



ACCELERATING TOWARDS A CURE

2019 ANNUAL REPORT

COLUMBIA UNIVERSITY
HERBERT IRVING COMPREHENSIVE
CANCER CENTER

The Herbert Irving Comprehensive Cancer Center (HICCC) is the home for cancer research and patient care at Columbia University and NewYork-Presbyterian/Columbia University Irving Medical Center. Our cancer center researchers and physicians are dedicated to understanding the complex biology behind cancer, from before it begins to its evolution and spread.

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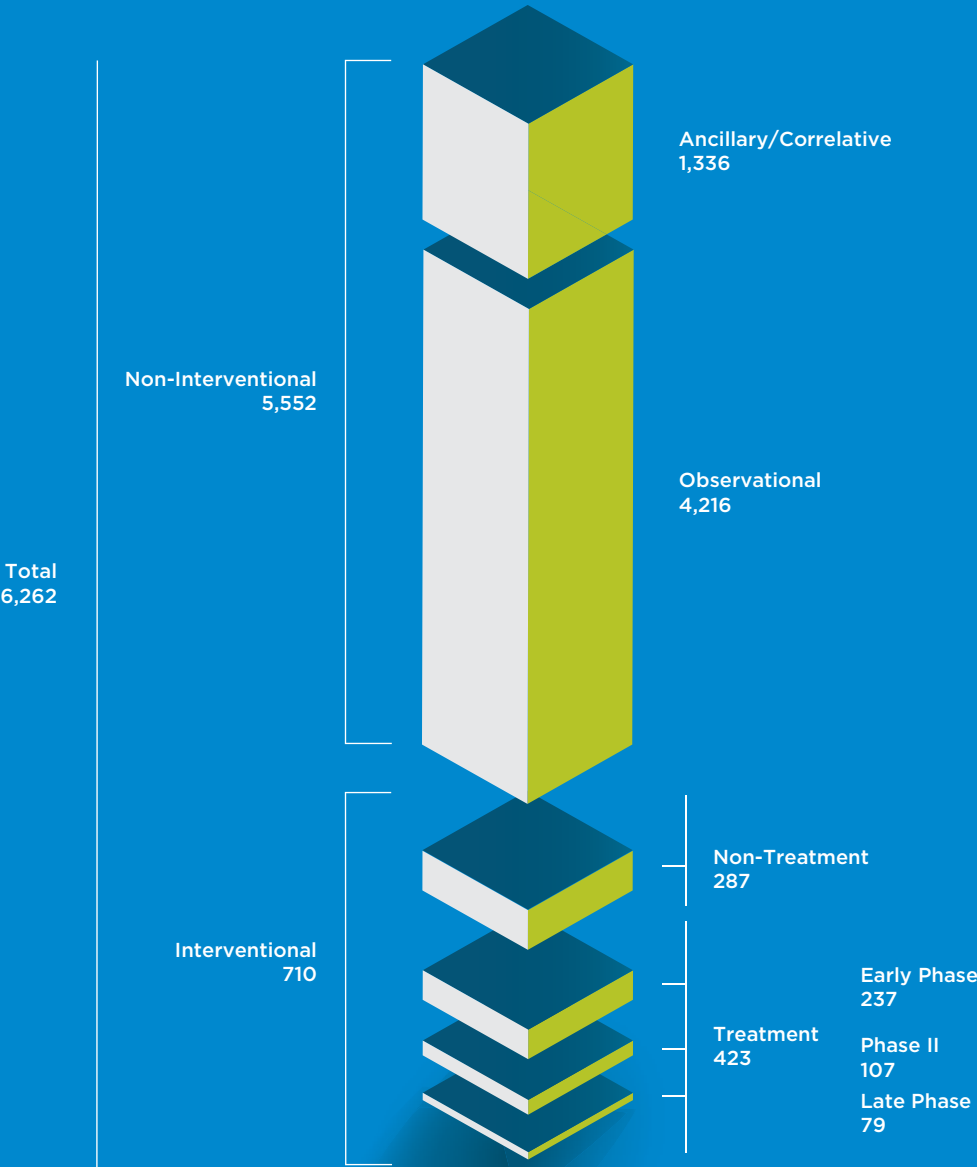
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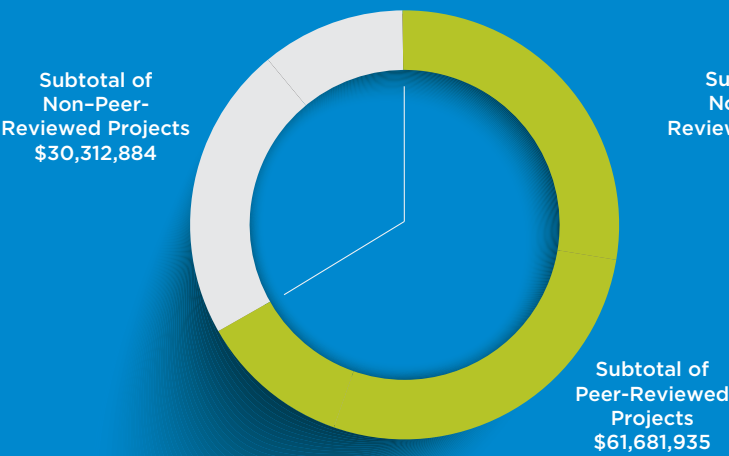
HICCC RESEARCH SNAPSHOT

The Herbert Irving Comprehensive Cancer Center (HICCC) has a wide-ranging portfolio of basic, clinical and population science research supported by funding from government, foundation, and industry partners.

