Division of Oncology

Washington University in St. Louis
School of Medicine
In this report, we showcase our patient care activities and research efforts as well as our fellowship training program, which receives applications from around the world. Among our faculty and alumni are world-class basic science researchers, translational and clinical investigators, and pre-doctoral and post-doctoral fellows who have gone on to become leaders in their fields of interest. Our Division is committed to driving research that results in premier patient care and more effective outcomes for all cancer types. That commitment is visible at Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine, which has continued to be honored with an “exceptional” rating as one of the largest and best NCI Comprehensive Cancer Centers in the United States.

In 2020, it’s estimated that more than 1.8 million people in the United States will be diagnosed with cancer. Even more tragic is that more than 600,000 people will die from the disease. While the mortality rate seems high, the statistic from the American Cancer Society’s annual report on cancer rates and trends notes that there has been a steady 26-year decline in overall cancer mortality. The decline is driven, in large part, by advances in treatments for several major cancers, primarily lung, colorectal, breast, and prostate. The report also notes that progress for the treatment of melanoma as well as for hematopoietic and lymphoid malignancies has been especially rapid due to advancements in immunotherapies.

For more than 25 years, the Division of Oncology at Washington University School of Medicine has been at the forefront of major advancements in oncology research and in identifying and evaluating more effective treatments for cancer patients. Today, we are one of the five largest oncology programs in the country with more than 130 faculty and in excess of 1,200 employees. Within the past decade, our total number of inpatient and outpatient visits has grown from 50,000 to more than 173,000. We perform more than 400 bone marrow and stem cell transplants and 150 cellular therapy infusions per year and we have more than 600 open clinical trials.

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Virginia E. & Samuel J. Goldman Professor of Medicine
Chief, Division of Oncology
Director, Center for Gene and Cellular Immunotherapy
Deputy Director, Siteman Cancer Center
Washington University School of Medicine Division of Oncology

Senior Leadership

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Virginia E. & Samuel J. Goldman Professor of Medicine
Chief, Division of Oncology
Deputy Director, Siteman Cancer Center

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Deputy Director, McDonnell Genome Institute
Director, Section of Computational Biology

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Associate Program Director (Basic Science Career Development)

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Associate Program Director (Hematology)

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Deputy Director, McDonnell Genome Institute
Director, Section of Computational Biology

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Assistant Chief, Section of Medical Oncology
Director, Section of Medical Oncology

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Director, Section of Stem Cell Biology

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Co-Director, Section of Molecular Oncology

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Professor of Molecular Microbiology, Pathology & Immunology
Co-Director, Section of Molecular Oncology

Peter Westervelt, MD, PhD
Professor of Medicine
Director, Section of Bone Marrow Transplant & Leukemia

Grant Lawrence
Sr. Director, Business Development Operations

Hematology and Medical Oncology Fellowship Program

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Director, Developmental Therapeutics

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Division of Oncology Organizational Structure

Section of Medical Oncology
Section of Bone Marrow Transplant & Leukemia
Section of Molecular Oncology
Section of Stem Cell Biology
Oncology/Hematology Fellowship Program
Scientific Career Development
Basic/Translational Science
Clinical Research
Developmental Therapeutics
Drug Development

Clinical Research
Developmental Therapeutics

Geoffrey L. Uy, MD
Professor of Medicine
Medical Director for Clinical Research

Haeseong Park, MD, MPH
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The Division of Oncology at Washington University School of Medicine and the Alvin J. Siteman Cancer Center at Barnes-Jewish Hospital together oversee one of the largest and most prestigious cancer programs in the United States. Because of their combined expertise in transformative cancer research, Siteman Cancer Center is the only center in Missouri and a surrounding 250-mile radius to be designated a Comprehensive Cancer Center by the National Cancer Institute (NCI). It also has been awarded the NCI’s “Exceptional” rating, the highest designation for cancer research programs available.

Division oncologists provide care to more than 30,000 patients with more than 173,000 distinct patient visits annually within two clinical services:

- Stem Cell Transplant and Cellular Therapy Program
- Section of Medical Oncology

**PATIENT CARE**

<table>
<thead>
<tr>
<th>Outpatient Visits (FY2019)</th>
<th>Inpatient Visits (FY2019)</th>
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<td>115,336</td>
<td>58,296</td>
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Total Inpatient/Outpatient Visits

FY 2000: 50,000

FY 2019: 173,632

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Inpatient Oncology Services
Inpatient oncology care by Washington University physicians is provided in nine hospitals in the region: Alton Memorial Hospital, Barnes-Jewish Hospital, Barnes-Jewish St. Peters Hospital, Barnes-Jewish West County Hospital, Memorial Hospital Belleville, Christian Hospital, John Cochran Veterans Affairs Medical Center, BJC Progress West Hospital, and Christian Hospital.

Stem Cell Transplant and Cellular Therapy Program
The Stem Cell Transplant and Cellular Therapy Program at Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine is one of the largest in the world and ranks among the top 10 nationally in the number of patients transplanted every year. More than 400 bone marrow and stem cell transplants are performed annually.

The program, accredited by the Foundation for the Accreditation of Cellular Therapy (FACT) for both autologous and allogeneic transplants, is world-renowned for the care of patients with hematologic malignancies and for its efforts to rapidly translate promising immuno-oncology research into clinical trials. Since it was established in 1982, more than 8,600 transplants have been performed.

Outpatient Oncology Clinics
Outpatient oncology patients are seen in eight hospitals and centers:

- Alton Memorial Hospital Cancer Center
- One Memorial Drive
  Alton, IL 62002
- Siteman Cancer Center at Barnes-Jewish St. Peters Hospital
  Barnes-Jewish St. Peters Hospital
  150 Entrance Way
  St. Peters, MO 63376
- Siteman Cancer Center at Barnes-Jewish West County Hospital
  Medical Office Building 2
  10 Barnes West Drive
  Creve Coeur, MO 63141

Division of Hematology/Oncology
Veterans Affairs Medical Center
John Cochran Division
Eric M. Knoche, MD
Section Chief
In a collaborative partnership, Washington University School of Medicine and Saint Louis University School of Medicine provide a wide variety of oncology clinical care services at the regional Veterans Affairs Medical Center in St. Louis. Over the past several years, the program has seen significant growth.

Six faculty members from the WU Division of Oncology serve at the VA, with Eric Knoche, MD, serving as section chief for hematology/oncology. All faculty are general oncologists who subspecialize in various cancer types, including gastrointestinal, genitourinary, lung, head & neck, melanoma, and hematologic malignancies.

Through industry-sponsored and cooperative trials, VA oncology patients have access to several active clinical trials, notably for prostate, lung, and colorectal cancers. In addition, faculty are involved in several active research efforts funded by the U.S. Department of Defense, the National Institutes of Health, and various industry sponsors. The VA also serves as a training site for the WU Hematology/Oncology Fellowship program, with eight fellows serving in outpatient clinics and one fellow serving on the inpatient unit.

