



Duke Cancer Institute 2012 Report



CANCER CARE AS IT SHOULD BE

FROM OUR PHILANTHROPIC PARTNERS, A SHARED VISION FOR A WORLD WITHOUT CANCER

USHERING IN A NEW ERA OF CANCER RESEARCH AND CARE AT ONE OF THE WORLD'S LEADING ACADEMIC HEALTH SYSTEMS, DUKE MEDICINE HAS CREATED THE

DUKE CANCER INSTITUTE

WHO WE ARE

The Duke Cancer Institute (DCI) fully integrates patient care, research, and education with the goals of improving patient outcomes, decreasing the burden of cancer, and accelerating scientific progress. Established in 1973 as **one of the original eight comprehensive cancer centers** designated by the National Cancer Institute (NCI), today the DCI remains one of only 41 in the country with that distinction.

- The Duke Cancer Institute is a member of the **National Comprehensive Cancer Network (NCCN)**, an alliance of 21 cancer centers dedicated to improving the quality and effectiveness of care delivered to patients who have a diagnosis of cancer.
- Duke currently receives over **\$300 million annually in cancer research funding** from a variety of sources, with more than \$40 million from the NCI in 2011.
- The DCI includes more than **300 researchers and physicians** from 24 departments, four schools, and four centers/institutes.

WHAT WE DO

The Duke Cancer Institute provides multidisciplinary **specialized care to patients**, treating every cancer type, with more than 120 oncology-dedicated, board-certified physicians and 500 clinical staff—nurses, social workers, nutritionists, and others—dedicated to cancer.

DCI **researchers advance the world's knowledge of cancer**, publishing hundreds of papers in peer-reviewed journals each year. The DCI has clinical and research partnerships in India, China, Singapore, and across the United States.

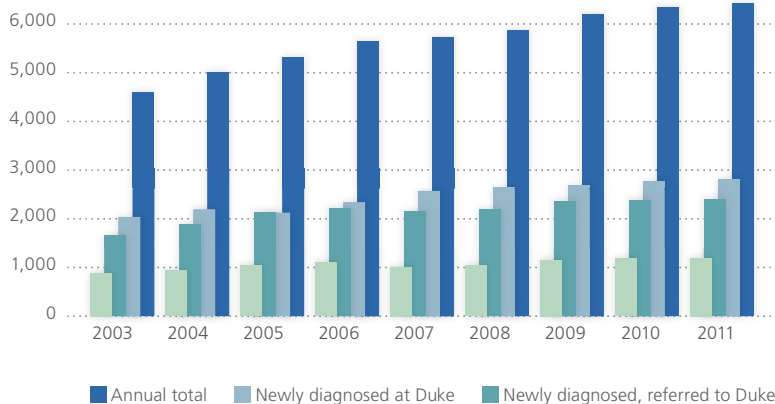
Duke University School of Medicine residency and fellowship training programs **provide comprehensive training** to develop the next generation of clinical and science leaders. Duke-NUS Graduate Medical School is a **groundbreaking partnership** that brings the Duke curriculum to the National University of Singapore.

THE PATIENTS WE SERVE

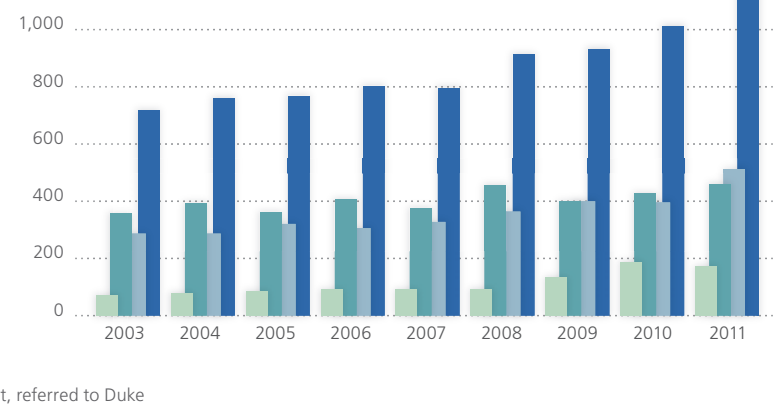
Patients come to Duke Cancer Institute from **every state in the nation**, every county in North Carolina, and from around the world.

- **More than 45,000 patients** were seen at the Duke Cancer Institute in fiscal year 2011, including more than 6,000 new patients.
- More than 1,100 new oncology patients were seen at **Duke Raleigh Hospital**.

DUKE UNIVERSITY HOSPITAL NEW ONCOLOGY PATIENT VOLUMES



DUKE RALEIGH HOSPITAL NEW ONCOLOGY PATIENT VOLUMES





“The Duke Cancer Institute is benefitting from the significant intellectual capital around the School of Medicine, across the entire university, and throughout the Research Triangle. The presence of other major universities, research and pharmaceutical companies, and community partners provides extraordinary opportunities for multidisciplinary collaboration.”

Michael Kastan, MD, PhD, Executive Director, Duke Cancer Institute



THE DUKE CANCER INSTITUTE (DCI) PROMISES TO BECOME A NATIONAL MODEL FOR THE WAY CANCER PROGRAMS WILL BE STRUCTURED IN THE FUTURE.

“It’s exactly what cancer medicine should be. It’s the merging and strategic oversight of a seamless structure, including everything from basic research to patient care, all part of a continuum,” says **Michael Kastan, MD, PhD**, executive director of the DCI, who arrived in August 2011. A year later, **Steven Patierno, PhD**, joined the DCI as deputy director, bringing his nationally recognized expertise in population sciences, navigation, and survivorship to Duke.

The DCI is a single entity—the first of its kind at Duke—which promotes collaborations among individuals involved in cancer care, research, and education. It was created to do nothing less than transform cancer care. Vice chairman of the Duke Department of Surgery, nationally recognized thoracic surgeon, and chair of the National Comprehensive Cancer Network, **Thomas D’Amico, MD**, serves as clinical director of the DCI.

THE NEW DUKE CANCER CENTER: A state-of-the-art building designed to transform the experience of every patient welcomed inside

Since the Duke Cancer Center opened its doors in early 2012, thousands of patients have benefited from best-in-class care—delivered in an environment designed to ensure their comfort and convenience.

In fact, patients helped inform the design, providing input in focus groups, complemented by extensive research and additional suggestions from caregiver teams and community supporters.

Beyond providing a comfortable and welcoming environment, the Duke Cancer Center also enhances the leading-edge care DCI is known for. The facility brings together almost all cancer clinical services under one roof on the main medical campus, meaning that patients no longer have to travel to far-flung locations to see multiple specialists and receive diagnostic studies. Instead, most of the DCI’s 120 board-certified physicians and 500 clinical staff come together in multidisciplinary teams organized by disease type—so that patients have access to a full range of expertise in one convenient setting.

The building epitomizes the Duke Cancer Institute model—fully integrating care and research. The synergy fostered by the cancer facility and the DCI accelerates the translation of research discoveries into the most advanced clinical care for patients.



A STANDARD OF EXCELLENCE

Award-Winning Patient Care

Duke University Hospital was **one of four hospitals** nationally to receive the Rising Star award from UHC (University HealthSystem Consortium), an alliance of leading U.S. academic medical centers recognizing significant improvements and **exemplary performance in patient safety, mortality, and clinical effectiveness.**

Additionally, Duke was recognized by the Joint Commission in 2012 for exemplary performance in the **Top Performers on Key Quality Measures** program, putting it in the top 18 percent of the 3,400 eligible U.S. hospitals reporting core performance data to the accrediting board.