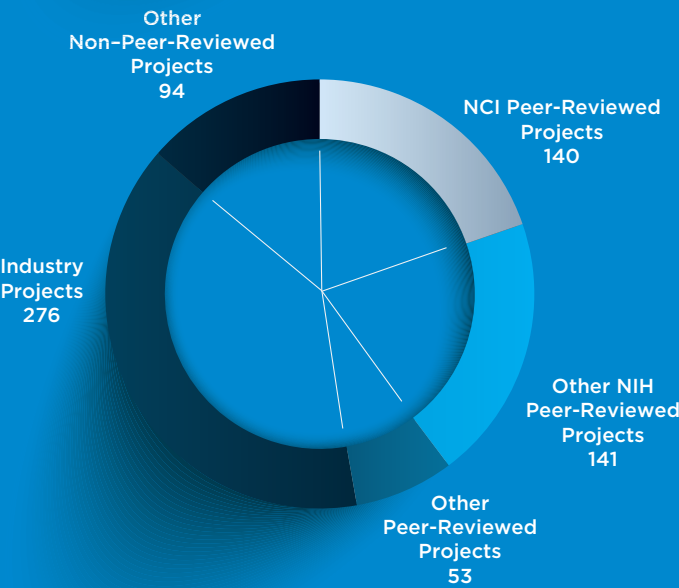
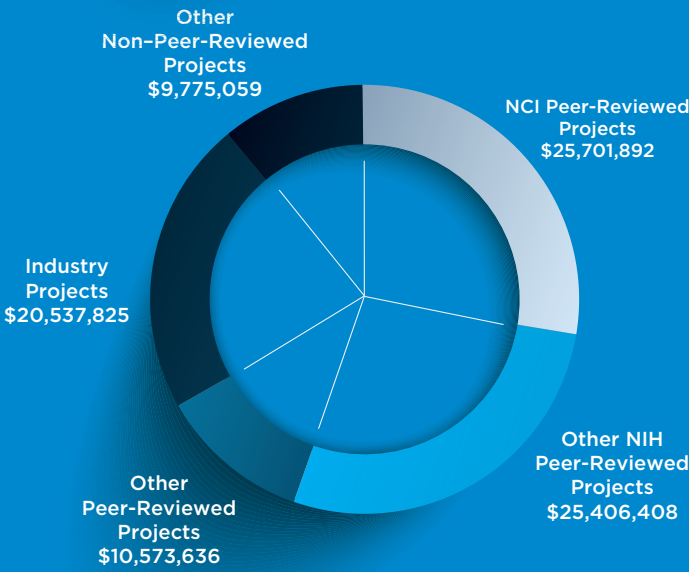
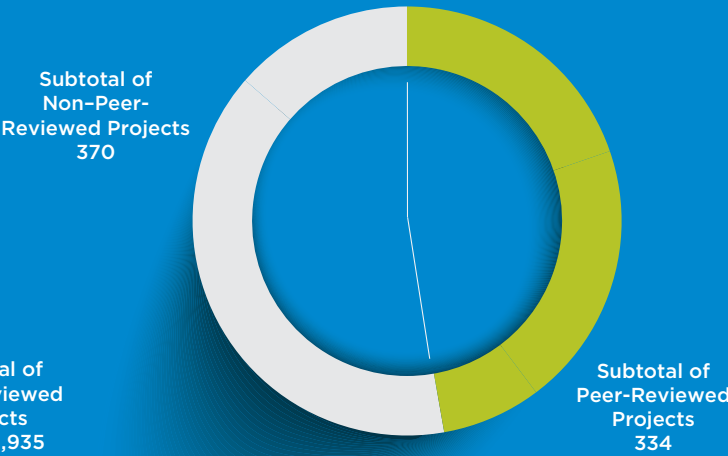
TOTAL CLINICAL TRIAL ENROLLMENTS 2018



RESEARCH FUNDING BY SOURCE



RESEARCH PROJECTS BY FUNDING SOURCE



Grand Total (All Projects) \$91,994,819

Grand Total (All Projects) 704



MISSION, VISION, AND GUIDING PRINCIPLES

VISION

Our discoveries here
can end cancer everywhere.

MISSION

Working together, we empower innovation and discovery in cancer research, prevention, early detection, therapy, and survivorship to reduce the burden of cancer for our patients, our communities, and the world.

We drive collaboration across disciplines to bring personalized and comprehensive care directly to our patients.

We are the engine of innovation and discovery in cancer research, prevention, therapy, and clinical care at NewYork-Presbyterian/Columbia.

We empower research from bench to bedside and back again.

We celebrate our diverse community as a unique characteristic that defines our cancer center.

We build a culture of compassion and respect, making Herbert Irving Comprehensive Cancer Center a place where people want to come.

HICCC BY THE NUMBERS

COLUMBIA UNIVERSITY
HERBERT IRVING COMPREHENSIVE
CANCER CENTER



NewYork-
Presbyterian



Number of new
cancer cases seen



Community members
screened



New inventions
patented



Publications in
the last 5 years



Countries involved in HICCC
global research programs

DISCOVERY.
COMPASSION.
INNOVATION.

FROM THE DIRECTOR



Anil K. Rustgi, MD

Associate Dean for Oncology
Irving Professor of Medicine
Vagelos College of Physicians and Surgeons
Chief, Cancer Service, NewYork-Presbyterian
Columbia University Irving Medical Center

I am pleased to share with you this inaugural issue of the Herbert Irving Comprehensive Cancer Center (HICCC) Annual Report.

Now in our 40th year as a comprehensive cancer center designated by the National Cancer Institute, the mission of the HICCC remains the same: empowering innovation and discovery in cancer research, prevention, early detection, therapy, and survivorship to reduce the burden of cancer for our patients, our community, and the world.

With more than 180 members spanning six schools and 35 departments across Columbia University, the HICCC brings together a wide range of experts all dedicated to solving cancer. Partnering with NewYork-Presbyterian Hospital, ranked among the top five hospitals in the country, and Columbia University Irving Medical Center, a leading academic medical center ranked #1 in the country in research, the HICCC is the epicenter of the most innovative and cutting-edge research that transforms patient care.

In this inaugural issue of the HICCC Annual Report, we spotlight our four multidisciplinary and comprehensive research programs connecting top researchers, physicians, and allied health care providers across a wide range of disciplines and examining cancer in bold and creative ways. Learn more about how we focus on bench-to-bedside research, rapidly translating our discoveries in the lab to state-of-the-art clinical trials that bring the newest therapies to our patients and taking what we learn from our patients back to our labs to find new ways to stop cancer in its tracks. We are also excited to introduce the new Columbia Precision Oncology Initiative program, launched this year with the goal of taking precision oncology to the next level and making personalized treatments the standard of care for all cancer patients.

Our mission also extends far beyond our campus. We engage and partner with our vibrant Washington Heights/Inwood community, the greater New York City area, Westchester County, northern New Jersey, and beyond to improve access to cancer prevention, clinical trials, and care. Our Community Outreach and Engagement program works with community members to provide resources in health education, prevention, screening, and surveillance, all with the goal of building a healthier community and empowering people to advocate for their own health and health goals. With our partnerships across the globe, we also connect with others to build a healthier world.

Here at the HICCC, our discoveries and compassionate care are changing lives, making a difference in our community, and working to end cancer everywhere.

Anil K. Rustgi

Anil K. Rustgi, MD



discoveries that change lives

180+ DEDICATED RESEARCHERS AND PHYSICIANS

The more than 180 researchers and physicians that are members of the Herbert Irving Comprehensive Cancer Center (HICCC) are dedicated to understanding the complex biology behind cancer, from before it begins to its evolution and spread.

Our programs reflect the changing landscape in cancer research, recently restructured to focus on four key themes: Cancer Genomics and Epigenomics, Cancer Population Sciences, Precision Oncology and Systems Biology, and Tumor Biology and Microenvironment.

Our team of experts collaborate across these themes to drive translation from discovery science to clinical trials and clinical care.

New Framework to Detect Pancreatic Cancer Earlier

A global team of researchers led by Raul Rabadan, PhD, co-lead of Herbert Irving Comprehensive Cancer Center’s (HICCC) Cancer Genomics and Epigenomics Program and professor of systems biology at Columbia’s Vagelos School of Physicians and Surgeons, is working to develop a comprehensive computational framework that will identify high-risk factors for pancreatic cancer.

CANCER GENOMICS AND EPIGENOMICS PROGRAM

LEADERS

Jean Gautier, PhD
Raul Rabadan, PhD

DIRECT FUNDING AS OF APRIL 1, 2019

Total cancer funding: \$22M
Peer-reviewed funding: \$16M

MEMBERSHIP

41 Members
13 Departments, 3 Schools

GOALS

To define the mechanisms, both genetic and epigenetic, that cause genome instability in cancer cells and maintain genome stability in normal cells.

To apply these findings to identify cancer genes and improve cancer therapies, including chemotherapy, radiation therapy, and immunotherapy.