Stem Cell Transplant and Cellular Therapy Program
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Siteman Cancer Center–South County
1555 Graham Road
Florissant, MO 63031
VA Medical Center
John Cochran Division
915 N. Grand Boulevard
St. Louis, MO 63106

Cancer Care Clinic
Parkview Tower
4921 Parkview Place
St. Louis, MO 63110

The Division of Oncology at Washington University School of Medicine and Siteman Cancer Center jointly operate the Cancer Care Clinic, as an alternative to an emergency department, for cancer patients requiring urgent medical services. The clinic, which sees an average of 20-25 patients/day, is open 24 hours and is equipped with 8 chemotherapy infusion chairs as well as 4 private beds. Patients are evaluated and treated for acute issues such as nausea/vomiting, low blood counts, pain, and fever in order to minimize hospitalizations or to start treatment in preparation for hospitalization.

Outpatient Oncology Services

Total number of patient visits to the Cancer Care Clinic in CY2019

6,924

CARE

*Includes inpatient and outpatient encounters

FY 2016: 7,889
FY 2017: 7,676
FY 2018: 8,893
FY 2019: 10,401

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Peter Westervelt, MD, PhD
Director

The Section of Bone Marrow Transplant & Leukemia specializes in the clinical care of patients with hematologic malignancies, including hematopoietic stem cell transplantation and gene and cellular therapy approaches. The program is recognized for its expertise in patient care and the rapid translation of promising basic research observations into early phase clinical trials.

Clinical Metrics
The transplant program, accredited by the Foundation for the Accreditation of Cellular Therapy (FACT) for both autologous and allogeneic transplants as well as for the collection and processing of cellular products, is ranked among the top hematopoietic cell transplantation programs in the world by volume, averaging in excess of 400 transplants annually. New patient referrals to the clinical program number more than 1,200 annually.

Programmatic Resources
The clinical program utilizes 96 inpatient beds on three floors in the recently constructed Parkview Tower, as well as 10 beds in an adjacent oncology-dedicated ICU. Onsite services include leukapheresis, HLA typing, cytogenetics, cryopreservation, extracorporeal photopheresis, and a state of the art Good Manufacturing Practices (GMP) facility. Patients are seen on an outpatient basis in the Center for Advanced Medicine (CAM) on the Washington University Medical campus as well as at five satellite locations in the greater St. Louis area.
The Center for Gene and Cellular Immunotherapy (CGCI) was formed as a collaboration between the Section of Bone Marrow Transplant & Leukemia and the Section of Stem Cell Biology to accelerate immuno-oncology research and to offer innovative gene and cellular immunotherapies for patients with hematologic malignancies as well as solid tumors. Through the CGCI, patients are offered treatment with FDA-approved immunotherapeutic agents, including CAR-T cell therapies, NK and CIML NK cell therapies, TCR-T cell therapies and bispecific antibody therapies as well as access to many new and promising investigational agents as part of over 30 additional clinical trials currently open to accrual.

John F. DiPersio, MD, PhD
Director
Armin Ghobadi, MD; Amanda Cashen, MD; Peter Westervelt, MD
Medical Directors
Todd A. Fehniger, MD, PhD
Scientific Co-Director

Clinical Research Highlights
The program places a high priority on accrual to clinical trials, offering in excess of 60 trials open to accrual for hematologic malignancy and/or transplant patients at any given time, and over 500 annual therapeutic accruals. Examples of ongoing investigator-initiated studies arising from institutional research observations include the use of NextGen DNA sequencing to guide post-remission treatment strategies for newly diagnosed patients with intermediate risk AML, the development of cytokine-induced memory-like natural killer (CIML NK) cells for clinical use in relapsed AML, and the inhibition of JAK/STAT signaling as prophylaxis against GVHD in allogeneic hematopoietic cell transplantation.

Research Milestones
The center has played a leading role in the development and testing of bispecific T-cell engaging agents for the treatment of AML, and was instrumental in research and clinical trials leading to FDA approval of several therapeutics, including axicabtagene ciloleucel for adult patients with diffuse large B-cell lymphoma. Ongoing CGCI research efforts include the development of the first CRISPR gene-edited and fratricide-resistant off-the-shelf CAR-T cells for the treatment of T cell malignancies, targeted immunotherapies for AML, and the development of personalized cancer vaccines.
Li Ding, PhD
Director

The Section of Computational Biology is internationally recognized for its efforts to identify the genetic mutations underlying cancer by integrating research data and clinical information across the molecular, cellular and tissue realms into a larger, more detailed picture of the onco-dynamics of cancer.

With expertise in bioinformatics, statistics, advanced computing, databases and visualization, section scientists are pivotal in integrative large-scale studies involving clinicians and research labs both within and outside of the Division of Oncology. The team includes research biologists, computer scientists, engineers and mathematicians as well as affiliated members and collaborators in clinical medicine and experimental biology.

Current research efforts are focused on the analyses of a myriad of disease-related factors, including the discovery and analyses of disease-causing somatic mutations in cancers and identification of hereditary variants that increase cancer susceptibility. In 2018, scientists at Washington University School of Medicine and other institutions nationwide completed the genetic sequencing and analyses of more than 10,000 tumors from patients spanning 33 types of cancer and identified almost 300 genes that are implicated in tumor growth. More than two dozen papers were published in the Cell family of journals from this project in 2018. The multi-institutional effort, led by the Division of Oncology’s Li Ding, PhD, was part of The Cancer Genome Atlas (TCGA) project and funded by the National Cancer Institute and the National Human Genome Research Institute.

Computational Tools
Section scientists have built and produced numerous bioinformatics and software tools for processing, analyzing and visualizing proteogenomic data. These tools have become indispensable research resources for the larger scientific community and are now available online under open source licenses for the widest possible distribution and use.

Several tools, such as VarScan, a platform-independent software tool for variant detection in massively parallel sequencing data, and Phred, a base calling program for DNA sequence traces, link back to early work done by Section personnel and have been cited thousands of times in the literature and in research papers.

Tool development activities continue to be tailored to new data types and experimental methods, such as single-cell/single-nucleus RNA and phosphosite data that are powering biomedical science’s drive toward personalized medicine.
Section scientists currently are collaborating with Washington University physicians and scientists in the departments of radiology and surgery on three high-priority cancer types associated with poor prognosis:

- Triple negative breast cancer (TNBC)
- Glioblastoma (GBM)
- Pancreatic ductal adenocarcinoma (PDAC)

The approach involves sophisticated integration and analysis of genomic, proteomic, metabolomic, and advanced imaging data to better understand the dynamics of these three diseases from their genesis to progression and metastasis in patients.

The comprehensive atlases that emerge from WU-HTAN will directly impact clinical treatment decisions and accelerate the pace toward personalized medicine.

Another national effort in which section scientists are playing an important role is the National Cancer Institute’s Clinical Proteomic Tumor Analysis Consortium (CPTAC), which seeks to use proteogenomics — integrated data across the DNA-RNA-protein cascade — to attain better understanding of complex cancer dynamics, like subtypes, driver mutations, and post-translation modifications.

Under CPTAC auspices, scientists in the Section of Computational Biology have contributed to important advancements in colon cancer, producing a catalog of colon cancer-associated proteins and phosphosites, new biomarkers, drug targets, and cancer/testis antigens.