Top-Ranked Care

Duke University Medical Center is ranked **among the top centers in the nation** for cancer services, according to *U.S. News & World Report*.

Extensive Clinical Research

The DCI has approximately 900 active cancer-related clinical research studies open. In calendar year 2011, Duke had **5,747 protocol enrollments**, and has approximately 1,200 therapeutic protocol enrollments per year. Two-thirds of the studies are early-phase trials.

Magnet, Across the Board

All three Duke hospitals (Duke University Hospital, Duke Raleigh Hospital, and Durham Regional Hospital) have achieved Magnet designation by the American Nurses Association. Earned by fewer than 7 percent of hospitals in the nation, this honor recognizes the **highest level of nursing care.**

TAKING ADVANTAGE:

Collaborations within the Duke academic community allow for significant advances in cancer research and policy

The DCI is a cancer center within a world-class university, which allows for the invaluable leverage of a diversity of expertise. In addition to the partnerships listed here, the DCI collaborates with the Duke Clinical Research Institute, the Center for HIV/AIDS Vaccine Immunology, the Duke Translational Nursing Institute, the Duke Institute for Genome Sciences & Policy, and other Duke entities to accelerate the progress of cancer research.

Cancer and the Environment:

The DCI and the Nicholas School of the Environment

The DCI is committed to research addressing the relationship between the environment and cancer across human populations, including those that experience disproportionate incidence and mortality rates.

The DCI's partnership with the nationally renowned Nicholas School of the Environment at Duke is a unique collaboration through which researchers have been seeking to unravel the relationship between genes and the environment, in order to better understand why some people develop disease while others remain unaffected when exposed to the same environmental factors. Additionally, DCI researchers are developing partnerships and enhancing interactions with the National Institute of Environmental Health Sciences (NIEHS), based in Research Triangle Park, NC.

New and planned research initiatives span the full continuum of cancer research:

- From population-level risk analysis and public policy to epidemiology and surveillance
- From cancer prevention and community health, especially among vulnerable populations, to understanding the molecular impact of environmental factors on cancer susceptibility
- From developing biomarkers for exposure, genetic susceptibility, and early detection to studying the geospatial aspects of how people live and its impact on both cancer risk and outcomes after treatment, including survivorship.

Addressing a Global Problem:

The DCI and the Duke Global Health Institute

Based on projections, cancer deaths will continue to rise, with an estimated 9 million annual cancer deaths in 2015, and 11.4 million in 2030. At Duke, there is growing interest in global cancer across diverse disciplines. Cancer researchers and faculty across Duke are providing a forum for discussion, and research efforts are under way. A multidisciplinary group of Duke faculty is continuing to make recommendations regarding key opportunities for the global cancer partnership going forward.

Current Duke global cancer initiatives include:

- Developing research capacity in Africa for studies on HIV-associated malignancies
- Developing standard operating procedures to deliver cancer care in low- or middle-income countries, and ways to sustain activities
- Developing a cancer registry in Tanzania and a cancer research infrastructure
- Researching human and viral genetic landscape of HIV-associated lymphoma
- Looking at HPV and cervical cancer in Haiti and Tanzania

Engineering Better Treatments:

The DCI and the Pratt School of Engineering

With more and more medical care relying on complex instrumentation for both diagnosis and treatment, a natural series of collaborations has arisen at Duke between cancer researchers and clinicians and the Pratt School of Engineering, where researchers are putting to work expertise in the construction and clinical evaluation of novel imaging methods including photonics, ultrasound, magnetic resonance imaging, x-ray, and nuclear medicine. An NIH-funded effort is looking at the ability of acoustic radiation force impulse (ARFI) imaging to detect and characterize liver cancers and to guide minimally invasive surgeries of liver and kidney cancer.

A second notable partnership is the long-time collaboration between veterinary radiation oncologist and tumor biologist, **Mark Dewhirst, DVM, PhD**, and Pratt faculty member **David Needham, PhD**, professor of mechanical engineering and materials science. Their research has led to the development of a technique in which the chemotherapy agent doxorubicin is administered through a liposome capsule. This application of mild hyperthermia acts to melt the nanosphere's encapsulating membrane, releasing the drug directly into the tumor, and sparing much of the healthy cells from the chemotherapy's toxic effects.



“In addition to its world-class researchers and clinicians and support staff, what makes Duke so great is the close proximity of the basic and applied sciences to the medical school,” says Needham. “The Duke Cancer Institute is so well-positioned to have access to experts in related fields. Right from day one, when I came here in 1987, I’ve been able to have a quick walk in one direction to Dr. Dewhirst’s lab or, on the way, I can visit technical staff and our oncologist clinicians at the outpatient clinics where trials are taking place.”

A Vision for the Future:

The DCI and Schools of Law, Public Policy, and Business

Duke Cancer Institute (DCI) leadership recognizes that the role of a world-class cancer center goes beyond research and patient care. The DCI is leading systemic change by working within the Duke community and beyond to affect the policy and business of cancer.

The DCI’s newly created **Office of Cancer Health Policy** is working to accelerate change on a local, state, and national level through policy analysis, outreach, and education.

The office advances the understanding of the impact of major policy changes, including cancer care in an era of health care reform and the implications for cancer prevention, detection, treatment, and survivorship.

Collaborations among the DCI and the local and academic community also seek to address disparities and advocate for patients. For example, a partnership between the DCI, the Duke School of Law, UNC Lineberger Comprehensive Cancer Center, and UNC School of Law, will provide cancer patients with assistance with issues such as creating powers of attorney and advance directives. Known as the **Cancer Pro Bono Legal Project**, the program will pair patients with law students under the direction of an attorney to help them understand their rights after a cancer diagnosis.



BRAIN TUMOR PROGRAM



The Preston Robert Tisch Brain Tumor Center at Duke, established in 1937, is one of the longest-standing and largest brain tumor research and clinical programs in the United States. Dedicated entirely to the treatment and cure of brain and spinal tumors in children and adults, the Center combines the resources of a leading research program with a commitment to the best in patient care. Duke currently follows more than 2,200 adult and pediatric patients with brain tumors from all over the world, and is committed to improving and extending patient survival.

A decade after diagnosis, a new life

In 2002, Sabrina Lewandowski had a life so removed from cancer she had never heard the word “oncologist.” Then came the headache that wouldn’t let up—followed by the diagnosis of glioblastoma multiforme, the deadliest form of brain cancer, at age 30.

The elementary school teacher had surgery almost immediately by Duke surgeon **Peter Bronec, MD**, and was referred to **Henry Friedman, MD**, neuro-oncologist and deputy director of the Preston Robert Tisch Brain Tumor Center at Duke. “He asked me how much I had researched about this kind of brain tumor, and I said I hadn’t at all,” remembers Lewandowski. “He said, ‘Good. Don’t.’ The drive home was quiet.”

Her boyfriend, Gregory, had proposed to her, having purchased a ring while she was in surgery. “Later I begged him not to marry me,” she says, “because I couldn’t even promise him a year.”