Pancreatic cancer currently has one of the lowest overall survival rates across all major cancers. The majority of pancreatic cancer patients overall live 8 to 12 months after diagnosis, and the instances of the disease are on the rise. While some key risk factors have been identified—age, non-genetic factors such as obesity, type-2 diabetes mellitus, and smoking, among others, and a handful of genetic mutations—currently known factors only explain a small fraction of the attributable risk of pancreatic cancer. Early detection remains a major challenge. By the time most patients are diagnosed, their prognosis is bleak.

Armed with a two-year, \$1 million grant from the Pancreatic Cancer Collective, Raul Rabadan, PhD and collaborators are attacking pancreatic cancer research from multiple disciplines—genomics, mathematics, and medicine—to provide an integrated, computational approach to studying genomic, environmental, and immune factors that could identify populations at high risk of pancreatic cancer. The need for deeper understanding of the contributing factors to this lethal disease is pressing, as pancreatic cancer is projected to become the second leading cause of cancer-related mortality within the next decade.

Dr. Rabadan’s co-lead investigator on the project is Núria Malats, MD, PhD, head of the Genetic and Molecular Epidemiology Group of the Spanish National Cancer Research Centre (CNIO). The team also includes leading experts from the HICCC Cancer Genomics and Epigenomics Program and researchers from Columbia University and CNIO, including Ken Olive, PhD, associate professor of medicine and member of the HICCC; Tal Korem, PhD, assistant professor of systems biology and core member of the HICCC; Gulam Manji, MD, assistant professor of medicine and member of the HICCC; Ioan Filip, postdoctoral fellow of systems biology; and Esther Molina, a Miguel Servet staff scientist in Dr. Malats’ group.

“Our interdisciplinary team of researchers—from molecular epidemiologists and clinicians to experts in tumor genomics and the microbiome—are working together to tackle this problem,” says Dr. Rabadan. “We are exploring large-scale datasets from the U.S. and Europe to build this new computational framework, and also studying



Photo left to right: Jean Gautier, Raul Rabadan

Raul Rabadan, PhD (standing) uses computational approaches to discover new approaches for cancer therapies.
Photo credit: Jeffrey Schiffman



preliminary epidemiological and genetic observations that link pancreatic cancer risk to the immune system. Our goal is to create a reliable, integrated framework for identifying populations high-risk for this detrimental disease.”

The researchers are focusing on rare gene variants, specific DNA regions and modifications, within large clinical and molecular datasets from multiple published databanks. The datasets include the UK Biobank, European Study on Digestive Illnesses and Genetics (PanGenEU), The Cancer Genome Atlas and the International Cancer Genome Consortium. The team also plans to characterize the tumor microenvironment, specifically the microbiome, and expression of proteins important for immune system regulation.

Attempting to understand the cancer biology of pancreatic tumors is arguably a far more difficult undertaking than most cancer tumors, notes Dr. Olive, an expert in pancreatic cancer research and director of the Oncology Precision Therapeutics Imaging Core at the HICCC, and this is in large part due to the tumor’s unique structure.

“In pancreatic cancer, some cells within the mass of a tumor that are not mutated—the stroma cells—which are

part of your normal body, have been recruited to help drive tumor growth,” says Dr. Olive, and this makes studying tissue samples challenging.

“These stroma cells far outnumber mutant tumor cells, and they make it very difficult to study the tumor biology,” he adds. “We’ve been focusing on how to tease out the biology.”

As part of this new project, researchers are also using a unique dataset from the Olive lab derived from manually carving out non-malignant cells from tumor cells in tissue samples, separating the different cell types and analyzing each component. This, and other complex data sets—clinical outcomes data and microbiome data—will help in expanding the team’s integrated computational platform to identify high-risk factors for the disease.

“Pancreatic cancer has become one of the most deadly cancers,” notes Dr. Rabadan. “Identifying genetic and epidemiological markers can elucidate risk factors that could lead to early detection. Our aim with this project is to greatly improve our ability to screen and identify highly susceptible individuals of this lethal disease.”

Reducing Health Risks for Cancer Patients

Many newly diagnosed cancer patients also are infected with hepatitis B or C virus and are unaware of their viral status, according to a recent study led by Dawn L. Hershman, MD, MS.

CANCER POPULATION SCIENCE PROGRAM

LEADERS

Dawn Hershman, MD, MS
Regina Santella, PhD
Mary Beth Terry, PhD

DIRECT FUNDING AS OF APRIL 1, 2019

Total cancer funding: \$16.6M
Peer-reviewed funding: \$14M

MEMBERSHIP

41 Members
18 Departments, 3 Schools

GOALS

To reduce the burden from cancer on a population level.

The Program conducts observational, cohort, and interventional studies with diverse communities and populations, both locally and globally who are affected, or potentially affected, by cancer.



New cancer patients are rarely screened for viral infections. “This is a significant missed clinical opportunity,” says Dawn Hershman MD, MS, a professor of medicine and epidemiology at Columbia University Vagelos College of Physicians and Surgeons and co-leader of the Cancer Population Sciences program at the Herbert Irving Comprehensive Cancer Center (HICCC). “We have effective treatments for HIV and hepatitis B, and hepatitis C can be cured.”

“Cancer therapies, especially the new immunotherapies, have the potential to reactivate viral infections,” adds Dr. Hershman. “Since patients with viral infections are usually excluded from clinical trials, we don’t know how cancer treatments affect the clinical outcomes of those with hepatitis or HIV.”

Experts disagree over the value of routine screening for hepatitis B and C and HIV in new cancer patients. “While routine screening would likely be helpful, it would also be very expensive,” says Dr. Hershman. “This study is a first step toward determining the prevalence of viral infections among newly diagnosed cancer patients and establishing new screening and treatment guidelines.”

The researchers screened more than 3,000 newly diagnosed adult cancer patients for hepatitis B (either previous or chronic), hepatitis C, and HIV at 41 academic and community oncology practices around the country.

They discovered that 6.5 percent had a previous hepatitis B infection, 0.6 percent had chronic hepatitis B, 2.4 percent had hepatitis C, and 1.1 percent had HIV. The study also found that 87 percent of patients with a previous hepatitis B infection, 42 percent of those with chronic hepatitis B, and 31 percent of those with hepatitis C didn’t know their viral status before they were screened, though 94 percent of those with HIV were already aware of their status.

“Clearly, there is a large, hidden reservoir of cancer patients who have hepatitis,” says Dr. Hershman. “Our findings suggest that routine screening for hepatitis B and C in new cancer patients may be warranted, particularly if it’s shown to be cost-effective.”

The researchers plan to study the cost-effectiveness of viral screening in this patient population. “We also need to gain a better understanding of what factors put patients at risk for viral reactivation and how cancer treatments affect viral infections,” Dr. Hershman says.

Photo left to right: Dawn Hershman, Regina Santella, Mary Beth Terry

A 360-DEGREE APPROACH TO precision oncology

A 360-Degree Approach to Precision Oncology

Researchers at the Herbert Irving Comprehensive Cancer Center (HICCC) have turned cancer research on its head. In addition to harnessing the handful of mutations that have shown response to targeted drugs, they're also honing in on the network of proteins that are crucial for keeping cancer alive.