Researchers also have made important discoveries in clear cell renal cell carcinoma, identifying microenvironment cell signatures that delineate four immune-based ccRCC subtypes, and in endometrial carcinoma, revealing new consequences of mutations to the p53 “guardian of the genome” signaling pathway.

CPTAC, which began in 2016, involves a consortium of researchers from Washington University School of Medicine, Baylor College of Medicine, Broad Institute of MIT and Harvard, Fred Hutchinson Cancer Research Center, Icahn School of Medicine at Mount Sinai and New York University Langone Medical Center. It is now in its third phase of research efforts.

In 2017, CPTAC consortium scientists completed the first large-scale proteogenomic study of breast cancer, linking DNA mutations to protein signaling and helping pinpoint the genes that drive cancer. As part of the study, researchers analyzed breast tumors using accurate mass, high-resolution mass spectrometry, which allowed them to scale efforts and quantify more than 12,000 proteins and 33,000 phosphosites. The analysis uncovered new protein markers and signaling pathways for breast cancer subtypes and tumors carrying infrequent mutations such as PIK3CA and TP53 mutations.

In addition to serving as director of the Section of Computational Biology, Li Ding, PhD, serves on the steering committee of the National Cancer Institute’s Genomic Data Commons (GDC), an interactive system for storing, analyzing and distributing cancer genomics data. The goal of the GDC is to improve the molecular diagnosis of cancer and identify potential therapies based on genomic information.
The Section of Medical Oncology at Washington University School of Medicine has been at the forefront of cancer care and research for more than two decades. More than 6,000 new patients are referred annually to Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine for evaluation, consultations and/or treatment.

Physicians within the section have set standards of care practices for cancer treatment in many areas. All faculty subspecialize in one or more of 14 different disease groups, with palliative care services integrated along with care for individual cancer types.

Ramaswamy Govindan, MD, Anheuser-Busch Endowed Chair in Medical Oncology Director

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Sarcoma specialists oversee one of the leading sites in the United States for clinical trials related to the treatment of sarcoma. They recently made an important discovery that many sarcomas lack an enzyme to synthesize a key amino acid, arginine, and are dependent on arginine from the blood stream. By temporarily depriving tumors of arginine, tumors become more vulnerable to chemotherapy. This bench-to-bedside discovery is now in clinical trials and early results are encouraging. The study now has been expanded to include not only sarcoma but also small cell lung cancer.

Significant clinical research within the Section has led to two first-in-human clinical trials — one for a personalized lymphoma vaccine based on tumor-specific neo-antigens for patients with follicular lymphoma and another for a combination study of anti-CD20 monoclonal antibodies and ALT-803 for patients with relapsed or refractory indolent non-Hodgkin lymphoma.

Other pioneering vaccine studies based on neoantigen expression are being conducted for melanoma, breast, lung, and brain tumors by investigators from the Section of Medical Oncology. The research is promising because tumor cells express altered proteins (neoantigens) in the cell surface that are foreign to the immune system.

Washington University School of Medicine also is one of only a few centers in the world investigating a novel bispecific biologic IMC-100 that induces cytotoxic T lymphocyte activation targeting melanoma cells in cutaneous and uveal melanoma patients.

In collaboration with the investigators from molecular oncology and surgery, medical oncologists have developed strategies to overcome chemotherapy resistance by targeting a protein called CCR2 in colorectal cancer. Based on promising results to date, these studies now are being expanded to pancreatic cancer and lung cancer, among others.

National Collaborative Projects with Leadership from Medical Oncology

Faculty members lead several multi-center studies to improve the outcomes of patients with lung cancer, including the NCI-sponsored Adjuvant Lung Cancer Enrichment Marker Identification and Sequencing Trials (ALCHEMIST) that is open to accrual by 1,200 sites across the country and is studying genomic alterations in patients with completely resected early stage non small cell lung cancer and to use targeted or immune therapies to improve the cure rates.

Working closely with colleagues from the Section of Cancer Genomics, researchers in the Section also have led landmark studies to define molecular alterations at the gene and protein level using cutting edge technologies such as next generation sequencing and mass spectrometry. In addition, a large multicenter study is under way to evaluate the effect of IL-7 on CD4 cell counts in patients with high-grade gliomas and severe treatment-related lymphopenia after standard chemo-radiation therapy.

For the treatment of non-clear cell renal cell carcinoma (nccRCC), genitourinary specialists founded the Rare Kidney Cancer Patient Education and Trial Network in 2016, which brings together kidney cancer specialists from North America and Europe to accelerate the discovery of treatment advances for rare kidney diseases.
The Section of Molecular Oncology focuses on the molecular basis of cancer, exploiting this information for developing new cancer therapeutics. Researchers study melanoma, bone metastasis, redox signaling, early phase drug development and lymphoid malignancies, as well as a wide range of solid tumors.

Scientists in six laboratories and from three different departments collaborate on research targeting genomic and proteomic analysis of several types of cancer — breast, brain, ovarian, lung and pancreas — to broaden understanding of molecular pathways and tumor cell growth.

Breakthrough research by molecular oncologists and colleagues has found that the use of dose-adjusted EPOCH chemotherapy with bortezomib and raltegravir for patients diagnosed with HTLV-Type I-associated adult T-cell leukemia resulted in complete or partial remission in Phase I and Phase II clinical trials. Investigators also identified mutations in the T-cell receptor signaling pathway that can be targeted for additional therapies.

Another new treatment option — nanoliposomal irinotecan in combination with fluorouracil and folinic acid — has been found to extend survival in patients with metastatic pancreatic ductal adenocarcinoma. This was a multi-center, Phase III clinical trial led by members of Molecular Oncology.

The design and development of novel nanoparticles and molecular imaging probes to study bone lesions in multiple myeloma and solid tumor malignancies is another area of investigation.
Among recent translational research efforts within the Section of Molecular Oncology has been the identification of integrin β3 (β3) as a promising therapy for immunosuppression in cancer. Laboratory investigations by Washington University molecular oncology researchers have found pre-clinical evidence for an antimetastatic therapy based on targeting β3, which is selectively induced on breast cancer cells in bone by the local bone micro-environment. The research is significant because bone metastases occur in approximately 70 percent of metastatic breast cancer patients, often leading to skeletal injuries.

An ongoing effort in the section is focused on determining how interactions between tumor cells and their cellular, biochemical and physical environments facilitate tumor progression and metastasis. The tumor microenvironment plays a critical role in many aspects of tumorigenesis, so modulating tumor stroma may improve the efficacy of existing therapies or present new opportunities for therapeutic targeting.

Immune Checkpoint Therapies

Investigators recently published promising research in the area of immune checkpoint inhibitors and the triggers behind rapid progression of hematologic malignancies, such as Hodgkin lymphoma and adult T-cell leukemia. In a study published in the journal Blood, researchers demonstrated that nivolumab, a PD-1 inhibitor, led to rapid clonal progression in patients with adult T-cell leukemia/lymphoma (ATLL). Further study found a novel connection between ATLL cells and tumor-resident regulatory T-cells (Tregs) and exposed a tumor-suppressive role for PD-1 in ATLL. Such research could lead to promising therapies that would block rapid progression after the use of immune checkpoint inhibitors.
The Section of Stem Cell Biology is internationally known for its basic and translational research efforts focused on leukemia, myelodysplastic syndromes, graft vs. host disease, stem cells, and gene therapy.