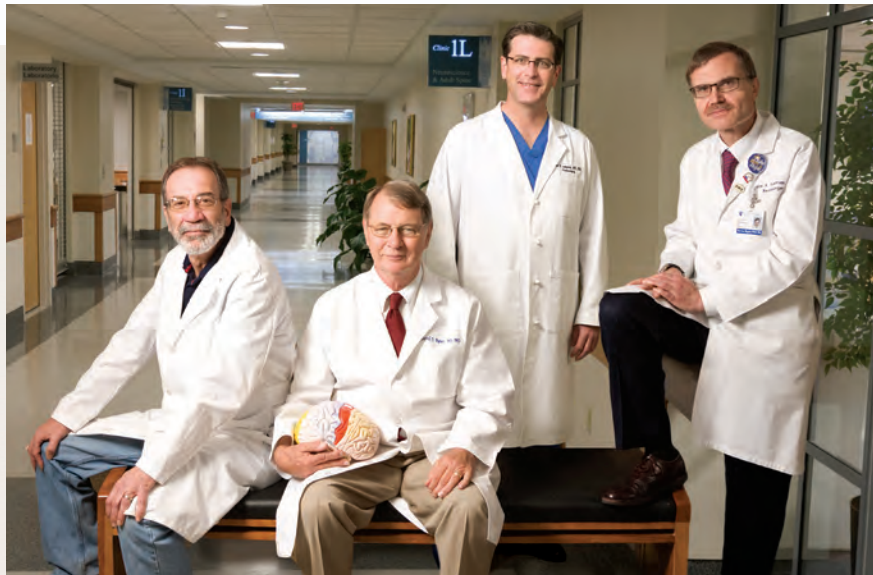
Friedman started Lewandowski on chemotherapy and radiation immediately. “He told me the plan, and he said that if it didn’t work, we had another plan,” she says. She battled neutropenia and lost her hair. But the cancer never returned.

“We believe she did well because rather than settle for the standard of care, we used multiple agents, and she also may have had a tumor with a unique predisposition to responding to therapy,” says Friedman.

Ten years later, Lewandowski compares the ordeal to another kind of pain. “You know how mothers say they forget the pain of childbirth? That’s how it is for me. It’s like it never happened. I don’t really remember the lows. We look forward to going to Duke. We walk out with smiles on our faces.”

She now knows firsthand if the childbirth-pain lore is true—she and Gregory welcomed a daughter, Layla, in February 2012.





Left to right: Henry S. Friedman, MD; Darell D. Bigner, MD, PhD; John H. Sampson, MD, PhD; and Allan H. Friedman, MD.

“FOR ME TO BE ABLE TO CREATE A NEW LIFE AFTER FIGHTING FOR MY OWN IS TRULY A MIRACLE.”

Sabrina Lewandowski, 10-year brain tumor survivor, with her husband Gregory and her daughter Layla in the Duke Cancer Center waiting area

RESEARCH HIGHLIGHT



Yan

Continuing Advancements in the Understanding of Brain Tumors

“This is one of the most important and surprising discoveries in genetic studies on malignant gliomas in the past 10 years.” That was the comment of Duke researcher **Hai Yan, MD, PhD**, about the uncovering of mutations in two genes that could become diagnostic markers and potential therapeutic targets in malignant glioma. The paper, published in the *New England Journal of Medicine* in 2009, went on to be named **one of the most important papers in the previous two years**, according to leaders in the field surveyed by the journal *Nature Medicine*.

Then, in August 4, 2011, a study published in the journal *Science* detailed a new discovery by Yan and Duke colleagues and scientists at Johns Hopkins University of the most likely genetic mutations involved in the development of the second most common type of brain tumor, oligodendroglioma.

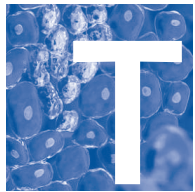
This discovery could increase the chances of an effective combination of drug therapy to treat this tumor.

The genetic mutations on chromosomes 1 and 19 were difficult to find until the technology improved, says Yan, Duke associate professor of pathology and co-corresponding author of the study.

“The team used whole genome sequencing technology so that no genes would be excluded, and we found to our surprise that one gene, on chromosome 19, was mutated in six out of the seven initial tumor specimens we sequenced,” Yan says. “A mutation frequency of 85 percent is very high.”

The genes they identified are tumor suppressor genes. The cancer-related pathways that involve these genes could become targets for future treatments, Yan says.

BREAST PROGRAM



The Duke Cancer Institute's Breast Program is one of the world's leading breast cancer programs, offering women a complete range of services from diagnostics to genetic and prevention counseling to state-of-the-art treatments for early and advanced-stage disease. The breast oncology team comprises medical oncologists, surgical oncologists, and radiation oncologists, and a host of other specialists including plastic surgeons, fertility specialists, nutritionists, and patient and family therapists—all dedicated to the care of women at risk or in treatment for breast cancer.

"I saw genius in the collaboration between my surgeon, my oncologist, and my radiation oncologist, which resulted in the conservation of my breast and a surgical outcome that is nothing short of miraculous."
Claire Weinberg, breast cancer survivor



"THAT'S WHAT THE DUKE CANCER INSTITUTE IS ABOUT. IT'S FAMILIES BRINGING THEIR LOVED ONES HERE SO THAT THEY CAN GET SPECIALTY CARE THAT CAN'T BE GIVEN ANYWHERE ELSE ON THE EAST COAST—PROBABLY IN THE COUNTRY OR EVEN THE WORLD. THAT'S WHAT'S DRIVEN ME TO STAY AT DUKE FOR OVER TWO DECADES. I WOULD NOT DERIVE JOY FROM GIVING CARE THAT I DIDN'T THINK WAS JUST ABSOLUTELY THE BEST CARE POSSIBLE."

—Kim Blackwell, MD, whose trial of a combination of T-DM1 and conventional therapy in 2012 led to longer survival times in women with metastatic breast cancer.



Duke leads trials for more effective breast cancer treatments

When Molly Montgomery Hudson's inflammatory breast cancer spread, her Myrtle Beach, SC, oncologist recommended she seek advanced care at Duke.

Hudson had never participated in clinical trials, but was one of the first to enroll in the study of a new treatment that would come to be known as the first smart bomb for breast cancer.

Kimberly Blackwell, MD, director of the Duke Cancer Institute's Breast Oncology Program, led the large clinical trial of the new treatment that links standard chemotherapy with a second agent that hones in on breast cancer cells to do a more effective job of killing those cells while sparing healthy cells.

The combination of the new, investigational drug, T-DM1, plus conventional chemotherapy led to longer survival times in women with metastatic breast cancer. For those who received this combination therapy in the study, their disease progression was delayed. The treatment also had significantly reduced side effects, including nausea and hair loss.

Nearly 1,000 people with advanced breast cancer were enrolled during the three-year study. All the participants had a form of aggressive breast cancer (HER-2 positive) with elevated levels of the protein human epidermal growth factor

receptor 2. The protein promotes the growth of cancer cells, and plays a role in about 20 percent of invasive breast cancers. The results of the study were presented at the 2012 American Society of Clinical Oncology (ASCO) Conference in June.

Hudson says the drug was less harsh than many of the other chemotherapy regimens she has tried. "I did not lose my hair or my eyebrows."

Blackwell says that benefit alone is a major advantage.

"Everything is difficult when dealing with cancer, but the added burden of losing your hair during chemotherapy can have a huge impact on your state of mind," Blackwell says. "It was amazing to see people receiving TDM-1 and not losing their hair."

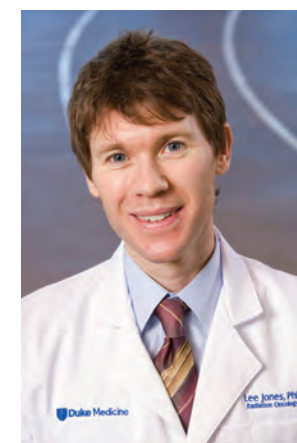
Hudson, who has been battling breast cancer since 2008, just got married in May 2012, and savors every day as a gift. With weekly visits to Blackwell's clinic in the Duke Cancer Center in Durham, Hudson said she wouldn't hesitate to volunteer for another clinical trial.

"If it was new and they were trying it out to help cure things, I would definitely try," she says. "Hey, I'm here to be cured."