PRECISION ONCOLOGY AND SYSTEMS BIOLOGY PROGRAM

LEADERS

Andrea Califano, Dr.
Richard D. Carvajal, MD

DIRECT FUNDING AS OF APRIL 1, 2019

Total cancer funding: \$23M
Peer-reviewed funding: \$10.6M

MEMBERSHIP

40 Members
12 Departments, 3 Schools

GOALS

To address the increasing complexity of cancer by:

Developing innovative and quantitative models that look at cancer from all sides

Translating molecular- and image-based biomarkers to develop more precise cancer therapies

Cancer therapies have traditionally been based on the tumor site, like breast cancer or lung cancer. More recently, researchers have found that cancers across tumor sites have common genetic mutations, and those mutations can be targeted with specific drugs.

Precision oncology goes beyond looking at cancer by tumor site, using genetic sequencing to uncover a patient's specific tumor mutations and deliver personalized therapies. The challenge with precision oncology is the vast amount of genetic information in cancers—the number of mutations that can cause cancer are greater than the number of atoms in the universe—which makes it difficult to identify which drug will work best for each patient based on all their specific genetic mutations. The majority of tumors lack known genetic mutations that can be targeted with existing drugs.

The Columbia Precision Oncology Initiative (CPOI) was introduced in November 2019 with the goal of taking precision oncology to the next level, making personalized treatments standard of care for all cancer patients. Led by three investigators from diverse disciplines, the CPOI is attacking cancer from all sides—using cutting-edge genetic sequencing, computational models that help physicians understand each patient's unique cancer, the latest immunotherapy, and world-class multidisciplinary teams that deliver the top care to cancer patients.

"We hope that our new initiative will be a huge step forward in making personalized oncology care routine for cancer patients."

—Richard Carvajal, MD
Director of Experimental Therapeutics and the Melanoma Service at Columbia University Irving Medical Center

The Power of Predictive Mathematics

Researchers at the HICCC have turned cancer research on its head. In addition to harnessing the handful of mutations that have shown response to targeted drugs, they're also honing in on the network of proteins that are crucial for keeping cancer alive. Mathematicians and computational biologists in the Department of Systems Biology have developed algorithms to identify these master regulators, the "engine room" of the tumor, and find therapies that target and turn off these proteins, effectively killing the cancer.

"Using novel systems biology methodologies, which combine the use of supercomputers with large-scale pharmacological assays, we can computationally predict and prioritize drugs and drug combinations that will most effectively kill cancer cells," explains Dr. Andrea Califano, chair of the Department of Systems Biology at Columbia University Irving Medical Center.

Using this network approach, Dr. Califano has launched a new kind of RNA-based clinical study, called an "N-of-1 trial."

Unlike standard clinical trials, the N-of-1 approach targets each patient on an individual basis. This approach is especially promising for patients who, following initial response to a standard of care drug or drug combination, may relapse thus providing few effective therapeutic strategies to the treating oncologist other than best guess.

"N-of-1 clinical trials explore different treatment options based on each patient's unique genetic makeup and cancer biology," says Dr. Califano. "We hope that this approach may offer the oncologist new alternatives when they run out of approved therapies, alternatives that are predicated on an increasingly mechanistic understanding of cancer cell regulation and response to drugs rather than on educated guesswork."

Going Beyond Next-Generation Sequencing

Next-generation sequencing has provided the foundation for precision medicine, allowing for more rapid and accurate sequencing of DNA, including many genes at once. CPOI will go beyond next-generation sequencing to use the most advanced genetic testing, including innovative RNA-based biomarkers and diagnostic tests developed here at NewYork-Presbyterian/Columbia.

"Where DNA is the book that stores information about each person's genetic expression, RNA is the reader that decodes it," says Dr. Kevin Roth, chair of the Department of Pathology and Cell Biology. "Since RNA is a more complex molecule, our RNA tests can provide a deeper view into a patient's genome, allowing us to identify more precise targeted treatments for each patient."

From the Bench to the Bedside, and Back Again

Taking all of the personalized data for each patient, a team of precision oncology clinical experts work together to identify the best treatment options. Oncologists, pathologists, surgeons, radiologists, immunologists, genetic counselors, and others come together at weekly molecular tumor boards to review each patient's case and the newest potential treatments, including clinical trials using novel immunotherapies.

Using samples from the patient's tumor, researchers then develop personalized tumor models to test each therapy option to find the most effective one. These models more comprehensively represent the tumor microenvironment—the complex signaling pathway that surrounds tumor cells—in order to better predict a treatment response. With these new personalized models, HICCC researchers and physicians are able to personalize each patient's therapy before their treatment even begins.

"By more closely connecting our deep bench of laboratory investigators with our world-class clinical team, we will be able to bring our learnings from our patients back to the lab and vice versa," says Dr. Carvajal. "It takes a village to cure cancer, and we are aiming to do that with our NewYork-Presbyterian/Columbia cancer team."



Photo left to right: Andrea Califano, Richard Carvajal



Treatments on the Cutting-Edge Give Patients Hope

As a veteran attorney, Joseph (Joe) Graves is accustomed to putting his clients’ needs first and championing their cases. But these days, Joe is making it a priority to focus on another very important client—himself. More than five years ago, Joe was diagnosed with prostate cancer, and continues his battle to this day.

TUMOR BIOLOGY AND MICROENVIRONMENT PROGRAM

LEADERS

Charles Drake, MD, PhD
Michael M. Shen, PhD
Timothy Wang, MD

DIRECT FUNDING AS OF APRIL 1, 2019

Total cancer funding: \$26M
Peer-reviewed funding: \$16.4M

MEMBERSHIP

49 Members
17 Departments, 4 Schools

GOALS

The Tumor Biology and Microenvironment (TBM) Program investigates the unique biology of the cancer cell and how the non-cancerous cells that surround the tumor impact progression of the disease.

Joseph (Joe) Graves had been getting routine prostate cancer screenings after he turned 45, so when he was diagnosed with aggressive prostate cancer, he says he was “bewildered, confused, and scared.”

Joe met Dr. Charles Drake in late 2014 while Dr. Drake was still at Johns Hopkins. Joe had just undergone surgery and had been in hormone and radiation therapy under Dr. Drake’s care.

“Dr. Drake was the most optimistic. He was compassionate, and he listened,” says Joe. “That was a big deal. He was hopeful.”

A nationally recognized genitourinary oncologist and researcher, Dr. Drake is pioneering the advancement of cancer immunotherapy. Dr. Drake and his collaborators have been awarded two prestigious Prostate Cancer Foundation Challenge Awards, both totaling \$1 million in research funding. The awards are funding advancements in prostate cancer research, and specifically supporting an innovative immunotherapy clinical trial, called MAGIC-8, being led by Dr. Drake and Dr. Matthew Dallos, another genitourinary oncologist at NewYork-Presbyterian/Columbia.

With Dr. Drake’s help, Joe made the decision to enroll in the MAGIC-8 clinical trial at the Herbert Irving Comprehensive Cancer Center (HICCC).

The MAGIC-8 clinical trial was designed by Drs. Drake and Dallos to deliver a novel combination therapy: a triple threat that combines the immunotherapy anti-PD-1, a novel drug designed to block IL-8 and a short course of very active hormonal therapy.

