precise biological characterization of the tumor and its genetic makeup. To do so, they will take small tissue samples from the patient, usually in an endoscopic procedure or by puncture, and analyze these samples regarding the expression of certain characteristics and genetic changes compared to healthy cells.

The analyses reveal mutations and other anomalies distinguishing tumor cells from healthy cells from the same patient. In short: The oncologists use molecular pathology analyses to reveal the biological profile of the tumor in question. These genetic and biochemical analyses are complemented by imaging such as computed tomography, magnetic

resonance imaging, and positron emission tomography (PET). The images provide important information regarding the exact location and size of the tumor and its metastases as well as their metabolic activity. Additional laboratory tests, finally, will provide data on potential comorbidities and the patient's general condition.



From left to right: Prof. Dr. Dirk Theegarten, Prof. Dr. Martin Stuschke, Prof. Dr. Martin Schuler, and Prof. Dr. Clemens Aigner during an interdisciplinary lung cancer tumor board review



Read more about this on pages 44-45.

“Depending on the specific situation, the tests done as part of the WTZ-POP and the WTZ-IOP may take up to two weeks to complete,” explained Dr. Martin Schuler, Deputy Director of the WTZ and Director of the Department of Internal Medicine (Tumor Research). “Given that patients are in a life-threatening situation, that may seem to be a long time. But in the end we will have a comprehensive idea of the tumor that includes many findings,” he emphasized. And this comprehensive image is necessary to determine which targeted therapy is best suited for the individual patient and promises the best outcome.

Even patients whose tumors cannot be immediately operated on because the tumors are too large, or too close to vital organs (stage III) can expect individualized treatment at the WTZ. The multimodal treatments offered at the WTZ include a finely tuned combination of chemotherapy, radiation, surgery, and, in some cases, immunotherapy. “The aim of this approach is to first shrink the tumor, so that we may then consider

operating on it”, explained Schuler. And he adds that this is only possible thanks to the close monitoring provided by the specialists of the WTZ's interdisciplinary tumor board and good communication between the various experienced physicians involved. As one of 13 Interdisciplinary Oncology Centers of Excellence supported by German Cancer Aid, every year the WTZ treats more than 2,000 patients with lung cancer from the Ruhr area and the western Rhineland. Of these, about 900 have been newly diagnosed. Patients come to here because they are referred by their physicians, but many also choose the WTZ because they have heard about its successes elsewhere.

Antibodies and inhibitors: Immuno-oncological therapies slow down tumor growth

In particular the treatment and care of patients with inoperable non-small-cell lung cancer (NSCLC) at the Essen top-level center lead to better long-term outcomes than those at similar institutions. “Our research sets standards,” as Schuler puts it, making a claim and a commitment at the same time.



Core Facilities DKTK
Partner site Essen

POOLED EXPERTISE IN TUMOR BOARDS

At the WTZ, patients receive the best possible treatment. To achieve this, specialists from all fields regularly meet in tumor boards. Within the 14 disease-oriented clinical programs (DCPs) at the WTZ, 25 tumor board meetings take place every week. Every single tumor treatment is discussed by the specialists involved. Dr. Daniela Pierscianek, a senior physician at the Department of Neurosurgery at University Medicine Essen, and Bachram Feiz, a tumor documentation specialist at the WTZ, talk about their tumor board experience.

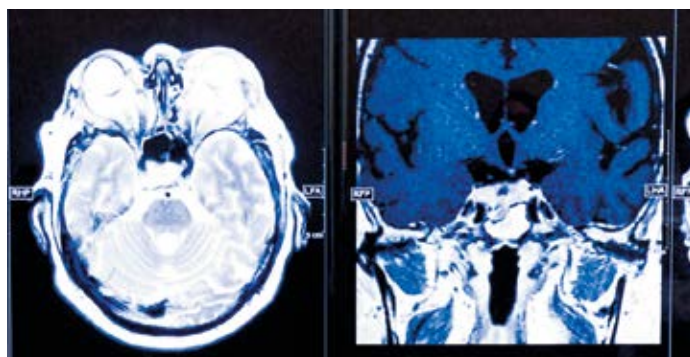
In Germany, tumor boards became common practice only about 10 years ago. They ensure a structured interdisciplinary collaboration of specialists from different fields in the treatment of patients with tumors. The German Cancer Society (DKG) has specified framework conditions for these boards.