Exercise Research

The Duke Breast Cancer Survivorship Clinic addresses the unique needs of women dealing with the long-term and late effects of breast cancer. The clinic is part of the Duke Center for Cancer Survivorship Research, which, under the leadership of scientific director **Lee Jones, PhD**, brings together Duke scientists and clinicians from diverse fields. For instance, Jones and his team are studying the role of exercise to minimize the immediate and long-term physiological side effects of breast cancer therapy, as well as exercise as treatment for breast cancer, seeking to answer the question of whether exercise inhibits breast cancer growth or even improves effectiveness of medical treatments for breast cancer. Jones' lab also studies the efficacy of exercise on a variety of other cancers, including brain, lung, and prostate.

Read more about Jones' research on page 15.



Jones

LAPATINIB PLUS TRASTUZUMAB: OVERALL SURVIVAL

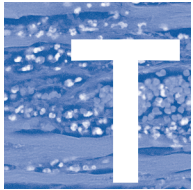
Median overall survival, combination therapy **14 months**

Median overall survival, lapatinib alone **9.5 months**

There was a 10 percent improvement in the absolute overall survival rate at six months and 15 percent improvement at 12 months in the combination arm compared to the monotherapy arm.

JCO, July 20, 2012

CELLULAR THERAPY



The Duke Adult Blood and Marrow Transplant (ABMT) Program is internationally recognized for its novel approaches to treating leukemia, lymphoma, and myeloma through bone marrow, cord blood, and stem cell transplantation.

Duke has earned global recognition for its leadership in bone marrow and stem cell transplantation. Duke doctors were among the first to successfully use these techniques in the treatment of many types of pediatric and adult cancers. Since the program began in 1984, Duke physicians have performed over 4,000 transplants.

Duke pioneered the use of cord blood cells for adults who don't have a matched donor. Today, under the leadership of **Nelson Chao, MD**, professor of medicine and cellular therapy, Duke physician-scientists have continued to expand the use of cord blood transplants.

Patients benefit directly from Duke's leadership in cancer research and the ability to make promising new therapies quickly available to those who need them most.

Stem Cell Research

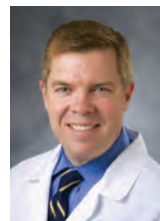
Duke's **John Chute, MD**, professor of medicine, pharmacology, and cancer biology, and colleagues are working to define the critical mechanisms through which bone marrow microenvironment cells regulate normal and leukemic stem cell fate, and to use these discoveries to develop new therapies to increase the formation of blood cells and to inhibit leukemia growth. Researchers have generated several novel endothelial-cell-specific transgenic mouse models, which have accelerated the discovery of mechanisms through which bone marrow endothelial cells regulate hematopoietic stem cell fate.

Today Duke is treating nearly 100 diseases with cellular therapy, including:

- | | |
|------------------------------|------------------------|
| Acute myeloid leukemia | Non-Hodgkin's lymphoma |
| Acute lymphoid leukemia | Hodgkin's disease |
| Chronic myeloid leukemia | Multiple myeloma |
| Chronic lymphocytic leukemia | Aplastic anemia |
| | Thalassemia |



Chao



Chute

Improving outcomes

Duke has more than 20 clinical protocols ongoing that center on improving outcomes for patients who receive stem cell transplants. These include supportive care and post-transplant processes to improve immunity, including vaccine therapies and selected lymphocyte boosts from donors.

Access to emerging strategies

Duke can offer stem cell transplantation as an option to a broader number of patients—including those who are older, sicker, or lacking a closely matched donor—through the use of less intense chemotherapy regimes, pharmacological manipulation and selection of donor cells, and the use of partially matched cord blood or haplo-identical stem cells.





“I WAS JUST AN ORDINARY PERSON WHO EXPERIENCED AN EXTRAORDINARY EVENT.”

Gayle Serls, the longest-surviving adult cord blood transplant patient in the world

Extraordinary

One of the first adult cord blood transplant recipients now works for the pioneer who treated her

Gayle Serls says her life is ordinary—and that’s just fine with her. For a time, it was about as far from ordinary as a life can get.

In 1995, at 45 years old, Serls was diagnosed with Philadelphia chromosome positive acute lymphocytic leukemia (ALL), a rare form of ALL which could not be treated with conventional chemotherapy. Her best hope was a bone marrow transplant, for which she was referred to Johns Hopkins. The night before she was to leave, she felt a lump on her neck—her cancer had returned, and the procedure would not be performed. “Now I had no hope and didn’t know what would happen,” she says.

Serls went back to Duke, and as she underwent high-dose chemotherapy in an effort to buy time, her mother saw a news story about umbilical cord blood transplants for leukemia patients.

At Duke, pediatric cord blood transplants were being performed successfully by **Joanne Kurtzberg, MD**. The transplants were not

offered to adults because of the low volume of cord blood available from each newborn. But in 1996, Serls received a cord blood transplant on the pediatric transplant unit at Duke, becoming one of the first adults in the world to receive the treatment, and is today the longest-surviving adult cord blood transplant patient in the world.

Today, Serls works for Kurtzberg at the Carolinas Cord Blood Bank, a public bank housed at Duke, which collects cord blood and lists it on the national donor registry. Serls describes Kurtzberg as “an amazing, visionary person,” and says that everyone she works with is committed to that vision because they know the impact of what they are doing.

Since her transplant, Serls has witnessed her children’s graduation from high school and college, her son’s marriage, and the birth of her grandchild. “I was just an ordinary person who experienced an extraordinary event with a happy ending,” she says.

Duke continues to pioneer advances in cord-blood transplants. Along with the pediatric program founded by Kurtzberg in 1990, an adult allogeneic program was founded by Nelson Chao, MD, in 1996.



Kurtzberg

DUKE CANCER INSTITUTE LEADERSHIP

Michael B. Kastan, MD, PhD¹
Executive Director

Steven Patierno, PhD²
Deputy Director
Director, Population Sciences and Health Services Research

Carolyn Carpenter, MHA, FACHE³
Administrator and Associate Dean

Thomas D'Amico, MD⁴
Clinical Director

Nadine Barrett, PhD⁵
Director, Health Equity and Disparities

Kimberly Blackwell, MD⁶
Director, Breast Cancer Program

Nelson Chao, MD⁷
Chief, Division of Hematologic Malignancies and Cellular Therapy/BMT
Chair, Scientific Review Committee

Christopher Counter, MD⁸
Professor, Pharmacology and Cancer Biology
Co-Chair, Scientific Review Committee

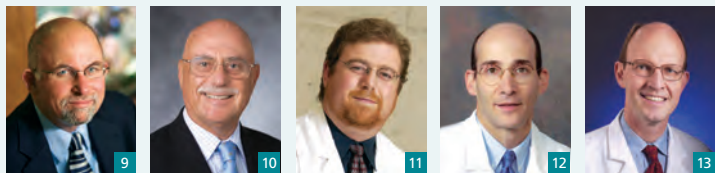
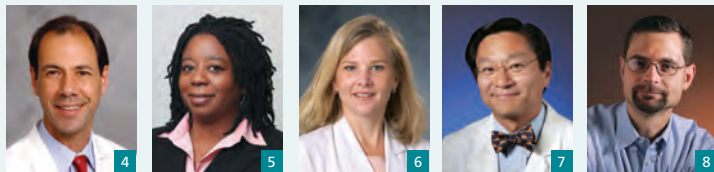
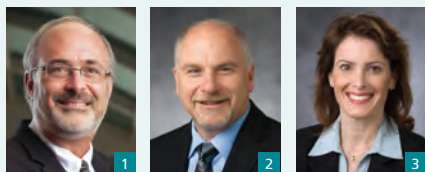
Mark Dewhirst, DVM, PhD⁹
Professor, Radiation Oncology
Associate Director, Basic Research