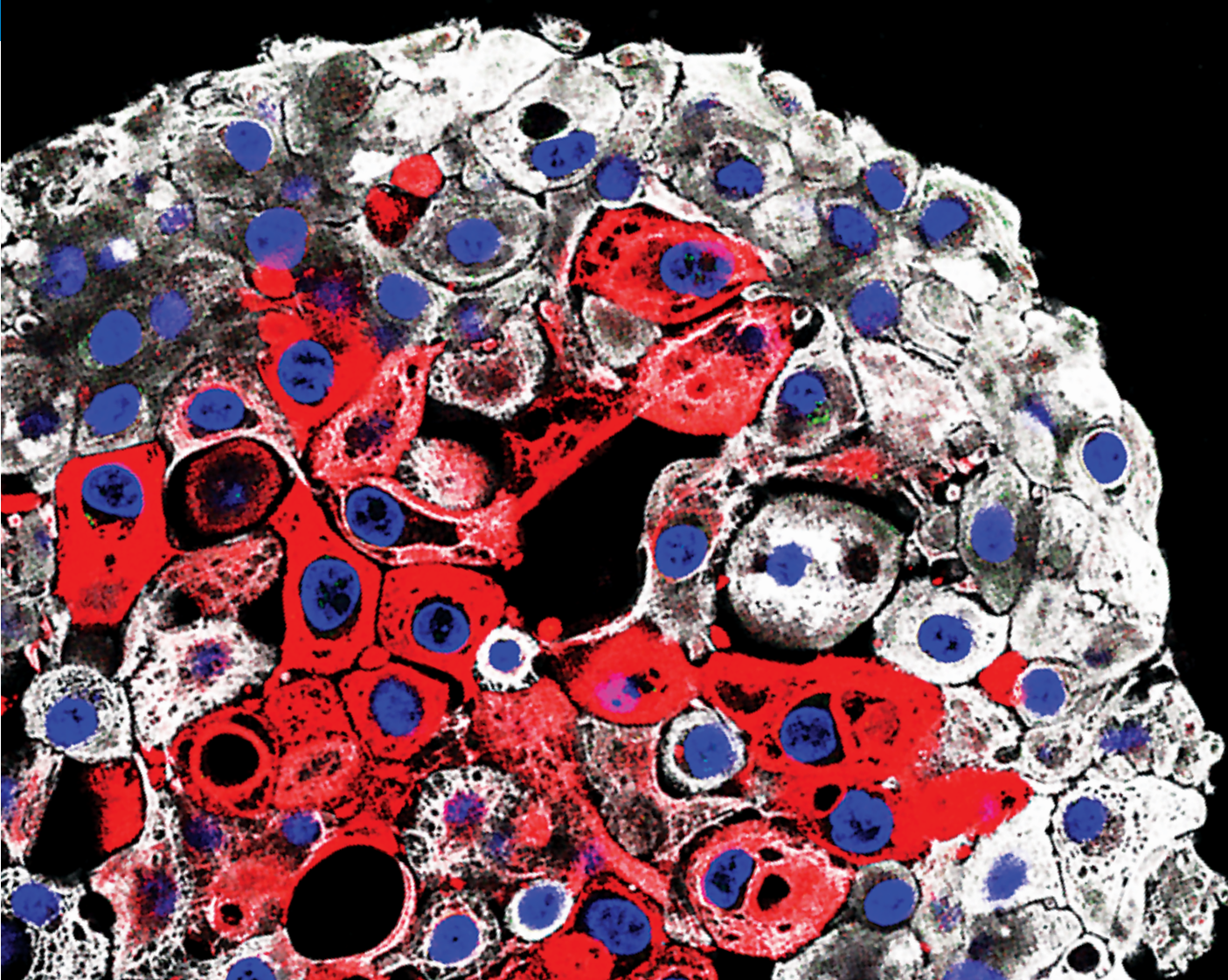
In recent laboratory studies, Dr. Drake and his team found that the immune suppressive protein IL-8 can be highly expressed in prostate cancer, and that blocking IL-8 markedly increases an anti-cancer immune response.

Joe started on the MAGIC-8 trial in March and has been responding well, experiencing only minimal side effects. He keeps an active life, running his own law firm, making time for walks, and heading to the gym routinely. Researching



Photo left to right: Charles Drake, Michael Shen, Timothy Wang

The innovative research being conducted in the Tumor Biology and Microenvironment program includes co-leader Michael Shen’s organoids. These tiny 3-D spheres mimic the characteristics of each patient’s tumor and may be used in the future to identify the best treatment for each patient.
Image credit: Shen lab



immunotherapy on his own, Joe is optimistic about its key role in the future of cancer care, and in his experience, enrolling in a clinical trial has added to his optimism.

“On a clinical trial, you’re getting an opportunity for treatment that isn’t available yet,” says Joe. “If you want an extraordinary result, you have to be open to doing different things and trying treatments that are more cutting edge.”

It has been almost six years since Joe was first

diagnosed with prostate cancer, and he says what keeps him going is remaining positive, and sticking with an oncologist he fully trusts and who also wholeheartedly cares.

“When I have a question for Dr. Drake, he responds right away. He cares about me. He wants me to do well,” says Joe. “Having cancer, things can go bad but why kick the hope away from the patient and only focus on what can go wrong? Bad things happen, but good things can happen for patients, too.”



REACHING OUR COMMUNITY

“It is important to not only reach out to our community but to remain in active engagement to serve the needs of community members.”

—Mary Beth Terry, PhD

Cancer touches us all at the Herbert Irving Comprehensive Cancer Center (HICCC)—a community of physicians, researchers, patients, caregivers, and administrators. Here we have one key goal: to put an end to cancer. The dedicated members of the HICCC’s Community Outreach and Engagement (COE) office are doing their part by making it a mission to reduce the burden of cancer and cancer disparities, specifically in the center’s catchment area, a richly diverse population across race, ethnicity, and socioeconomic status.

Focusing on the five New York City boroughs, Westchester and Rockland Counties in New York, and Bergen County in New Jersey, COE is striving to understand the needs of the populations and patients served by the HICCC, and working to remove access barriers to cancer prevention, screening, treatment, and survivorship services. With community partners and stakeholders, COE develops community- and family-based outreach and research specifically to accelerate cancer prevention within the diverse communities HICCC serves. Some of its key programs focus on tobacco cessation, promoting HPV vaccination, and educating community members about lifestyle changes and increasing physical activity.

During the last five years, COE programming, in partnership with Manhattan Screening Services, has connected thousands of individuals to cancer screening services. Over the last five years, COE has also enrolled over 8,200 individuals in the catchment area into 31 separate studies, and facilitated minority enrollment into clinical trials, a key health disparity that persists today. COE ensures that survivorship resources are available for all HICCC patients, including long-term health needs of patients and caregivers.

BREAKING DOWN BARRIERS TO CANCER CARE

The risk of dying from breast, colon, liver, and prostate cancer is much greater for people who live in Washington Heights than for those living in other parts of New York City, New York state, and the United States.

Researchers and physicians at the Herbert Irving Comprehensive Cancer Center (HICCC)—situated in the heart of this community—have been working to understand and address this disparity.

For the past five years, the cancer center has participated in the National Cancer Institute’s Community Oncology Research Program (NCORP), which brings NCI-funded cancer trials to more communities through 46 sites across the United States. The HICCC is one of only 14 Minority-Underserved NCORP sites focused on offering the latest cancer treatments to minority and underserved patients, which make up the population of Washington Heights and adjacent neighborhoods.

“NCORP allows us to engage in more of the research that will have the biggest impact on cancer patients from our local community,” says Gary K. Schwartz, MD, deputy director of the HICCC and one of the three principal investigators of Columbia’s Minority-Underserved NCORP.