“Every patient with a suspected tumor of the head or spine must be presented to an interdisciplinary tumor board,” explained Pierscianek. This is also stated in the certification guidelines of the German Cancer Society. And there is a good reason for this: “Only after discussion at a tumor board can the best possible decisions for the treatment made, weighing all the alternatives.” The neuro-oncology tumor board at the WTZ meets twice a week, on Mondays and

Thursdays. Here, specialists from many departments and institutions meet: Neurosurgery, Neuro-oncology, Oncology, Neuroradiology, Neuropathology, Nuclear Medicine, the Department of Radiotherapy, and the West German Proton Therapy Center (WPE) are represented. Pierscianek said, “If needed, additional specialists such as pediatric oncologists and dermatologists may be called in as well.”

When patients first arrive at the university medicine for consultation as outpatients at the Policlinic, they usually bring with them images provided by an external radiologist. At the Policlinic, patients undergo a physical examination and are counseled. Their case is reported to the tumor board where it will be discussed at the next opportunity.

Neuroradiologists and nuclear medicine specialists contribute significantly to the board's decisions. Their fields include complex procedures such as PET-MRI (a combination of positron emission tomography and magnetic resonance imaging) and DOTATOC-PET, both of which provide information on metabolic activity in the affected areas. In addition, there is functional imaging (fMRI) that enables the exact location of certain functional areas in the brain to be pinpointed, such as the speech center. Based on the available information, the neurosurgeon on the tumor board will assess whether an operation is useful, what risks



The neuro-oncology tumor boards at the WTZ meet W-TWICE WEEKLY

it carries, and whether it will be likely possible to remove the tumor completely. When surgery seems too risky or the patient's clinical condition does not allow it, the specialists will discuss alternative treatment options. The determination of the exact nature of the tumor, whether it is benign or malignant, and of what type it is can only be determined after the surgical procedure. The tissues removed during the operation

are examined under a microscope (histologically) to better understand the tumor, and the case is then presented at the tumor board a second time.

Based on the histological findings and the patient's clinical condition, further treatment options are now discussed. This is also the time at which the tumor

board specialists will discuss whether a patient can be included in a clinical study.

Decisions are made only after all aspects have been taken into account. The discussion and its results are documented in the tumor board minutes, which are signed by all those present.

“The documentation is available to the attending physicians,” Feiz said. “This way, they know exactly which therapy the tumor board has decided on, and if any changes are necessary, they can present the case again.” The documentation is also important for quality assurance purposes. On this basis, assessments on important quality and outcome benchmarks are regularly undertaken for all tumor boards.

“The documentation is available to the attending physicians.”

The tumor boards are also important for those patients who will receive further treatment at another hospital or doctor's office after their surgery at the university medicine. For such cases, the WTZ communicates closely with the local hospitals and physicians in private practice. External medical professionals are invited to participate in tumor boards to discuss their cases and benefit from the interdisciplinary expertise represented by the board. In this way the WTZ contributes to optimum care for patients who live far away from the center as well.



Neuro-Oncology at the WTZ



Dr. Daniela Pierscianek during a neuro-oncology tumor board meeting

RADIOMICS: AI FOR ONCOLOGISTS

The Institute of Diagnostic and Interventional Radiology and Neuroradiology at University Medicine Essen supports the oncology specialists at the WTZ in using the latest imaging modalities to diagnose cancer. They provide images that allow deep insights into a tumor's biology, offering an important basis for additional diagnostics and therapy. In a joint research group at the WTZ, highly qualified radiologists and oncologists headed by adjunct professor Dr. Felix Nensa seek to further expand the collaboration between the two departments. "In our research group, we focus on the latest technologies that rely on artificial intelligence (AI) and machine learning," explained Nensa.