Jules Heisler, PhD, MBA¹⁰
Director of Academic Administration

Bruce Sullenger, PhD¹¹
Professor, Surgery
Professor, Pharmacology and Cancer Biology
Associate Director, Translational Research

Douglas Tyler, MD¹²
Director, Melanoma Program
Associate Director, Strategic Relationships

Christopher Willett, MD¹³
Chairman, Department of Radiation Oncology
Associate Director, Clinical Research



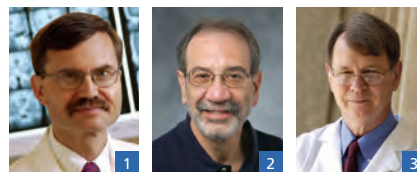
DUKE CANCER INSTITUTE DISEASE-SITE GROUPS

Brain Tumors

Allan Friedman, MD,¹ Director

Henry Friedman, MD,² Associate Director for Clinical Research

Darell Bigner, MD, PhD,³ Associate Director for Basic Science



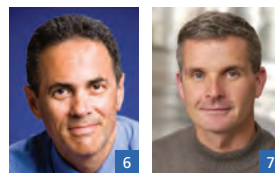
Part of the Duke Cancer Institute, the Preston Robert Tisch Brain Tumor Center is one of the largest and most successful brain tumor treatment and research centers of its kind. Please read more on pages 4–5.

Breast Cancer

Kim Blackwell, MD,⁴ Director

P. Kelly Marcom, MD,⁵ and Neil Spector, MD,⁶ Associate Directors for Clinical Research

Donald McDonnell, PhD,⁷ Associate Director for Basic Science



Duke offers a complete range of services and clinical trials for all stages of breast cancer. Read more about this program on pages 6–7.

Gastrointestinal Cancer

Christopher Willett, MD,⁸ Director

Herbert Hurwitz, MD,⁹ Associate Director for Clinical Research

Gerard Blobe, MD, PhD,¹⁰ Associate Director for Basic Science



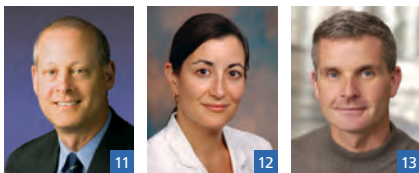
To ensure the best outcomes, patients with GI cancers require access to the most advanced surgical, radiation, and medical treatment options with integrated multi-disciplinary coordination. The Duke Cancer Institute is a preeminent referral center for the multidisciplinary care of patients with gastrointestinal cancers, where patients have access to the highest quality imaging studies and same-day treatment evaluations from nationally recognized medical, surgical, and radiation oncologists all in one location. At Duke, there is extensive surgical expertise in the management of cancers of the esophagus, stomach, pancreas, liver, colon and rectum, including novel laparoscopic and sphincter-preserving approaches. Additional areas of expertise include endoscopic imaging and interventions, and intraoperative and neoadjuvant radiation therapy. Duke is a leader in novel therapeutic approaches through clinical trials of chemotherapy and radiochemotherapy. At Duke, GI cancers are the focus of strong research programs, with basic and translational investigators working together to improve early detection, prevention, and treatment options for these patients.

Gynecologic Cancer

Andrew Berchuck, MD,¹¹ Director

Angeles Secord, MD,¹² Associate Director for Clinical Research

Donald McDonnell, PhD,¹³ Associate Director for Basic Science



Duke's Gynecologic Oncology Program is one of the most comprehensive cancer treatment and research programs of its kind. A multidisciplinary team provides the latest approaches in surgery, chemotherapy, radiation, and brachytherapy in a patient-centered environment. Duke physicians are leaders in hereditary gynecologic cancers

and in adapting laparoscopic and robotic surgical approaches to the treatment of gynecologic cancers.

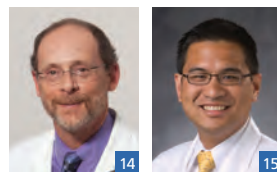
The DCI fosters interactions among members who have basic, translational, and clinical research interests in gynecologic cancer. Programs draw from translational research strength and the ability to translate basic science discoveries to impact early detection and treatment:

- Early detection strategies for gynecologic cancer
- Methylation imprinting and epigenetic dysregulation
- Basic gynecologic cancer biology and novel therapeutic targeting
- Genomics
- Disparities for African American women

Head and Neck Cancer

David Brizel, MD,¹⁴ Co-Director

Walter Lee, MD,¹⁵ Co-Director



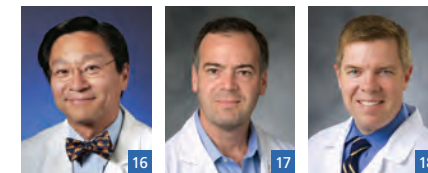
Duke is a high-volume referral center for cancers of the mouth, salivary and thyroid glands, nasal cavity, paranasal sinuses, oropharynx, nasopharynx, larynx, skin of the head and neck, and lymph nodes. The Duke team of specialists in head and neck oncologic surgery, plastic and reconstructive surgery, radiation oncology, medical oncology, speech pathology, radiology, and pathology ensures that each patient receives state-of-the-art treatment—supported by the most advanced technology available anywhere—while maintaining quality of life throughout treatment and recovery. Duke's head and neck physicians are internationally recognized experts in the field who make head and neck cancer care their primary career focus. Duke has developed innovations that are now the standard of care for treatment of head and neck cancer, including the combination of intensity modulated and image-guided radiation therapy and simultaneous chemotherapy for advanced-stage head and neck cancer, use of advanced PET scanning techniques, and minimally invasive operations that result in better function and less disfigurement.

Hematologic Cancer

Nelson Chao, MD,¹⁶ Director

David Rizzieri, MD,¹⁷ Associate Director for Clinical Research

John Chute, MD,¹⁸ Associate Director for Basic Science



At Duke a team of nationally recognized experts is working to improve outcomes for patients battling lymphoma, leukemia, myeloma, myelodysplasias, myeloproliferative disorders, aplasia, and other neoplastic diseases of the marrow or blood system.

Many of the therapies offered for leukemias and lymphomas have been developed and refined at Duke, and patients can access novel treatments through an extensive array of clinical trials.

Specialists in medicine, surgery, radiation therapy, and stem cell and marrow transplantation meet at least weekly to review difficult cases, debate new therapy plans, and formulate treatment algorithms.

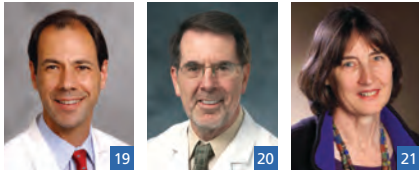


Lung Cancer

Thomas D'Amico, MD,¹⁹ Director

Jeffrey Crawford, MD,²⁰ Associate Director for Clinical Research

Brigid Hogan, PhD,²¹ Associate Director for Basic Science



Duke thoracic oncology surgeons are national leaders in minimally invasive surgical procedures. The Thoracic Oncology Program's radiation oncologists have access to specialized techniques such as stereotactic body radiation therapy for early-stage lung cancer, as well as radiation treatment planning aided by 4D CT technology. Duke's nationally renowned medical oncologists have developed a portfolio of targeted therapies, novel agents, and immune approaches.

The Thoracic Oncology Research Program investigates lung cancer through basic, translational, and clinical research. An important strategy in the program is the study of how individual genes affect oncogenesis and tumor progress. Investigators are using mouse models to determine the role of stem cells in the development of cancer in humans and in the development of resistance to treatment. Clinical researchers are studying the use of unique genetic mutations in an individual patient to personalize treatment.