Physician-scientists in this section, along with collaborators at the McDonnell Genome Institute at Washington University and Siteman Cancer Center, led the effort to sequence the first cancer genomes — from patients with acute myeloid leukemia (AML). The university is one of only 14 members of the Multiple Myeloma Research Consortium, which enables collaborative research to accelerate the identification of promising treatment options.

Investigators also lead one of only three programs in the country with a Specialized Program of Research Excellence (SPORE) in leukemia. Innovative research also is supported by the “Genomics of Acute Myeloid Leukemia” Program Project Grant (GAML PPG), a large, multidisciplinary effort supported by the National Cancer Institute for the past 16 years (see pages 32-33).

Outstanding Investigator Awards (R35) from the National Cancer Institute are currently awarded to two internationally recognized faculty within the Section:

Timothy J. Ley, MD, Principal Investigator, Molecular Pathogenesis of Acute Myeloid Leukemia (AML). This ongoing research effort utilizes genomic, proteomic and disease-modeling approaches to better understand how AML-initiating mutations after hematopoietic stem/progenitor cells (HSPCs) so that novel therapeutic approaches to treat AML can be developed.

FY2020 Funding: $915,000
Total Funding 2015-2020 (6 grants): $5.462 million

John F. DiPersio, MD, PhD, Principal Investigator, Optimizing Hematopoietic Stem Cell Transplantation for the Treatment of Hematological Malignancies. Extension of long-standing research aimed at overcoming major limitations to successful hematopoietic stem cell transplant (HSCT), sensitizing acute myelogenous leukemia (AML) to chemotherapy, and developing novel methods to prevent graft-versus-host disease (GvHD), a major complication that occurs after allogeneic HSCT. Novel immunotherapies for the treatment of AML as well as T-cell acute lymphoblastic leukemia (T-ALL) also are being investigated.

FY2019 Funding: $887,400
Total Funding 2017-2019 (3 grants): $2.464 million
Among major research accomplishments within the Section has been the definition of almost all of the mutations associated with AML and MDS pathogenesis as well as the identification of clonal heterogeneity and evolution for progression and relapse of both diseases. The discovery of mutations in spliceosome genes in these two diseases also has led to the development of therapeutic approaches that target the mutations.

Similarly, the discovery of novel ligands for retinoid receptors in hematopoietic cells has led to the development of new approaches to target such receptors in AML patients. In addition, researchers have developed novel bispecific antibodies targeted to AML-specific antigens and discovered human memory-like NK cells that now are being adapted in clinical trials for the treatment of relapsed and refractory AML.

Other breakthroughs include the identification of new therapeutic approaches to mitigate various symptoms of graft vs. host disease as well as the development of innovative gene therapy and stem cell transplantation approaches that may potentially treat inherited lysosomal storage diseases. Early laboratory research, which led to the discovery of long non-coding RNAs that are involved with the development of cancer, also opens the door for further investigation into more therapeutic approaches.

Related to ongoing scientific career development, more than 20 fellows in the section have received mentored K-series awards from the NIH. Section faculty also sponsor the Hematopoietic Development and Malignancy Program for faculty, postdocs and students at Siteman Cancer Center. To support collaborative research, the Section hosts the Stanley J. Korsmeyer Memorial Lectureship, which is one of the premier lectureships at Washington University School of Medicine. The annual lectureship draws internationally renowned investigators, including four Nobel Laureates to date, to present their data and meet with faculty.

Related to ongoing scientific career development, more than 20 fellows in the section have received mentored K-series awards from the NIH. Section faculty also sponsor the Hematopoietic Development and Malignancy Program for faculty, postdocs and students at Siteman Cancer Center. To support collaborative research, the Section hosts the Stanley J. Korsmeyer Memorial Lectureship, which is one of the premier lectureships at Washington University School of Medicine. The annual lectureship draws internationally renowned investigators, including four Nobel Laureates to date, to present their data and meet with faculty.

Flow Cytometry Core
Scientists in the section direct the Siteman Cancer Center Flow Cytometry Core, which offers services for high speed flow cytometry-based cell analysis, cell sorting and flow cytometry instruction. The core includes multiple workstations for self-service flow cytometry analysis as well as dedicated staff to perform cell sorting.

Dysplastic megakaryocytes from a patient with a myelodysplastic syndrome initiated by a U2AF1 mutation.

Extensive changes in the structural and cellular composition of the bone marrow during the progression from myelofibrosis to secondary acute myeloid leukemia. Color scheme: collagen I – plum; collagen III – yellow; CD34 – green (co-expresses with blue CD31 to make the blood vessels teal); CD61 – red (co-expresses with the blue CD31 to make megakaryocytes magenta); CD31 – blue; smooth muscle actin – orange.

Flow Cytometry Core
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Oncology researchers at Washington University School of Medicine have been at the forefront of numerous discoveries that have advanced the understanding or changed the course of treatment for a wide variety of cancers. The University is ranked #3 overall among the National Institute of Health’s funded institutions in fiscal 2019, with $218.79 million received in NIH grants. Of that, just over half — $110 million in direct and indirect costs — was awarded for basic and clinical oncology research efforts. In addition to researchers in the Division of Oncology, funds go toward several collaborative, multidisciplinary oncology research efforts that involve investigators at Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine as well as researchers and physician scientists in the university’s Bursky Center for Human Immunology and Immunotherapy Programs (CHiiPs) and the McDonnell Genome Institute. The institute is one of only three NIH-funded, large-scale genome sequencing centers in the country.

Within the division, oncologists lead one of the largest and most robust clinical oncology research programs in the United States. Many have conducted first-in-human clinical trials of innovative cancer therapeutics. The Division also has a designated program for the rapid translation of innovative basic research findings into clinical trials. Researchers here were the first to sequence the complete genome of a leukemia patient and, through the years, have been leaders in the development of new treatments and personalized gene and immunotherapy approaches. Scientific investigations reflect a broad range of cancer disease types. To fast track promising therapeutics, the Division oversees robust developmental therapeutics and drug development programs for the rapid translation of innovative basic research findings into early phase clinical trials and, ultimately, into clinical practice. Distinguished faculty have served as leaders in several National Cancer Institute research consortiums, including the Alliance for Clinical Trials in Oncology, the Blood and Marrow Transplant Clinical Trials Network, the AIDS Malignancy Consortium, and the Experimental Therapeutics Clinical Trials Network. In addition, several faculty are members of the National Academy of Medicine and National Academy of Sciences and hold leadership positions on the National Cancer Advisory Board as well as the American Society of Transplantation and Cellular Therapy, among others.