Radiological imaging not only provides insights into a tumor itself, but also into the interactions between the tumor and its surrounding tissues. Thanks to their skills and experience, radiologists can visually distinguish between this important information and the "noise" created by the technology itself. However, there also are new approaches to statistically based systematic image analysis using artificial intelligence.

These approaches are used in quantitative radiology, also referred to as radiomics, where radiographic images of many tumors are collected in a database and made accessible to statistic evaluations to answer diverse questions. An example of these questions might be: How do patients with a tumor respond to tyrosine kinase inhibitor (TKI) therapy? This is a proven treatment method involving a growth inhibitor that lowers the cell division rate in a tumor.

Using the stored radiological data, artificial intelligence applications can not only arrive at conclusions about how the TKI therapy works, but can also make specific statements about certain tumor types, such as non-small-cell lung cancer. These tools can also take into consideration other parameters, such as patients' pre-existing conditions, or interactions with other treatment approaches. "Individual patients benefit from this because their oncologists receive practical decision support for planning a personalized therapy," explained Dr. Dr. Simon Bogner, resident physician at the Department of Internal Medicine (Tumor Research) and a member of Nensa's research group.



Adjunct professor Dr. Felix Nensa, senior physician at the Institute of Diagnostic and Interventional Radiology and Neuroradiology

"The specific benefit for the individual patient is that the oncologists providing treatment receive decision-making aids that they can put into practice to determine individualized therapy."



From left to right: Adjunct professor Dr. Felix Nensa and Prof. Dr. Michael Forsting (Director of the Institute of Diagnostic and Interventional Radiology and Neuroradiology)

To build, manage, and use the imaging database that allows these analyses, tailored and highly complex software is needed, which is developed and expanded by mathematicians, computer scientists, and physicians pooling their expertise in Nensa's group. The team links existing software solutions with proprietary approaches to generate a perfect workflow from adding images to the database to extracting meaningful data from it.

"Radiologists who use AI will replace radiologists who don't."

The plan is to make the software self-learning, so that it can develop algorithms from the huge amounts of existing patient data that will in turn allow making specific predictions for new patients. In this way, digitization and the processing of a multitude of radiological data by a self-learning system would turn mere quantity into quality for the benefit of each individual patient.



Institute of Diagnostic and Interventional Radiology and Neuroradiology

UTILIZING THE BODY'S SELF-HEALING POWERS

Immunotherapy against cancer is both a research focus and a success story at the WTZ. Prof. Dr. Dirk Schadendorf, Director of the WTZ and the Department of Dermatology, and Germany's most-cited cancer researcher heads the dermatology and dermato-oncology clinical study team. The team is a leader in clinical research on the effects of checkpoint inhibitors both in palliative and adjunct therapy of malignant melanoma and other types of tumors.

Successful immunotherapy for malignant melanoma and other types of cancer

"Patients with melanoma at the WTZ benefit from our unique expertise," explained Schadendorf. He and his team have a long history of clinical research in the field of immunotherapy. "To date, studies have shown that immunotherapy may significantly lengthen the time to recurrence of a cancer, and also the overall survival of patients."

How does immunotherapy work? A subgroup of white blood cells, the T cells, act as the immune sys-



Preparing immuno-oncology drugs at the University Hospital Essen pharmacy



Current clinical studies in WTZ's tumor research



Dermato-oncology outpatient study center at the WTZ

tem's sentinels. They recognize diseased cells and contribute significantly to the immune defense. This defense is fine-tuned by "checkpoints" at the T-cell surface. Certain proteins are able to bind to these checkpoints, inhibiting the T-cell activity. In healthy tissue, these mechanisms prevent an overactive immune reaction that might lead to an autoimmune disorder, but in tumor cells the inhibitory effect is too strong.

The tumor cells then go undetected and escape destruction by the immune system. And this is where immunotherapy comes in. It uses specific antibodies to block the checkpoint proteins, thereby minimizing their regulatory effects. Thanks to these checkpoint inhibitors, the T cells remain active and able to fight the tumor.