The lung cancer researchers at Duke have assisted in developing the most

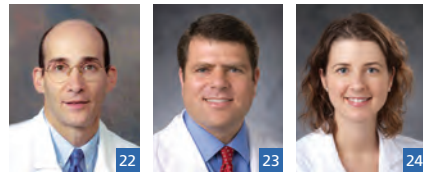
comprehensive lung cancer database in the world: the NCCN Non-Small Cell Lung Cancer Outcomes Database. This project, the best example of Comparative Effectiveness Research in lung cancer to date, provides the process for the study of all aspects of lung cancer outcomes.

Melanoma

Douglas Tyler, MD,²² Director

David Kirsch, MD, PhD,²³ Associate Director for Basic Science

April Salama, MD,²⁴ Associate Director for Clinical Research



At Duke a comprehensive melanoma treatment and research program offers the full spectrum of care. Duke offers surgery and systemic treatment for people with advanced or progressing melanoma, including multi-agent chemotherapy, novel treatments, and investigational agents available only through clinical trials, including those testing new ways to use interferon-based therapies and vaccine therapies to prevent recurrences in patients with stage 2 and stage 3 melanoma. Mole-mapping technology, pioneered by Duke researchers and now used around the world, allows physicians to detect the earliest signs of melanoma. Duke is one of only a handful of centers using a reflectance confocal microscope to diagnose and study melanoma.



Duke clinical research highlights in melanoma include: the largest regional chemotherapy program in the United States for patients with advanced extremity melanoma; work to develop a new generation of tumor vaccines designed to augment the function of the dendritic cell; and one of the world's largest melanoma databases, which enables researchers to perform retrospective analyses of recurrence patterns and other outcomes.

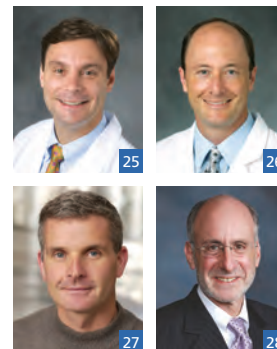
Prostate/Genitourinary Cancer

Daniel George, MD,²⁵ Director

Andrew Armstrong, MD,²⁶ Associate Director for Clinical/Translational Research

Donald McDonnell, PhD,²⁷ Associate Director for Basic Science

Glenn Preminger, MD,²⁸ Chief, Division of Urology



Duke offers one of the country's premier comprehensive treatment, training, and research programs for prostate cancer and other genitourinary cancers, including bladder, renal, and testicular cancers.

Duke has been a leader in clinical trials that have led to many of the dramatic improvements in the treatment of kidney cancer for the last 10 years, and in the last two years, of prostate cancer.

A new oral hormone drug for advanced prostate cancer, enzalutamide, is expected to be approved by the U.S. Food and Drug Administration after clinical trials at Duke Cancer Institute and elsewhere demonstrated promising results.

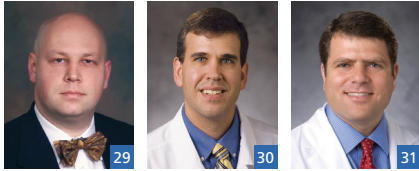
Basic and translational scientists at Duke have focused on research to better understand the underlying biology of prostate cancer, which can lead to better treatment options. Four areas of emphasis that basic scientists are researching are androgen receptor biology, tumor plasticity, immunotherapy, and survivorship/nutrition.

Sarcoma

Brian Brigman, MD, PhD,²⁹ Director

Richard Riedel, MD,³⁰ Associate Director
for Clinical Research

David Kirsch, MD, PhD,³¹ Associate Director
for Basic Science



Sarcoma patients of all ages, with tumors in all locations, receive the most advanced care available at Duke. The team works together to create the most effective treatment plan for the individual, using both standard procedures and the latest innovative techniques, many developed at Duke.

Duke is leading the way in the research of sarcoma, studying the cancer in children as well as adults. Areas of focus include investigation of new agents for rhabdomyosarcoma and other sarcoma subtypes. Other Duke researchers are using novel approaches to understand how sarcomas develop and metastasize. Duke scientists genetically engineered a mouse model of sarcoma with mutations in the same genes that cause sarcomas in humans. Researchers use the model to identify mechanisms associated with metastases and resistance to chemotherapy, to learn how current therapies work and to develop new ones. Sarcoma mechanisms identified in the mouse model are then analyzed in samples from Duke's sarcoma tissue repository, which contains tumor tissue donated by patients for genomic analysis. As tumor characteristics associated with clinical outcomes are identified, this knowledge can be used to develop personalized therapies specific to a patient's individual tumor.

RADIATION ONCOLOGY

Christopher Willett, MD,³² Chairman, Radiation Oncology

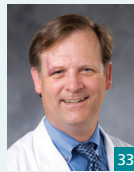


The Department of Radiation Oncology at Duke University Medical Center provides state-of-the-art cancer treatment for patients with a wide variety of tumor types. Imaging capabilities include CT, PET-CT, MRI, linear accelerators that have both photon and electron capabilities, and electronic portal imaging and on-board imaging with cone-beam CT. Physicians provide a full range of radiation treatment services, including conformal precision radiation therapy, intensity modulated radiation therapy, brachytherapy, and stereotactic therapies. Radiation Oncology faculty receive over \$7 million a year in support of research in clinical investigations, radiobiology, and radiation physics.

CROSS-CUTTING SPECIALTY CLINICS

Hereditary Cancer Clinic

P. Kelly Marcom, MD,³³ Director



Duke's Hereditary Cancer Clinic offers risk assessment and education to cancer patients and people with a family history of cancer or other cancer risk factors.

Board-certified genetic counselors work closely with medical oncologists to provide each patient with information about their risk of inherited cancers, ways to reduce the chance of developing cancer, and ways to increase the chance of early detection.

Since the Hereditary Cancer Clinic opened in 1999, more than 3,500 patient evaluations have been performed. The Hereditary Cancer Clinic has extended services to several hospitals in rural North Carolina that are affiliated with the Duke Oncology Network. Teleconferences with genetic counselors allow us to reach patients in areas where genetic counseling services were previously unavailable. (Learn more about the Network on page 17.)

Palliative Care Clinic

The new Duke Cancer Institute Palliative Care Clinic provides consultative and longitudinal palliative and supportive care for all patients at the Duke Cancer Institute, regardless of diagnosis or stage of disease. The clinic provides an extra layer of support for patients facing a diagnosis of cancer, including a focus on disease understanding, symptom assessment and management, and advance care planning and goal setting.

Duke Center for Cancer Survivorship

The Duke Cancer Institute believes in treating the whole person, not solely the cancer. The Duke Center for Cancer Survivorship was founded based on the belief that care focused on the unique needs of cancer survivors is vital to the millions of individuals living through and beyond cancer in the United States today. It provides a unique array of services and resources to help support patients and their loved ones throughout their experience with cancer.