In FY 2019, Washington University School of Medicine received $110 Million* from the National Institutes of Health for cancer research in multiple divisions and centers across the campus. *includes direct and indirect costs
Clinical Research

Geoffrey Uy, MD
Medical Director for Clinical Research

Yi Zhang, RN, JD
Director of Clinical Research

Clinical research is a critical component of the mission of the Division of Oncology at Washington University School of Medicine and Siteman Cancer Center. In 2019, the Division accrued a total of 4,462 patients to 605 active trials. This includes 1,367 patients to 443 interventional studies, making our clinical research program the largest and most robust cancer research program in the Midwest. Clinical trials include both observational and interventional studies and cover a broad range of cancer types and therapeutic interventions with specific expertise in conducting early Phase 1, cellular and immunotherapy trials. Approximately 200 research staff support the clinical research program.

Clinical trials are organized around 12 primarily disease-based groups:

- Hematologic Malignancies and Bone Marrow Transplant
- Breast
- Gastrointestinal
- Genitourinary
- Neuro-Oncology
- Developmental Therapeutics
- Melanoma and Skin
- Thoracic
- Supportive Care
- Head and Neck
- Lymphoma
- Sarcoma

Centralized services include regulatory, budget and finance, protocol content administration and quality assurance, training and education programs. The Division has active clinical trials that are sponsored by the National Institutes of Health, Washington University School of Medicine, other institutions or industry partners.

The Division has several strategic relationships with pharmaceutical companies and contract research organizations, including the Genentech Immunotherapy Centers of Research Excellence (imCORE™) Network and the Quintiles Early Phase Oncology Network. In addition, Washington University School of Medicine maintains reliance agreements with independent central IRBs to streamline operations, including the NCI CIRB, WIRB-Copernicus (WCG) and Advarra and operates master clinical trial agreements with more than 40 major pharmaceutical companies and contract research organizations.

The primary site for clinical trials is Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine, which houses the Division’s Investigational Drug Service. Research also is supported at Barnes-Jewish West County Hospital, Barnes-Jewish St. Peters Hospital, Siteman Cancer Center at Northwest HealthCare, Siteman Cancer Center-South County, and Siteman Cancer Center at memorial Hospital East.
Specialized Program of Excellence (SPORE) in Leukemia

Daniel Link, MD
Alan A. and Edith L. Wolff Distinguished Professor of Medicine
Principal Investigator

Total Funding to Date: $17,654,856
Washington University School of Medicine is home to one of only three SPORES in Leukemia in the United States.

SPORE grants, awarded by the National Cancer Institute (NCI), are given to leading oncology research institutions to focus on the rapid translation of novel interdisciplinary and collaborative investigations that could lead to the prevention, early detection, and treatment of specific cancers.

The SPORE in Leukemia grant was first awarded to Washington University investigators in 2013 and renewed for an additional five years in 2018. The multi-million dollar collaborative research effort involves more than 20 clinicians and scientists here who are focused on discovering new therapies for acute myeloid leukemia (AML) and myelodysplastic syndromes (MDS).

Among the latest and most exciting research is the development of natural killer (NK) cell immunotherapy for AML. Todd Fehniger, MD, PhD, have found that treatment options following relapse are limited. Scientists here are investigating an alternative therapy with the drug BL-8040, a novel and potent inhibitor of CXCR4. T-ALL and T-JBL are “addicted” to signals generated by the CXCR4. Indeed, blocking these signals with BL-8040 induces massive leukemic cell death in laboratory. These observations have led to a clinical trial of BL-8040 in combination with nelarabine for relapses T-ALL and T-LBL. Early clinical results are promising, with complete remission achieved in approximately 50% of patients.

The Genomics of Acute Myeloid Leukemia Program Project Grant (GAML PPG)

Timothy J. Ley, MD
Lewis T. and Rosalind B. Apple Chair in Oncology
Principal Investigator
Renewed continuously since 2003
Total Funding to Date: $49,124,258

The GAML PPG is an NCI-funded grant that focuses on the genetic and epigenetic changes that underlie AML initiation, progression, and relapse. It is the only program project grant in the United States focused on AML genomics. Specifically, researchers are seeking to better understand the interplay of mutations and the gene expression patterns in AML patients at various stages of their disease.

The grant supports four research projects:
- Genetic and epigenetic characterizations of intermediate-risk AML
- Novel approaches to improve patient responses to stem cell transplantation
- Genetic and epigenetic characterizations of secondary AML
- Genetic and epigenetic characterizations of AML initiated by TIPS3 mutations
The physicians and scientists within the Division are national and international leaders in their respective oncology subspecialties. They serve as leaders in National Cancer Institute clinical research consortiums, including the Alliance for Clinical Trials in Oncology, ECOG-ACRIN Cancer Research Group, Blood and Marrow Transplant Clinical Trials Network, AIDS Malignancy Consortium, and the Experimental Therapeutics-Clinical Trials Network. In addition, our investigators are active members of the Cancer Immunotherapy Network, Multiple Myeloma Research Consortium (MMRC), Hoosier Oncology Group, Pancreatic Cancer Action Network, and Sarcoma Alliance for Research through Collaboration (SARC). Network, and Sarcoma Alliance for Research through Collaboration (SARC).

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All work collaboratively with researchers from other departments across Washington University School of Medicine as well as with investigators in other leading oncology programs across the country and around the world.

WU Multi-Investigator Research Grants

Edward P. Evans Foundation Multidisciplinary Grant

A $5 million grant from the Edward P. Evans Foundation endowed a new center established in 2019 that is focused on advancing research and improving treatments for myelodysplastic syndromes (MDS). The center is led by Matthew J. Walter, MD, the inaugural Edward P. Evans Endowed Professor of Myelodysplastic Syndromes. The multidisciplinary effort involves researchers from oncology and cardiology as well as scientists in the McDonnell Genome Institute at Washington University School of Medicine. Research in the center also is funded by the Department of Medicine and Siteman Cancer Center.

Siteman Cancer Center Multidisciplinary Research Programs

Seven formal research programs coordinated by Siteman Cancer Center, four are directed or co-directed by researchers in the Division of Oncology.

- **Solid Tumor Therapeutics Program (STTP)** — focused on the discovery of somatic and germline genomic alterations that are either shared or unique across various solid tumor malignancies. Includes 47 researchers from 14 departments at Washington University. Co-Directors: Ramazawmy Govindan, MD; Joshua Rubin, MD, PhD; Ryan Fields, MD

The following also are large Washington University multi-investigator, collaborative research grants involving Division faculty:

**NCI Alliance U10**

(Pt: N. Bartlett)

UG1CA233339 - Washington University/Siteman Cancer Center Lead Academic Site – N. Bartlett (Medical Oncology); P. Thaker (OBSVYI), B. Siegel (Radiology); B. Kozower (Surgery), C. Robinson (Radiation Oncology). 03/19 - 02/25. The fundamental goal is to create a supportive environment that fosters scientific leadership and mentorship; the development of cooperative group clinical trials; substantial accrual to clinical trials; and exceptional conduct of clinical trials.

**NCI PDX grant**

(Pt: L. Ding and R. Govindan)

US4CA224083 - Washington University PDX Development and Trial Center (WU-PDTC) – R. Govindan (contact PI), Li Ding, Shunqiang Li. 09/17 - 08/22.