As a Minority-Underserved NCORP site, the HICCC participates in clinical trials that help to diversify clinical trial enrollment. Across the country, fewer than 20% of patients with cancer who enroll in clinical trials are from racial and ethnic minorities. During the first five years of participating in NCORP, the HICCC has consistently enrolled at least one-third of all clinical trial participants from underserved populations in the surrounding community.

“In addition to serving our mission to provide access to care for our community, it is very important from a scientific perspective to include volunteers from all racial and ethnic groups in clinical trials,” says Dr. Schwartz. “The effectiveness of some therapies may vary among different racial and ethnic groups based on genetic makeup, so we need to ensure that our clinical trials include diverse groups of patients to develop the most effective therapies for all.”

Another one of the cancer center’s goals is to understand why drug therapy ultimately fails for some patients, and NCORP has designed trials to help answer this question. The

NCORP Tissue Procurement Protocol: An NCI Cancer Moonshot Study, will focus on why some patients with metastatic cancer stop responding to targeted therapy. The study will look at the molecular profile of these patients to help answer this question. The DNA sequencing results of these tumors will be made available to patients who may not otherwise be able to afford this advanced testing. If the sequencing results identify targetable mutations, patients could be offered additional treatment options.

The HICCC has a long track record of prioritizing community outreach and engagement to reduce the cancer burden and cancer-related health disparities in the local Washington Heights community and surrounding areas.

The HICCC’s Community Outreach and Engagement (COE) office also promotes health education programs in the community and on the NewYork-Presbyterian/Columbia campus to improve vaccination against HPV, the virus that causes cervical cancer, increase physical activity, reduce smoking, and encourage other behaviors that we know reduce the risk of cancer. The COE also promotes cervical, colon, and breast screening to increase early detection of cancer.

In addition to their outreach efforts, COE is collaborating with the NCORP team to increase enrollment in a trial comparing the effectiveness of conventional digital mammography with a new type of imaging called digital tomosynthesis, or 3D mammography.

“Together we are working with community-based organizations to educate people in our community about breast cancer risk and offer them the opportunity to participate in this important study,” says Dr. Schwartz.



“NCORP allows us to engage in more of the research that will have the biggest impact on cancer patients from our local community.”

—Gary K. Schwartz, MD



Physicians and clinical investigators from NewYork-Presbyterian/Columbia take the stage at the annual American Society of Clinical Oncology (ASCO) meeting during the Conquer Cancer Foundation awards. Photo credit: ASCO

“My mentors surround me in an environment where I can thrive as both an investigator and a clinician.”

—Jessica Hawley, MD

THE NEXT GENERATION OF CANCER RESEARCHERS

Young Investigator Award Recipients

Rajat Bansal, MD
Matthew Dallos, MD
Jessica Hawley, MD
Bahar Laderian, MD
Alexander Raufi, MD
Vikram Premkumar, MD

Career Development Award

Matthew Ingham, MD

At the Herbert Irving Comprehensive Cancer Center (HICCC), we are dedicated to not only treating cancer today, but also paving the way for future cancer researchers. The Cancer Research Career Enhancement (CRCE) Core provides cancer-specific educational opportunities and career enhancement activities across the HICCC and educates cancer researchers about the patients’ perspective.

With multiple programs across different education levels—from high school to post-graduate trainees and faculty members—the CRCE provides future and current cancer researchers with educational opportunities to enhance their careers. High school and undergraduate students gain exposure to laboratory research in summer placements with the Continuing Umbrella of Research Experiences (CURE) and Summer Undergraduate Research Fellowship (SURF) programs, inspiring students to pursue careers in STEM (science, technology, engineering, and mathematics) through a unique research experience. For graduate and post-graduate students and professionals, there are nine different training programs supported by the National Institute of Health (NIH) focusing on different subspecialties that range from molecular biology to epidemiology. The training doesn’t stop with the students—faculty members receive ongoing training on how to improve their mentorship skills and help to train future researchers.

RISING STARS IN CANCER RESEARCH

Advances in cancer clinical research and patient care were not the only points of interest covered at this year’s ASCO, the American Society of Clinical Oncology’s annual meeting, held May 31 to June 4. Promising junior investigators shared the spotlight as ASCO honored this year’s class of Young Investigator Award (YIA) recipients, including six physician-researchers from the Herbert Irving Comprehensive Cancer Center (HICCC) at NewYork-Presbyterian/Columbia University Irving Medical Center.

“This is a stellar year for our recipients of the ASCO Conquer Cancer Foundation Awards,” says Gary Schwartz, MD, deputy director of the HICCC. “This is really an amazing achievement for us and speaks to the success of our fellowship program, our outstanding fellows and to our great faculty mentors who have made these grant awards possible.” Conquer Cancer Foundation (CCF) each year provides funding to promising investigators to encourage and promote quality research in clinical oncology.

The one-year young investigator grant funds physicians during their transition from a fellowship program to a faculty appointment. The awardees from NewYork-Presbyterian/Columbia will be focusing their winning research on areas such as immunotherapy in metastatic prostate cancer and in gastric cancer, identifying unique molecular targets for potential therapies in multiple myeloma, and evaluating novel treatments for sarcoma, a rare cancer with more than 50 different tumor subtypes.

Supporting the careers of junior investigators contribute directly to the future of clinical research and patient care. At Columbia, junior investigators are able to work with mentors on grant proposals, and the collaboration between fellows and faculty are critical in training next-generation cancer physician-researchers—a priority at Columbia.

“The summer grant-writing course for our fellows, for instance, has been ongoing for over 10 years, and during this course, our multi-disciplinary fellows in adult and pediatric hematology/oncology, gynecologic oncology, and radiation oncology get practical experience in developing research hypotheses and honing their scientific writing skills,” says Kathy Crew, MD, an HICCC member and associate professor of medicine and epidemiology at Columbia and oncologist at NewYork-Presbyterian/Columbia. Dr. Crew also co-directs the Columbia Cancer Research Training Program for Resident-Investigators (CAPRI) program at Columbia

devoted to training medical residents to conduct relevant, hypothesis-driven research in the cancer field.

“The ASCO Young Investigator Awards,” she adds, “are a great vehicle for new investigators to gain exposure to rigorous clinical and translational research and jump start their academic research careers.”

Dr. Matthew Ingham, a recipient of CCF’s Career Development award, will be investigating the causes of sarcomas—their growth and development—and use these insights to develop new, targeted treatment approaches that are more effective and less toxic than traditional chemotherapy.

He points to his mentor, Dr. Schwartz, a leading expert in sarcomas and melanoma, for his unwavering support and for inspiring him to conduct a humane, compassionate approach to patient care.

YIA recipient Jessica Hawley, MD, a clinical oncology fellow co-mentored by Drs. Charles Drake and Mark Stein, says she is fortunate to count two incredible mentors who have helped support and guide her career as a physician-investigator. Dr. Drake is director of genitourinary oncology and associate director for clinical research at the HICCC, professor of medicine and urology, and an oncologist at NewYork-Presbyterian/Columbia. Dr. Stein is associate professor of medicine at the Vagelos College of Physicians and Surgeons and an oncologist at NewYork-Presbyterian/Columbia.