NCI-DESIGNATED PROGRAMS

Cancer Prevention, Detection, and Control

Joellen Schildkraut, PhD

Developmental Therapeutics

Timothy Haystead, PhD
Neil Spector, MD

Hematologic Malignancies and Cellular Therapies

Nelson Chao, MD
Yiping Yang, MD, PhD

Molecular Genetics and Genomics

Sandeep Dave, MD
Mariano Garcia-Blanco, MD, PhD

Neuro-Oncology

Darell Bigner, MD, PhD
Allan Friedman, MD
Henry Friedman, MD

Radiation Oncology and Imaging

David Kirsch, MD, PhD
Daniel Sullivan, MD

Solid Tumor Therapeutics

Gerard Blobbe, MD, PhD
Jeffrey Crawford, MD

Tumor Biology

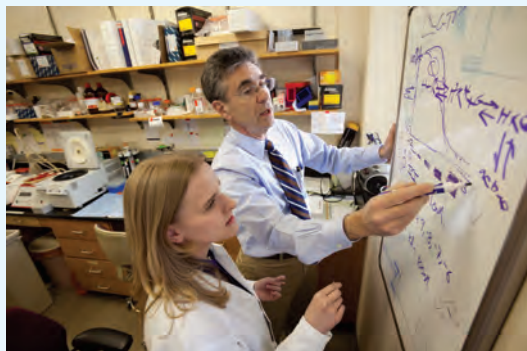
Christopher Counter, PhD
Ann Marie Pendergast, PhD

Women's Cancers

Andrew Berchuck, MD
Kim Blackwell, MD
Donald McDonnell, PhD

OF NOTE

Selected Findings and Honors
of Duke Cancer Institute Members



Lefkowitz

Nobel Prize Awarded to DCI Member

Duke Cancer Institute member **Robert Lefkowitz, MD**, was awarded the 2012 Nobel Prize in Chemistry for his work on seven-transmembrane G protein-coupled receptors (GPCRs).

Lefkowitz, who has spent his entire 39-year research career at Duke University Medical Center, is sharing the prize with Brian K. Kobilka of Stanford University School of Medicine, who was a post-doctoral fellow in Lefkowitz's lab in the 1980s.

GPCRs have become the target of prescription drugs. The receptors catch chemical signals from the outside and transmit their messages into the cell, providing the cell with information about changes occurring within the body. These particular receptors are called seven-transmembrane G protein-coupled receptors, or just "G-coupled receptors" for short. Serpentine in

appearance, G-coupled receptors weave through the surface of the cell seven times.

"Dr. Lefkowitz's research accomplishments have far-reaching implications for medical conditions ranging from cardiovascular disease to cancer," says Michael Kastan, executive director of the Duke Cancer Institute. "He also led the recent discovery of a linkage between stress responses and DNA damage signaling. He and his team found that this model of chronic stress triggered certain biological pathways that ultimately resulted in accumulation of DNA damage. He explained that the findings could provide a plausible explanation of how chronic stress, signaling through the beta adrenergic receptor, can induce stress responses that contribute to a variety of human pathologic conditions, ranging from the cosmetic, like graying hair, to life-threatening disorders, like malignancies."

New Breast Cancer Drug Halts Tumor Growth Better Than Standard Therapy

A phase 3 trial led by **Kimberly Blackwell, MD**, showed that a new cancer treatment that links chemotherapy with an agent that hones in on specific breast cancer cells was significantly better than the current drug regimen at keeping patients' advanced tumors from progressing.

Participants with invasive breast cancer who took the investigational drug, called trastuzumab emtansine (T-DM1), also had fewer and less harsh side effects than study participants who received a standard treatment. The findings were reported at the American Society of Clinical Oncology annual meeting in June 2012.

Read more about Blackwell's research on page 7.



Blackwell



Chao

Chao Receives NBSB Appointment

Nelson J. Chao, MD, has been appointed to the National Biodefense Science Board (NBSB), a federal advisory committee which provides expert advice and guidance on preventing, preparing for, and responding to adverse health effects of public health emergencies to the HHS Secretary and the HHS Assistant Secretary for Preparedness and Response (ASPR).

Research Examines Effects of Cancer Therapy on Cardiopulmonary Function

Lee Jones, PhD, associate professor and member of the Duke Cancer Institute, was lead author of a study that showed that women receiving care for breast cancer have significantly impaired cardiopulmonary function that can persist for years after they have completed treatment. The findings, published July 2012 in the *Journal of Clinical Oncology*, also provide initial evidence that poor cardiopulmonary function may be a strong predictor of survival among women with advanced breast cancer.

“We know that exercise tolerance tests, which measure cardiopulmonary function, are among some of the most important indicators of health and longevity in people who do not have cancer; however, relatively little research has been done assessing the clinical importance of these tests

in patients with cancer,” says Jones. “Our work provides initial insights into the effects a cancer diagnosis and subsequent therapy may have on how the heart, lungs, and rest of the body work together during exercise.”

To begin to understand the direct and indirect effects of therapy on breast cancer patients, Jones and his colleagues examined cardiopulmonary function at rest and during exercise in 248 women in various stages of treatment for breast cancer. All completed a carefully controlled cardiopulmonary exercise test on a stationary bike, which escalated until the patients reached maximum exertion. At that point, the researchers took a measurement called VO₂-peak, the gold standard assessment of cardiopulmonary function that athletes use to measure fitness levels and design training programs.

The researchers found that women with breast cancer, regardless of treatment status, had significantly worse cardiopulmonary function than healthy women of the same age who were sedentary. Even among patients who had completed cancer therapy years previously, cardiopulmonary function levels were markedly impaired, suggesting that fitness levels may not recover after therapy. More striking, approximately a third of women in the study had a cardiopulmonary function score below the threshold that suggests people can function independently—do household tasks, walk up and down stairs, or walk a half-mile.

Among the patients with advanced breast cancer, median survival was significantly longer for women with higher cardiopulmonary function. Median survival was 36 months for high-fitness patients vs. 16 months for low-fitness patients.



Jones, third from left

PATIENT-CENTERED CARE

With the opening of the Duke Cancer Center in February 2012, Duke welcomed a new era. The building became perhaps the most visible symbol of the Duke Cancer Institute's utter commitment to patient-centered care. The Duke Cancer Center is a warm, welcoming environment. Patients have easy access not only to a multidisciplinary team of specialists and on-site diagnostics, but also a host of support services and amenities designed to mitigate the rigors of the treatment process.



Howard

"I feel like a warrior. I feel like a survivor. That is the gift that this place gives to every patient."

—Jamie Valvano Howard, cancer survivor, at the opening of the Duke Cancer Center in February 2012

Multidisciplinary Clinics

Duke Cancer Institute caregivers work as multidisciplinary teams organized to ensure communication among providers and convenience for the patient. Patients benefit from having physicians, advanced practice providers, nurses, clinical trials coordinators, pharmacists, counselors, social workers, and dietitians working side by side to provide comprehensive care. Almost all clinical cancer services offered at Duke's main campus are located in the new facility—supporting multidisciplinary care and improving accessibility for patients.



Lynda and Richard Petty

The building facilitates greater synergy between cancer treatment and clinical trial opportunities with dedicated space where clinical research nurses can speak privately with patients about clinical trial opportunities.

"I look at Dr. Friedman as our crew chief. It's a team effort, not a one-man show. It takes the whole hospital to bring all this together."

—Richard Petty, NASCAR legend, on the Preston Robert Tisch Brain Tumor Center's multidisciplinary approach to the care and treatment of his wife, Lynda



Duke oncology nurses are dedicated to excellence in patient care, education, and research across the care continuum. They serve as leaders locally, nationally, and internationally. They serve on a variety of boards and committees, including the Association of Community Cancer Centers, the Oncology Nursing Society, the Oncology Nursing Certification Corporation, the National Cancer Policy Forum, and the International Society of Nurses in Cancer Care.

Patient Coordinators

Patient coordinators (left) provide a vital connection to the resources available to patients and their families. While their primary role is to coordinate the many tests, appointments, and procedures needed for cancer care, patient coordinators also provide educational and emotional support and encouragement. They serve as a primary contact for referring physicians.

Nursing Innovation

Disease-site nursing gives patients a single point of contact for all of their care at the Duke Cancer Center—from the initial consultation, throughout the education and treatment process, and beyond. The goal is to provide a consistently high level of care for patients, and to develop the nurse-patient relationship.