As part of National Cancer Institute’s PDXNet program, the WU-PDTC is developing and characterizing patient-derived xenografts (PDXs) across all major tumor types to advance the ability to predict clinical responses to new molecularly targeted agents under development.

**NIH/NCI: US4 CA199092 Center for Multiple Myeloma Nanotherapy**


The objective of this effort is to develop nanotherapeutics to treat multiple myeloma.

**NIH/NCI: 1 P30 CA18142 Cancer Center Support Grant**


Supports Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine as a multidisciplinary comprehensive cancer research facility dedicated to advancing cancer diagnosis, treatment, and prevention.

**NIH/NCI: 1 UG1 HL138669-01 BMT-CTN**


The goal is to achieve designation of the Washington University Bone Marrow Transplant program as a Core Clinical Center for the BMT Clinical Trials Network (CTN).

**Multi-Institutional Collaborations**

Investigator-initiated, multi-institutional studies of novel therapeutic approaches and major multi-center clinical trials include:

- **Novel bispecific antibodies for the treatment of acute myeloid leukemia (J. DiPersio, P. Westervelt)**
- **Cytokine-induced memory-like NK cells for the treatment of acute myeloid leukemia (T. Fehniger)**
- **Registration study of palbociclib plus cetuximab in head and neck cancers (D. Akis)**
- **Adjuvant Lung Cancer Enrichment Marker Identification and Sequencing Trials (ALCHEMIST) study for EGFR mutated lung cancer (R. Govindan)**
- **ALTernate approaches for clinical stage II or III Estrogen Receptor positive breast cancer Neoadjuvant Treatment (ALTERNATE) (C. Ma)**
- **Gene-edited CAR-T for treatment of T-cell malignancies (J. DiPersio, M. Cooper)**
- **BCMA-Csi CAR-T for treatment of myeloma (J. DiPersio)**
- **Novel nanoparticle therapy for myeloma (S. Achilefu, M. Rettig)**
- **Novel JAK 1/2 inhibitors for treatment of GVHD (J. Cha)**

Matthew Walter, MD, heads the multidisciplinary Edward P. Evans Center for Myelodysplastic Syndromes.
Haeseong Park, MD, MPH
Director

The Division’s Developmental Therapeutics Program is exemplified by its rapid translation of innovative and groundbreaking basic research into the clinical setting. The program oversees a Fast Track clinical trial activation process, which enables innovative early phase therapeutic trials to be fully activated in as little as eight to nine weeks.

The DT program has launched multiple first-in-humans, first-in-class studies with some of the newest drugs in the oncology pipeline. The program is not only a preferred site for multiple industry partners for conducting their early phase trials but also a chosen site for conducting phase 1 trials to be fully activated in as little as eight to nine weeks.

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Accelerated track approval timeline:

- **Initial IRB Approval:** 2/20/2020
- **Timeline from submission to first patient treatment:** 64 days
- **Timeline from submission to trial activation:** 3/26/2020
- **First Patient Accrual:** 3/12/2020

**Washington University’s Developmental Therapeutics Program**

The Division’s Developmental Therapeutics Program is a member of the Experimental Therapeutics Clinical Trials Network (ETCTN) via the NCI’s Cancer Therapy Evaluation Program (CTEP). This network has been evaluated in patients with breast, lung, prostate, and pancreatic cancers as well as in patients with glioblastoma. A Phase I trial using personalized DNA vaccine in patients with resected pancreatic cancer is ongoing via the DT program. This study also is one of pancreas Specialized Program of Research Excellence (SPORE) projects. The DT program has a robust clinical trial portfolio encompassing immunotherapy, targeted therapy, antibody-drug conjugate, epigenetic modifiers and other novel therapeutic inventions. The DT core investigators are researchers with dual role of being early phase investigators and disease experts. The DT core meeting occurs monthly with a purpose of brainstorming new ideas of clinical trial and clinical research.
Complementing the Developmental Therapeutics Program is a comprehensive effort to translate discoveries and therapies identified by Washington University School of Medicine researchers into new drugs optimized for oncology clinical trials.

The goal of the Drug Development Program is to understand the disease mechanisms being targeted for a specific disease, and to determine if any drug molecules have already been identified that are related to that particular cellular pathway or mechanism. Potent, novel drug analogues that have appropriate pharmacologic and physiochemical properties will then be designed to optimally target these mechanisms, leveraging the knowledge already reported in the scientific literature. The optimization process is very strategic and results-oriented, with the intent of rapidly identifying and advancing new drugs or drug combinations for human clinical trials targeting the desired disease indication.

The Drug Development Program is led by pharmaceutical scientist and molecular biologist Peter Ruminski, MS. He has 40+ years of expertise in drug discovery and development within the pharmaceutical industry (Searle, Pharmacia, and Pfizer) and previously led a Drug Discovery Center at an academic medical center prior to joining the Division of Oncology.

Current projects include identifying novel drugs or synergistic drug combinations to treat graft vs. host disease, AML, and multiple myeloma, and novel drug combinations for more efficient peripheral hematopoietic stem cell mobilization used in the treatment of various forms of leukemia. These novel blood stem cell mobilization drugs can also be applied toward efficient collection of these stem cells that can then be modified using CRISPR technologies to correct genetic mutations in diseases such as sickle cell disease.

Additional collaborations with researchers in oncology have also been established to identify and develop novel therapies to treat intestinal cancers and malignant peripheral nerve sheath tumors.
At the core of the Division’s research efforts are basic investigations that consistently have led to increased understanding of cancer risk, progression and relapse as well as to novel therapeutics. In FY2019, $35.7 million (direct and indirect funding) was awarded to division faculty for basic research efforts. In a significant number of studies, division researchers collaborate on multidisciplinary and multi-institutional investigations in which they serve as principal investigators. Research efforts are diverse and extend to all fundamental and translational aspects of cancer biology. Faculty members are world leaders in cancer genomics and epigenomics. Researchers here were the first to sequence a cancer genome, which became the foundation of personalized cancer care here and around the world. Scientific investigators study basic aspects of stem cell trafficking and hematopoiesis as well as T cell and NK cell biology. Work focuses on the physiologic processes involved in optimizing CAR-T and other cellular therapies for therapeutic use, defining novel targets for drug therapy, constructing high throughput screens and CRISPR/Cas9 screens for targeting various pathways and genes implicated in the initiation and progression of solid tumors and hematologic malignancies. Researchers also have been at the forefront of technology development and transfer — from the design of novel single cell genomic platforms to imaging techniques to better identify tumors in preclinical models and in man. A distinguishing factor is the development of many elegant mouse models of disease and immunodeficient mouse models used to propagate human tumors that have enabled faculty to generate and test key hypotheses relating to cancer biology and provided insights into novel therapeutics for use in the clinic.