“My mentors’ distinct but overlapping skillsets really complement each other nicely,” she says. “It’s the perfect marriage of clinical trial investigation and basic science/immunology.” Collectively Dr. Hawley’s mentors have helped her promote and present her research in front of key leaders and faculty outside of Columbia. “They surround me in an environment where I can thrive as both an investigator and a clinician.”

The NewYork-Presbyterian/Columbia group of awardees were honored during a ceremony on May 31 at ASCO in Chicago. Oncology is a diverse medical and research field that draws physician-scientists for a multitude of reasons. But, all have one common goal: to put an end to cancer.

“The field of oncology is progressing rapidly, with new discoveries and treatments being made on a daily basis,” says award recipient Alexander Raufi, MD. “I chose to pursue this field not only because I want to be a part of this change, but also because I want to help bring these advances more rapidly to those affected by cancer...My patients consistently motivate me to engage in research that may both extend and improve the quality of their lives.”

“Dealing with cancer, I found that there are a lot of peaks and valleys. There are days where you receive great news, and some days, bad news. There are days where you feel awful and weak and some days where you feel strong. Living with cancer, it is important to stay the course.”

—Michael Furman

STAYING THE COURSE: MICHAEL’S STORY

When Michael Furman was diagnosed with bladder cancer in 2010, he was 45 years old. Looking back now to the time of diagnosis, he says, “It has been a long road and an interesting journey.”

Michael Furman began his cancer treatment at another cancer center, and had undergone many of the standard treatment options for his cancer, or has he puts it, “I tried every drug they had”. In 2015, Michael enrolled in a clinical trial at the Herbert Irving Comprehensive Cancer Center (HICCC) with Dr. James McKiernan, who heads the Department of Urology at NewYork-Presbyterian/Columbia University Irving Medical Center. After a period of success following this clinical trial at NewYork-Presbyterian/Columbia, Michael’s cancer returned, and in May 2017, he underwent an ambitious 10-hour bladder removal and reconstruction surgery performed by Dr. McKiernan.

After a successful recovery, Michael was soon active again, and just five months later even participated with his wife, Kathleen, and son, David, in Velocity, Columbia’s annual fund-raising bike ride for cancer research.

Two years later unfortunately, Michael learned that his cancer had metastasized to his lymph nodes.

“Dealing with cancer, I found that there are a lot of peaks and valleys. There are days where you receive great news, and some days, bad news. There are days where you feel awful and weak and some days where you feel strong,” he says. “Living with cancer, it is important to stay the course.”

So for Michael, part of ‘staying the course’ meant exploring all treatment options, and enrolling in yet another clinical trial. Clinical trials can be the best treatment option for cancer patients, and provide them access to the most leading-edge treatments.

Michael enrolled in an immunotherapy clinical trial led by prominent genitourinary oncologists, Drs. Emerson Lim and Chuck Drake of the HICCC at NewYork-Presbyterian/Columbia. Immunotherapy is a cancer treatment that is able to kick one’s immune system into high gear to attack their own cancer cells. Researchers have found that the body’s own immune system may slow down or control cancer growth.

In this trial, Drs. Lim and Drake are studying whether a novel DNA-based vaccine can be injected into the body and awaken the immune system. The vaccine incorporates three proteins which are similar to proteins present on cancer cells, and once these have been injected into a patient’s muscle cells, the gene(s) will instruct proteins that may help their own immune system fight the cancer.

Michael jokingly calls this the “weird science” part of the clinical trial, and since joining the trial last March, his cancer cell growth has slowed and the tumors in his lymph nodes have begun to shrink considerably. Michael has had a positive response to the immunotherapy to date. In addition to feeling healthy and energetic—Michael manages a busy New York-based law firm and is known to hit the gym regularly with colleagues—he believes strongly that it is important to take advantage of clinical trials. “It is empowering...I want the study to be successful and I really do feel that clinical trials give hope to others.”

He credits his clinical trials care team for helping him get through the process, and for their dedication. “I never felt like a number at NewYork-Presbyterian/Columbia. You get

individualized care,” he says. “We’re all rooting for the same outcome, a good outcome. And, it’s not just Dr. Lim or Dr. Drake who are heavily invested, it’s everyone.”

Michael, whose cancer journey has included many highs and lows, looks to the NewYork-Presbyterian/Columbia cancer community for constant inspiration. Most notably, this inspiration comes to him while riding the elevators at the Herbert Irving Pavilion. As the elevators stop at each floor, the doors open to reveal a different busy clinic dedicated to a specific type of cancer. A seemingly mundane task—riding up and down a hospital elevator—but for Michael, the takeaway is somewhat positive.

“Cancer is sadly a disease that does not discriminate. On each floor you’ll see young people with cancer, older people, all races and all genders. And, some people look healthy, some frail. If you saw me you would not know that I have cancer,” he says. “You realize you’re all part of the same community. I have been a frequent visitor at the HICCC for many years, and I’m not saddened to be there. To the contrary, I am inspired. There’s always someone else going through their own battle, and their courage inspires me to keep battling as well.”

Michael Furman (left), pictured at Velocity with his surgeon, Dr. James McKiernan.



“I want people to see that you can have cancer and still ride these long distances.”
—Doug Rozen,
rode Velocity while battling cancer

VELOCITY: PEDALING FOR A CURE

More than 1,000 riders, volunteers, and supporters came together on October 6, 2019 for the third annual Velocity: Columbia’s Ride to End Cancer, raising a record \$1.5 million to support cancer research and care at the Herbert Irving Comprehensive Cancer Center (HICCC).

Velocity cyclists rode 10, 25, 45, or 62.5 miles, beginning at four different start areas and merging together onto a single route to cross the George Washington Bridge and end at Columbia University Irving Medical Center as one unstoppable force. One hundred percent of the funds raised by riders support the cutting-edge research happening at the HICCC, helping to achieve better patient outcomes and aiming for a future without cancer.

With community partner, I Challenge Myself, the Community Outreach and Engagement (COE) office of the HICCC encouraged local high school students to ride in Velocity. Last fall, 15 high school students joined the Tour de MORE team (pictured right), cycling alongside faculty, staff, and HICCC community partners in the fight against cancer.



VELOCITY 2019

Riders	724
Volunteers	123
Virtual Riders	63
Total Participants	910
Average Donation	\$109.84
Average Raised Per Rider	\$1,084.76
Sponsors	21
Miles Ridden:	25,840
Distances	10, 25, 45, 62.5 Miles
TOTAL RAISED \$1.5 MILLION	



NEW FACES AT THE HICCC

We welcome the following members who have recently joined the Herbert Irving Comprehensive Cancer Center (HICCC).



Alejandro Chavez, MD, PhD

Assistant Professor of Pathology and Cell Biology, Vagelos College of Physicians and Surgeons
Dr. Chavez focuses on developing new methods with which to modify and regulate eukaryotic genomes to gain fundamental biological insights, with a particular focus towards understanding neurodegenerative diseases and cancer.

HICCC Research Program: Precision Oncology and Systems Biology



Elena Elkin, PhD

Professor of Health Policy and Management, Mailman School of Public Health
Dr. Elkin recently joined the faculty at Columbia University's Mailman School of Public Health. Her expertise lies in breast and women's cancers, emphasizing access to screening mammography and an interest in clinical and population research in cancer.