Nursing Center of Excellence

The Oncology Nursing Center of Excellence (ONCE) is a partnership between the Duke Translational Nursing Institute and the Duke Cancer Institute. The mission of ONCE is to facilitate knowledge development within oncology nursing and promote translational nursing initiatives that directly improve patient care. The goal is to serve as a model for developing future nursing specialty research centers. Specific objectives are related to research and translational science initiatives.

The Duke Oncology Network: Broadening Our Impact

The Duke Oncology Network brings Duke's strengths in oncology to community practices in the Southeast. Duke provides an array of services to a regional network of community cancer programs sharing a commitment to excellence in cancer care.

● Clinical affiliates

Duke and community hospitals partner to develop and manage clinical oncology programs—whether medical oncology, radiation oncology, or both. Clinical affiliates are staffed by Duke medical oncologists, radiation oncologists, physician extenders, and fellows. Education and training activities related to the care of cancer patients are provided for affiliated members.

Duke physicians evaluate, offer treatment, and manage patients at each of the clinical affiliate locations. All affiliates offer chemotherapy, infusions, and other supportive treatment services. All patients also have access to a variety of Duke clinical trials.

**Columbus Regional Healthcare System
Donayre Cancer Care Center**
Whiteville, NC

**Johnston Hematology
Oncology–Smithfield**
Smithfield, NC

**Johnston Hematology
Oncology–Clayton**
Clayton, NC

**Maria Parham Medical Center
Maria Parham Cancer Center**
Henderson, NC

**Scotland Memorial Hospital
Scotland Cancer Treatment Center**
Laurinburg, NC

**Southeastern Health
Gibson Cancer Center**
Lumberton, NC

■ Research affiliates

A research affiliation with Duke offers expertise in the development and management of a quality oncology research program. A broad variety of research-related education and training opportunities are available as part of the relationship. Affiliation includes access to Duke investigator-initiated clinical trials, national cooperative group research studies, pharmaceutical industry studies, and collaborative research.

Alamance Regional Medical Center
Burlington, NC

Charles George VA Medical Center
Asheville, NC

Palm Beach Cancer Institute
West Palm Beach, FL

Presbyterian Hospital
Charlotte, NC

**St. Mary's Medical Center
Regional Cancer Center**
Huntington, WV

**Spartanburg Regional Healthcare
System, Gibbs Cancer Center**
Spartanburg, SC

Virginia Oncology Associates
Norfolk, VA

◆ Program development affiliates

A program development affiliation generally offers consultative management and administrative functions, clinical relationships between community-based providers and Duke faculty/staff, and clinical trials development and management. The relationship is extensively customized depending on the needs and interests of each affiliate. Programmatic development can be comprehensive or focused on a specific subspecialty and includes educational activities tailored to the needs of each affiliate.

Augusta Health
Fishersville, VA

**Beaufort Memorial Hospital
Keyserling Cancer Center**
Port Royal, SC

**High Point Regional Health System
Hayworth Cancer Center**
High Point, NC

Indian River Medical Center
Vero Beach, FL

Lexington Medical Center
West Columbia, SC

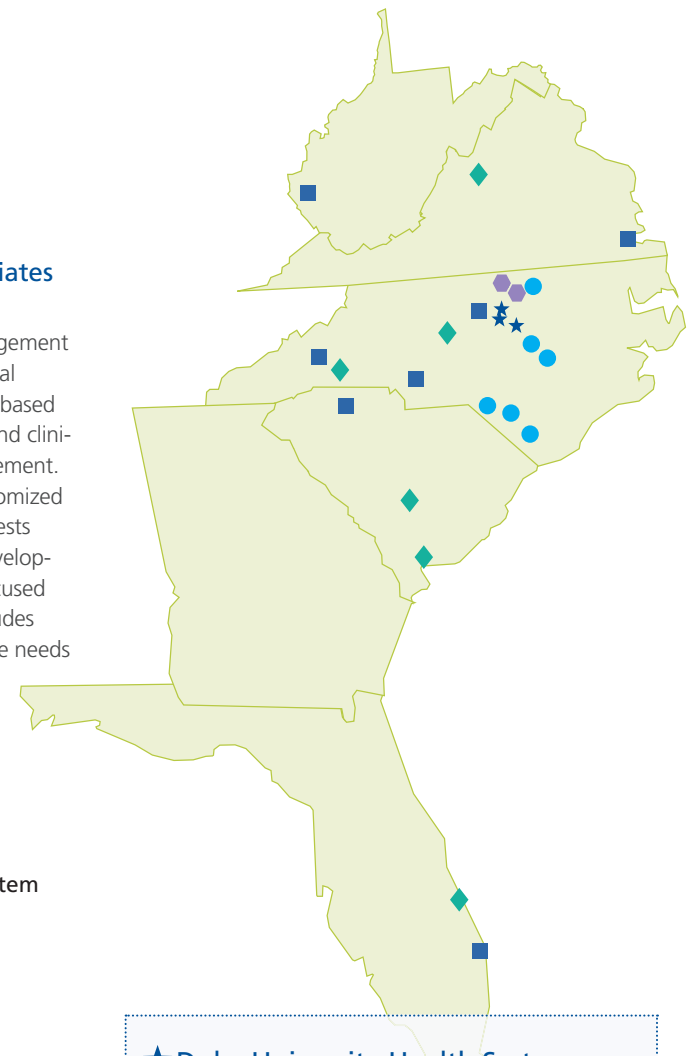
Rutherford Regional Health System
Rutherfordton, NC

◆ Consultative clinics

Duke faculty and Duke fellows see patients and recommend treatments at consultative clinics.

Granville Specialty Clinic
Oxford, NC

**Person Memorial Hospital
Specialty Clinics**
Roxboro, NC



★ Duke University Health System

Outpatient

Duke Cancer Center
Duke Raleigh Cancer Center
Tolnitch Surgical Associates

Inpatient

Duke University Hospital
Duke Raleigh Hospital
Durham Regional Hospital

Referrals: 800-MED-DUKE
dukecancerinstitute.org

"I consider the establishment of the Duke Cancer Institute to be among our most important and transformative initiatives during my time as chancellor. To me, this discovery-care continuum is the promise of Duke Medicine, and what makes us a source of real hope to every patient we serve."

Victor J. Dzau, MD
 Duke University Chancellor
 for Health Affairs



Duke Cancer Institute member Robert J. Lefkowitz, MD, shared the 2012 Nobel Prize in Chemistry for his discovery of G protein-coupled cell receptors, which are the target of some 40 percent of pharmaceuticals.



Duke University Medical Center is ranked #8 among America's Best Hospitals by *U.S. News & World Report*, 2012–2013.



Duke University Medical Center is ranked among the nation's best cancer programs by *U.S. News & World Report*, 2012–2013.



All three Duke University Health System hospitals have earned Magnet status for nursing excellence from the American Nurses Credentialing Center.



2012 Rising Star award from University HealthSystem Consortium in recognition of significant improvements and exemplary performance in patient safety, mortality, and clinical effectiveness. Duke University Hospital is one of only four hospitals nationally to win the award; Duke and Cleveland Clinic are the only top-10 ranked hospitals to receive the award.



Duke University Hospital was recognized as a 2012 Top Performer by The Joint Commission. Just 18 percent of eligible U.S. hospitals received the recognition.

dukecancerinstitute.org REFERRALS: **800-MED-DUKE**

While care was taken to ensure the accuracy of data and information reported in this publication, any necessary updates or corrections will be available at dukemedicine.org/cancerreport.