Proteins that inhibit the immune response include PD-1, PD-L1 and CTLA-4. CTLA-4 is the target protein of ipilimumab, the first checkpoint inhibitor antibody approved in Germany for the treatment of metastatic melanoma (in 2011). Today, ipilimumab monotherapy is rarely used for melanoma treatment anymore because other drugs have been developed that target PD-1 and PD-L1, including nivolumab, pembrolizumab, atezolizumab, and avelumab.

"The best outcomes so far have been observed with treatments targeting PD-1, and with therapies using several checkpoint inhibitors combined," said Schadendorf. This is true not only for melanomas, but also

"The best outcomes so far have been observed with treatments targeting PD-1, and with therapies using several checkpoint inhibitors combined."

for other tumors like non-small-cell lung cancer, renal cell carcinoma, Merkel cell carcinoma, epidermoid squamous cell carcinoma, head and neck tumors, urothelial carcinoma, and Hodgkin lymphoma.

So far, immunotherapy has been used primarily in a palliative setting to alleviate the symptoms of the disease. Most recently, however, treatment with checkpoint inhibitors has been approved as adjuvant therapy in patients with melanoma, and they have been shown to significantly extend the time until a recurrence of the cancer is observed.

The longest-running studies of checkpoint inhibitors even seem to indicate that for a certain percentage of patients with melanoma this therapy may even be curative. "The first patients treated with immunotherapy have been cancer-free for more than five years now," explained Schadendorf.

However, immuno-oncology applications require a lot of experience with immunotherapeutic procedures—experience the WTZ has to offer. One of the aspects that make these treatments challenging is that their side effects that have to be carefully monitored and

"The first patients treated with immunotherapy have been cancer-free for more than five years now."

controlled. Because checkpoint inhibitors "unleash" the immune system, it often not only attacks the tumor but also stages an autoimmune attack against healthy organs such as the skin, intestine, liver, or lungs.

Currently, many of the WTZ's outpatient study centers are running numerous clinical studies, many more are planned and will be conducted in close cooperation with partners from academia and the pharmaceutical industry. Prof. Dr. Schadendorf: "A major future task will be to optimize the efficacy of immunotherapy and to reduce their side effects. A second challenge is to further develop this treatment so that it can be applied in other types of cancer as well."

WEST GERMAN

CANCER CENTER

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DEPARTMENTS AND INSTITUTES

14 DISEASE-ORIENTED CLINICAL PROGRAMS (DCPs)
DCP01: Gastrointestinal tumors • **DCP02:** Tumors of the lungs and thorax • **DCP03:** Leukemia, lymphomas, and myelomas • **DCP04:** Gynecological tumors • **DCP05:** Neuro-oncology • **DCP06:** Tumors of the urinary and reproductive organs • **DCP07:** Pediatric hematology/oncology • **DCP08:** Skin tumors • **DCP09:** Endocrine tumors • **DCP10:** Head and neck tumors • **DCP11:** Tumors of the eyes • **DCP12:** Bone and soft tissue tumors (sarcomas) • **DCP13:** Bone marrow transplants • **DCP14:** Liver tumors

WTZ OUTPATIENT CENTER

WEST GERMAN PROTON THERAPY CENTER

SUPPORTIVE CARE
 Palliative care • Hospice services • Psycho-oncology • Social services • Pain therapy • Art therapy • Physiotherapy • Nutrition counseling • Pastoral services • Hospital volunteers • Cancer counseling • School for the Sick • Visitor accommodations

POP AND IOP

TRANSLATIONAL RESEARCH PROGRAMS AND PLATFORMS
 Exploitation of Oncogenic Mechanisms • Molecular Diagnostics, Early Detection and Biomarker Development • Molecular Targeted Therapy • Cancer Immunotherapy • Radiation Oncology and Imaging Clinical Communication Platform • School of Oncology • Cancer Genome Sequencing and Proteome Analysis