HICCC Research Program: Cancer Population Sciences



Lauren Houghton, PhD, MSC

Assistant Professor of Epidemiology, Mailman School of Public Health
Dr. Houghton investigates the hormonal etiology of breast cancer, and as a recipient of pilot funding from the Irving Institute for Clinical and Translational Research, she is currently examining screening strategies for women at risk for early onset breast cancer.

HICCC Research Program: Cancer Population Sciences



Nobuko Hijiya, MD

Professor of Pediatrics, Vagelos College of Physicians and Surgeons
Dr. Hijiya's research includes treatment of pediatric leukemias, development of new drugs utilizing a translational approach in collaboration with basic researchers, a broad range of ancillary studies, and cancer survivorship.

HICCC Research Program: Cancer Genetics and Epigenetics



Benjamin Izar, MD, PhD

Assistant Professor of Medicine, Vagelos College of Physicians and Surgeons
Dr. Izar is a physician-scientist whose research, primarily in melanomas, focuses on understanding the interactions of cancer and immunity in tumor development, metastasis, and drug resistance using high-dimensional functional single-cell genomics and imaging.

HICCC Research Program: Precision Oncology and Systems Biology



Lisa Kachnic, MD

Chair of Department of Radiation Oncology, Vagelos College of Physicians and Surgeons
Dr. Kachnic, who joined Columbia in September, is one of the nation's leading radiation oncologists and a pioneer in researching the effectiveness of novel approaches to radiation therapy. One of her key near-term goals as the new chair of the Department of Radiation Oncology is to link the cancer center as well as the Center for Radiological Research efforts with Radiation Oncology's clinical and translational radiation programs.

HICCC Research Program: Cancer Population Sciences



Alexander Melamed, MD, MPH

Assistant Professor of Obstetrics & Gynecology, Vagelos College of Physicians and Surgeons
Dr. Melamed is a gynecologic oncologist and clinical researcher with an interest in generating credible evidence from observational data. His work focuses on using quasi-experimental study designs and sensitivity analyses to improve causal inference in oncology outcomes research. His work has been published in *The New England Journal of Medicine*, *Journal of Clinical Oncology*, *The BMJ*, *JAMA Oncology*, and other leading clinical journals.

HICCC Research Program: Cancer Population Sciences



Nathalie Moise, MD, MS

Assistant Professor of Medicine, Vagelos College of Physicians and Surgeons
A key part of Dr. Moise's ongoing research focuses on developing and implementing a depression screening and patient-preference driven treatment tool for breast cancer patients.

HICCC Research Program: Cancer Population Sciences



Hiroshi Nakagawa, MD, PhD

Associate Professor of Medicine, Vagelos College of Physicians and Surgeons
Dr. Nakagawa spent 18 years on faculty at the University of Pennsylvania before joining Columbia University Vagelos College of Physicians and Surgeons last summer, bringing to the HICCC his broad expertise in esophageal and head and neck cancers.

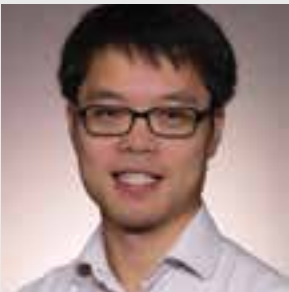
HICCC Research Program: Tumor Biology and Microenvironment



Jianlong Wang, PhD

Professor of Medical Sciences, Vagelos College of Physicians and Surgeons
Dr. Wang's research includes transcriptional control and epigenetic regulation of pluripotency and reprogramming under both normal and pathological conditions. The Wang laboratory employs biochemical approaches for proteomic studies of self-renewing cancer stem cells and pluripotent stem cells including embryonic stem cells (ESCs) and induced pluripotent stem cells (iPSCs).

HICCC Research Program: Tumor Biology and Microenvironment



Xuebing Wu, PhD

Assistant Professor of Medicine and Systems Biology, Vagelos College of Physicians and Surgeons
With a longstanding interest in understanding how genetic information is encoded in the genome and how genetic defects cause human diseases such as cancer, Dr. Wu's research studies mechanisms of RNA-centric gene regulation. Dr. Wu's lab works to advance the progress of genome-guided precision medicine, and has harnessed a new CRISPR system to kill cancer cells upon recognition of cancer-specific mutations.

HICCC Research Program: Precision Oncology and Systems Biology

“Herbert and I have always been proud to help the terrific doctors at Columbia and NewYork-Presbyterian. It meant everything to him to be able to support world-class research and caregiving that makes a difference in people’s lives.”
—the late Florence Irving

DRIVING THE FUTURE OF CANCER RESEARCH, THANKS TO THE IRVINGS



In 2017, Herbert and Florence Irving gave a transformative \$700 million gift to Columbia University and NewYork-Presbyterian to dramatically advance research and clinical programs for the treatment of cancer.

The Irvings’ extraordinary philanthropy has been felt across a wide range of scientific disciplines, including cancer genomics, immunology, computational biology, pathology, and biomedical engineering. A key focus is to further advance cancer research and clinical care in Columbia’s Precision Medicine Initiative which, in partnership with NewYork-Presbyterian, is exploring the genetic and genomic basis of cancer and other life-altering diseases.

The Irving name has long been a familiar part of Columbia and the Columbia campus of NewYork-Presbyterian. The medical center, renamed Columbia University Irving Medical Center in 2016, is home to the Herbert Irving Comprehensive Cancer Center (HICCC), as well as numerous named professorships, faculty chairs, and clinical and research facilities. The Irvings’ generosity began with their 1987 endowment of the Irving Scholars program for early-career clinical investigators, and their donations over the past three decades to Columbia University and NewYork-Presbyterian total more than \$900 million.

Both Florence and Herbert Irving were born and raised in Brooklyn. Herbert Irving, who died in 2016 at the age of 98, was a co-founder and former vice chairman of Sysco Corporation, the nation’s largest food distributor. Florence Irving, who died in 2018 also at the age of 98, served in leadership positions on the boards of several non-profit institutions, including The Metropolitan Museum of Art.

Florence Irving often talked about the dedication of the doctors at Columbia and NewYork-Presbyterian. “Herbert and I have always been proud to help the terrific doctors at Columbia and NewYork-Presbyterian,” said the late Florence Irving. “It meant everything to him to be able to support world-class research and caregiving that makes a difference in people’s lives. I am honored, as he always was, to be associated with these great institutions and the special people who make them what they are.”



ACKNOWLEDGMENTS

We would like to thank the members of our advisory committees, who help us in our mission to reduce the burden of cancer on patients, families, and communities.

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Desiree A.H. Walker

OUR MEMBERS

The more than 180 researchers and physicians across six schools and 35 departments that are members of the Herbert Irving Comprehensive Cancer Center (HICCC) are dedicated to understanding the complex biology behind cancer, from before it begins to its evolution and spread.

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Timothy Cragin Wang TC, MD

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914.293.8400

2 NewYork-Presbyterian Lawrence Hospital

55 Palmer Avenue
Bronxville, NY 10708
914.787.5000

**3 Herbert Irving Pavilion at NewYork-Presbyterian/
Columbia University Irving Medical Center
(patient care)**

161 Fort Washington Avenue
New York, NY 10032
212.305.5098

**Herbert Irving Comprehensive Cancer Center
(HICCC) at NewYork-Presbyterian/
Columbia University Irving Medical Center
(research and administration)**

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4 ColumbiaDoctors Midtown

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CANCER CENTER