Basic Laboratory Structure

The Division has intentionally linked all of its basic research labs with both translational and clinical investigators who can provide key insights into the human cancers studied in the lab and translate discoveries into the clinic. Research is conducted in 46 different labs on the Washington University School of Medicine campus. The research facilities, which comprise both wet and dry laboratory space, are intelligently grouped by common interests and focus and are consolidated in six major locations on campus:

- **Southwest Tower:** Hematopoiesis, cellular therapies, leukemia, myelodysplastic syndromes (MDS) and hematopoiesis, cancer genomics, proteomics and epigenetics
- **Wohl building:** Myeloma, solid tumor immunotherapy, transcriptional regulation and non-coding RNAs
- **Couch Building:** Breast cancer, metabolomics and mass spectroscopy, sarcoma and single cell genomics
- **BJC Institute of Health:** Tumor invasion, tumor microenvironment, solid tumor immunology
- **McDonnell Genome Institute:** Genomics, gene therapy and genetic counseling
- **Clinical Sciences Research Building:** DNA repair, DNA replication

From 2009 to 2019, researchers in the Division of Oncology were awarded $260.4 million* in grants from government, private, and industry sources.

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*Direct and indirect costs

**Division of Oncology Research Grant Award Totals, FY2009 to FY2019 in millions**

- 2009: $14 million
- 2010: $15 million
- 2011: $17 million
- 2012: $16 million
- 2013: $15 million
- 2014: $17 million
- 2015: $16 million
- 2016: $18 million
- 2017: $17 million
- 2018: $18 million
- 2019: $25 million

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Bioclassifier
Focused on applications with Prosigna, a laboratory testing kit that categorizes breast tumors into one of four main types, which is then used to determine cancer recurrence risk and viable treatment options. Sub-licensed to NanoString Technologies. Sub-licensed to Veracyte. In collaboration with the University of North Carolina, University of Utah and BC Cancer Agency in Canada.

Precision Diagnostics
Focused on precision analytics and advanced, ultra-high sensitivity LC-MS/MS technology for clinical urine and oral fluid drug testing.

True Diagnostics
Focused on the development and manufacturing of a wide range of diagnostic tests.

Start-Ups
As research moves into practical clinical use, the Division develops collaborations or establishes start-up companies to rapidly accelerate translation to patient care. Since 2009, more than 20 licensing agreements have been signed with existing or start-up companies. These agreements involve the development of:

- Innovative research tools such as antibodies and humanized cancer models
- Novel diagnostic tools, including gene signatures
- Promising treatment options, such as antibodies and engineered immune cells

Companies
Four companies have been established to further research efforts.

Wugen
Focused on the development of off-the-shelf CAR T-cell therapies for the treatment of T-cell leukemias and lymphomas, including acute myeloid leukemia (AML) and multiple myeloma (MM).

Base Case
Preventing Friendly-Fire
Preventing GvHD

WU-CART-007, developed by Wugen, is an off-the-shelf, self-killing resistant CAR T for the treatment of T-cell cancers. In this image:

A: healthy T-cells and malignant T-cells share the same surface proteins (target antigens). B: Deletion of the target antigen from the surface of the engineered CAR T-cell prevents fratricide while ensuring CAR T-cells kill malignant T-cells. C: Deletion of the T-cell receptor enables use of T-cells from healthy donors without the risk of life-threatening Graft vs. Host Disease (GvHD). D: Shows WU-CART-007 as self-killing resistant CAR-T.

Illustration courtesy of Wugen

Research within the Division of Oncology has led to numerous discoveries that have translated from scientific investigations to novel pharmaceuticals and therapies.

Over the past 20 years, researchers in the Division have submitted more than 200 patent applications, with 68 patents issued to date for technologies developed here. These technologies provide novel methods of diagnosing and/or more safely and effectively treating a broad range of tumors. Examples include the development of immune cells with genetically encoded chimeric antigen receptors that have been proven to stimulate stronger anti-tumor immune responses and the creation of biologic drugs that can increase the recruitment of immune cells to tumors. Other patents have been issued for diagnostic tests that can more accurately subtype breast cancer to determine risk and better identify effective treatment options.

Patents
Number of Applications: 221
Number issued: 68

Licensing Agreements, 2009–2020
24

Start-Ups
Companies
Bioclassifier
Precision Diagnostics
True Diagnostics

Patents

20

221

68

24

Wugen

Base Case
Preventing Friendly-Fire
Preventing GvHD

WU-CART-007, developed by Wugen, is an off-the-shelf, self-killing resistant CAR T for the treatment of T-cell cancers. In this image:

A: healthy T-cells and malignant T-cells share the same surface proteins (target antigens). B: Deletion of the target antigen from the surface of the engineered CAR T-cell prevents fratricide while ensuring CAR T-cells kill malignant T-cells. C: Deletion of the T-cell receptor enables use of T-cells from healthy donors without the risk of life-threatening Graft vs. Host Disease (GvHD). D: Shows WU-CART-007 as self-killing resistant CAR-T.

Illustration courtesy of Wugen
The Hematology-Oncology Fellowship Training Program at Washington University School of Medicine is a three-year, ACGME-accredited program. The curriculum is designed to attract outstanding physicians and train them for successful careers in the fields of hematology and oncology with a focus on academics.

The fellowship program, administered jointly by the Divisions of Hematology and Oncology in the Department of Medicine, is highly competitive. The program accommodates up to 24 fellows, with eight positions offered annually through the NRMP Match. Additional non-accredited opportunities exist for advanced training in Bone Marrow Transplant and Medical Oncology.

Fellows come from across the United States and from around the world. To date, the program has trained more than 250 clinical fellows and numerous graduate and postdoctoral research fellows.

The overwhelming majority of graduates double-board in hematology and oncology, with 66 percent of fellows transitioning into academic positions. Many alumni also are academic and healthcare leaders.
Three Training Pathways:

First-year fellows in the Hematology and Oncology Fellowship Training Program receive broad-based, rigorous clinical training in hematology and oncology and are required to identify a mentored scholarly clinical research project that they will pursue throughout their training. Clinical training sites include Barnes-Jewish Hospital, Siteman Cancer Center, and the John Cochran Veterans Affairs Medical Center in St. Louis as well as several outpatient clinic locations. Subsequent years of training are along one of three pathways, with the majority of fellows choosing the Clinical Investigator or Laboratory Research pathway.

Prepares fellows for a career in clinical research by focusing on clinical research training in a disease-specific setting. Fellows are expected to produce effective clinical research during years 1-3 that results in oral or poster presentations at national or international meetings and peer-reviewed publications under senior mentorship. Fellows are encouraged to apply for clinical research training experiences (ASCO/AACR Methods in Clinical Cancer Research Workshop, ASH Clinical Research Training Institute, Paul Calabresi K12).

Prepares fellows for a career in laboratory research by providing protected research time, laboratory space, and mentorship from an established lab director. Fellows on an ABIM-approved Research Pathway complete one additional year of dedicated research training. Fellows develop a portfolio to obtain independent funding in the future.

Prepares fellows for a career in clinical practice by providing additional broad-based experience in general and disease-specific clinics. Fellows on this track maintain a robust clinical experience throughout all three years of training, with a particular emphasis on community settings.