RESEARCH CORE FACILITIES
 West German Biobank Essen • Imaging Center Essen • BioChip Laboratory • Centre for Clinical Trials Essen • Central Animal Laboratory • Central Laboratory (Research and Teaching) • Medical Library • DNA Sequencing Service

THE WTZ IN NUMBERS

More than
500
partnerships and collaborations at the
WTZ

3.4
million euro donations to the *Stiftung
Universitätsmedizin* foundation for
oncological projects

22
million euro building
investments at University
Medicine Essen

STRUCTURE

ONKOZERT CENTERS, MODULES, AND FOCUS AREAS AT THE WTZ

West German Cancer Center of University Medicine Essen	Organ-specific cancer centers						Modules						Focus areas							
	OCC	Oncology center	Breast	Intestine	Gynecological	Skin	Lungs	Prostate	Head & neck tumors	Neuro-oncology	Pancreas	Stomach	Liver	Head & neck tumors	Pediatric oncology	Other gastrointestinal tumors	Sarcomas (incl. GIST)	Malignant endocrine tumors (incl. thyroid, adrenals)	Lymphoma, leukemia, hematological neoplasias	Urinary bladder
OnkoZert-certifications 2018	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

x = certified
in transition

€13
MILLION

External funding



€2.2 MILLION

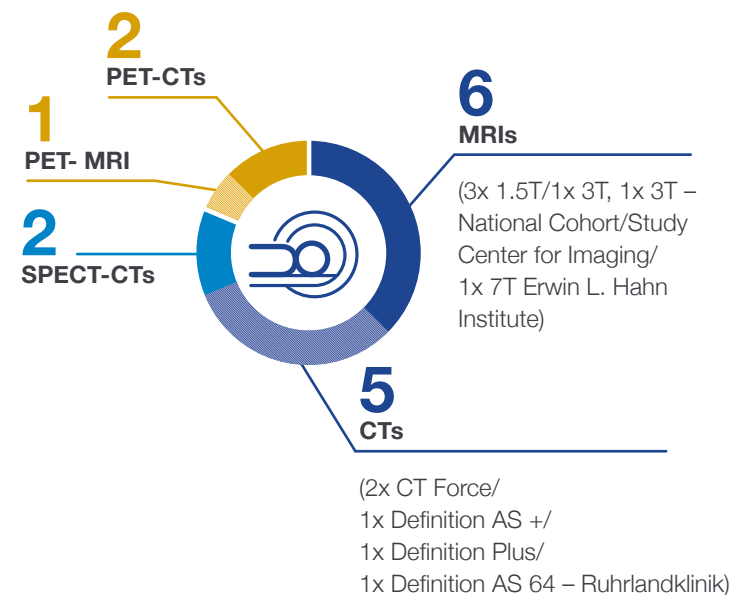
at the German Cancer Consortium (DKTK) partner site Essen/Düsseldorf of which

€1.8 MILLION

at the Essen site

IMAGING DIAGNOSTICS, THERAPY & INTERVENTION IN RADIOLOGY & NUCLEAR MEDICINE

- Radiology
- Nuclear medicine
- Collaboration radiology/nuclear medicine



1,850

Students **241** Graduates
26 Habilitations
154 Doctoral degrees at the Medical Faculty of Duisburg-Essen Uni.

2017 & 2018:

104 + **2** supernumerary oncology professorships (sarcoma surgery)

Professors
20 of which new appointees

3 in oncology (of which 2 are endowed professorships: Pediatric Oncology [“Stiftung für krebskranke Kinder“] and Uro-Oncology [Carolusstiftung])

TEACHING & RESEARCH

CLINICAL STUDIES

700 active studies at the WTZ with 1,900 new participants, of which **180** are investigator initiated trials



BIOBANK

650,000

Samples from 30,000 donors in the biobank; 180 projects supported with biobank materials

16,104 **m²**

Research areas at University Hospital Essen of which 1000 m² are allocated to lab & office space for DKTK sections with 38 DKTK employees in Essen

SELECTED NEWLY FUNDED RESEARCH PROJECTS

€1.6 MILLION

In funds by German Cancer Aid for the DKFZ 5-site collaborative research project (including the WTZ, headed by Adj. Prof. Dr. Iris Helfrich, Dermatology) to develop strategies against the formation of brain metastases