The primary program goal is to facilitate the career development of future leaders in academic hematology and oncology. To support this mission, our program aims to:

- Develop superb clinicians through a breadth of exposure and strong didactic experience
- Develop successful, independent clinical and laboratory investigators
- Provide outstanding mentorship

Fellowship Research

All fellows are required to design, implement, and complete a mentored prospective clinical trial. Fellows are paired with research mentors based on their clinical interests and receive structured training in clinical research methodology. Mentors guide fellows through the protocol development process that includes formulating a research plan, writing a letter of intent, securing funding, writing a protocol, and accruing and monitoring patients on the protocol. Fellows analyze the data and prepare manuscript(s) for potential publication. Fellows present data on their projects annually at the Division of Oncology’s fall or spring research symposiums.

Research projects initiated by fellows have included:

- Phase 1 or Phase 1/2 Drug Protocols
- Phase 2 Drug Protocols
- Outcomes Projects
- Clinical Biomarker Studies
- Clinical Genomics Studies
- Clinical Imaging Studies
- Health Care Delivery Research

Patrick Grierson, MD, PhD, recently joined the Division of Oncology as an Instructor in Medicine in the Section of Molecular Oncology. Grierson, who served as a research fellow in the laboratory of Kian-Huat Lim, MD, PhD, is now the principal investigator for a study investigating mechanisms of resistance to genotoxic stress in pancreatic cancer, funded by a two-year, $200,000 grant from the Emerson Collective Cancer Research Fund.
The Division of Oncology offers individualized mentoring as well as specific programs designed to support training and advance the research of junior faculty. Each year, a work-in-progress meeting is organized by two physician scientists in the division, Daniel Link, MD, and Ramaswamy Govindan, MD, for junior oncology faculty to present their current research to a panel of senior faculty. The meeting is an opportunity for young investigators to receive career guidance as well as discuss current grant applications, clinical trials, publications, ongoing research activities and other academic pursuits.

In addition, the Division of Oncology oversees several Cancer Research Career Enhancement (CRCE) programs, including:

- **K12 Paul Calabresi Career Development Award Program in Clinical Oncology**
  - Program Directors: Ramaswamy Govindan, MD; John DiPersio, MD, PhD
  - This program supports the development of senior fellows, postdoctoral scholars, and junior faculty through patient-oriented cancer research training, curricula, and mentored projects in order to train a new generation of highly skilled investigators with specialized expertise. The program started in 2012, is supported with funding by the National Cancer Institute (NCI) and includes 36 mentors from various departments at Washington University School of Medicine.

- **T32 Cancer Biology (Molecular Oncology) Pathway Program (CBPP)**
  - Program Director: Lee Ratner, MD, PhD
  - The CBPP supports graduate and postgraduate trainees involved in interdisciplinary cancer biology research. The program began in 2002 with funding from the Siteman Cancer Center and was expanded with NCI support in 2006. The program currently includes 24 faculty members who have substantial research funding and are focused on investigating the molecular basis of solid tumor and hematopoietic malignancy development and progression.

- **R25 Short-Term Research Education and Growth Through Hands-On Experience (STRENGTH)**
  - Program Director: Ramaswamy Govindan, MD
  - The STRENGTH Program is designed for postdoctoral scholars (PhDs or MDs) or junior faculty who are interested in pursuing patient-oriented cancer research. The program began in 2015 and is supported by the National Cancer Institute. It has 24 faculty mentors who oversee hands-on laboratory experiences and didactic training.

- **SPORE in Leukemia Career Enhancement Program (CEP)**
  - Program Directors: Matthew Walter, MD; Geoffrey Uy, MD
  - This CEP supports new, independent investigators in the field of translational leukemia research. Funding is provided for two years, along with didactic training and mentored research opportunities. Awarded have the opportunity to present their research and meet with leadership at other SPORE institutions.

- **SPORE in Leukemia Diversity Program**
  - Program Directors: Daniel Link, MD; Cherilynn Shadding, PhD
  - This one-year, career development program supports minority post-baccalaureate students wanting to conduct basic or translational research in leukemia. Applications are accepted from across the nation.

- **T32 Molecular Hematology Research Career Development Program (CDP)**
  - Program Director: Stephen T. Oh, MD, PhD
  - This CDP provides support to five pre-doctoral and eight post-doctoral trainees annually who are interested in pursuing careers in basic and translational hematologic research and who want to make discoveries that will transform the diagnosis and treatment of hematologic diseases. Trainees will work with the program’s 35 faculty mentors during three to four years of laboratory research to complete their dissertation. Applications for this program have been received from around the world. Candidates usually have completed the clinical training component of a hematology-oncology fellowship program at Washington University or elsewhere. The duration of the postdoctoral training program depends on prior experience.

*Washington University School of Medicine also offers a SPORE in Pancreatic Cancer CEP for investigators interested in translational research in pancreatic cancer. This program is overseen by faculty in the Department of Surgery.*
Endowed Professors

Medical Oncologist Matthew J. Walter, MD, the inaugural Edward P. Evans Endowed Professor of Myelodysplastic Syndromes (MDS) at Washington University School of Medicine, is the latest faculty member in the Division of Oncology to be honored with an endowed professorship. An international leader in the study and treatment of MDS, Walter is a professor of medicine and director of the Edward P. Evans Center for Myelodysplastic Syndromes at the School of Medicine.

The endowed professorship and the center are supported by funding from the Edward P. Evans Foundation, established in 1984 by Edward Parker Evans, a businessman and philanthropist who died in 2010 from a blood cancer related to MDS.

An estimated 30,000 Americans are diagnosed with MDS each year. About one-third of these patients develop an aggressive form of the disease that progresses to acute myeloid leukemia (AML), which is a fast-growing blood cancer. Without a successful stem cell transplant, AML is fatal.

Walter studies patients at risk of developing MDS. Some patients have mutations in a few important genes linked to MDS but don’t yet have symptoms. This condition is called age-related clonal hematopoiesis. Even though relatively few of these patients go on to develop MDS, studying this group of patients could help doctors understand the differences between those who develop MDS and those who don’t have the disease.

Photo by Mark Beaven
Faculty

**Section of Bone Marrow Transplant & Leukemia**

**Director**

Peter Westervelt, MD, PhD
Professor of Medicine
AML, MDS

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MPD

**Ramzi Abboud, MD**
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GVHD, Myeloma

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Leukemia

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Hematopathology

**Kiran R. Vij, MD**
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Deputy Director, Siteman Cancer Center
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### Stem Cell Biology continued

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<thead>
<tr>
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<th>Title and Affiliation</th>
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</thead>
<tbody>
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<td>Matthew J. Walter, MD</td>
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Many of the activities and research projects in the Division of Oncology are supported by generous donations from families, faculty, alumni, and organizations, among others.

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Cover Image:
In the laboratory of Carl DeSelm, MD, PhD, two engineered CAR T-cells are attacking and killing a pancreatic cancer cell. DeSelm, an assistant professor of radiation oncology, is part of a multidisciplinary and collaborative team of investigators within the Division of Oncology’s Center for Gene and Cellular Immunotherapy studying novel CAR immune therapies for solid tumors.

Carl DeSelm, MD, PhD, 2020