€2.6 MILLION

in DFG funds for the University Medicine Essen Clinician Scientist Academy

For more reliable detection of malignant melanoma in sentinel lymph nodes using 3D imaging: DFG funds a cancer study at the Department of Dermatology at the WTZ (headed by Prof. Dr. Joachim Klode & Adj. Prof. Dr. Ingo Stoffels) with

€3.5 MILLION

The LEPPER foundation jointly supports research on cancer development and treatment at the Institute of Cell Biology (Tumor Research) with **€1.6 MILLION** and funds a newly endowed professorship in epigenetics

DFG funding for 13 light microscopes of about

€14.5 MILLION

including one Deconvolution Light-Sheet Microscope for Mesoscopic Tissue Imaging at the Institute for Experimental Immunology and Imaging (responsible: Director Prof. Dr. Matthias Gunzer)

PATIENT CARE

ONCOLOGY NURSING



Nurses with oncology advanced specialized training



Nurses with palliative in-house training

STRAHLENTHERAPIE



Department of radiotherapy

46
Beds

1,885
In-patients per year

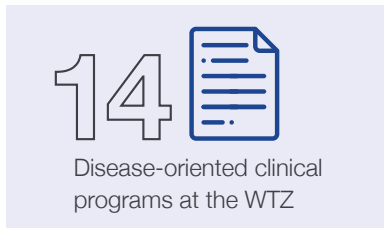
More than
1,500
Patients per year

1,500
Patients since first treatment in 2014



Department of Particle Therapy/WPE

15,000
Fractions delivered to 500 patients with cancer

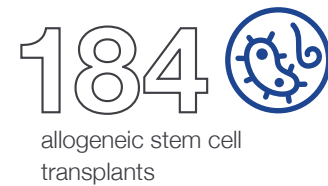


Patients at the WTZ for cancer treatment, of which

8,300
first time patients with cancer

22,000
as outpatients and

9,000
as in-patients at the WTZ



PALLIATIVE CARE*

2
Physicians (senior physicians and specialists) with a focus on palliative care plus one resident on rotation

12
beds on ward WTZ-4 at the WTZ's in-patient center (Palliative services for all of University Hospital Essen under development)

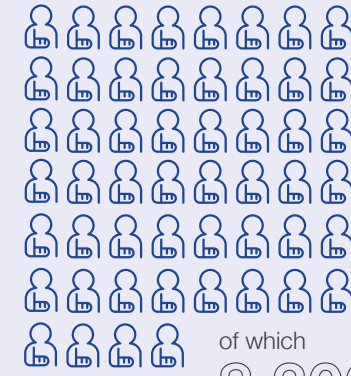
14
Nurses on the palliative ward WTZ-4, of which 12 have advanced palliative care training

*palliative services for all of University Hospital Essen under development

INTERDISCIPLINARY TUMOR BOARDS

patients presented

13,500



of which
8,300
patients presented for the 1st time



Tumor boards per week, with discussions of 260 patients with cancer on average

PRECISION ONCOLOGY PROGRAM WTZ-POP

1,400

Cases with differential diagnostic analyses in molecular pathology

Biomarker screenings within WTZ-POP

800

Cases with NGS analysis

PSYCHOONCOLOGY

Introduction of digital, tablet-based psycho-oncology screenings at the WTZ (ePOS)

1,100

Patients with cancer screened

2,100

Patients with cancer with psycho-oncology care at the WTZ with more than 2,750 initial and follow-up contacts

Psycho-oncology case discussions for

4,200

WTZ patients

PRECISION ONCOLOGY PROGRAM WTZ-POP*

Antibody drugs	Treat. Patients total	Drugs total
Ipilimumab	101	339
Atezolizumab	48	196
Pembrolizumab	159	785
Nivolumab	400	3.028
Durvalumab	24	105
Avelumab	12	111

* plus additional checkpoint inhibitors currently under development

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