# DISCOVERY

2012 Rush University Cancer Center
Annual Report

RUSH UNIVERSITY
MEDICAL CENTER

1 Chair's Report

2 Rush University Cancer Center in Brief

4 Breast Cancer

5 Endocrine Cancers

6 Gastrointestinal Cancers

7 Genitourinary Cancers

8 Exploring Strategies to Combat Breast Cancer

10 Gynecologic Cancers

11 Head and Neck Cancers

12 Hematalogic Cancers

13 Lung and Thoracic Cancers

14 Give and Take: Physician-Scientist Collaborations Open Doors to Discovery

16 Melanoma and Cutaneous Cancers

17 Neurological Cancers

18 Pediatric Cancers

19 Sarcomas and Soft Tissue Tumors

20 Representative Publications

23 2011 Cancer Registry Report

25 Cancer Mortality at Rush


*On the cover: Thoracic surgery nurse Nikita Patel, RN, MSN, and thoracic surgeon William Warren, MD.*

# CHAIR'S REPORT

As health care providers and researchers, we long for that "aha" moment — and relish the pursuit of it. While that one puzzle piece may not offer a cure, it may spare patients the burden of unnecessary treatments; it may inspire colleagues to ask — and answer — more revealing questions; it may play a vital role in unraveling mysteries behind cancer development and treatment.

In the *2012 Rush University Cancer Center Annual Report,* we take a closer look at some of Rush's research endeavors and the people behind them. As practitioners of translational research, clinicians and scientists at Rush often enjoy dynamic and productive relationships, as you will see in our feature articles about research in breast, lung and colon cancers.

In our cancer registry report (see p. 23), you'll find that 3,138 cases were abstracted at Rush in 2011 (an increase from the previous year), 2,599 of which were analytic. These numbers reflect the breadth of the diseases we treat. We are indebted to the patients behind these numbers — many of whom participated in clinical trials — and the many others affected by cancer.

While there are many exciting accomplishments cited in this report, which includes snapshots of our cancer center and its programs, several more are worthy of mention:

**Rush offering cancer treatment services in the western suburbs.** In addition to serving residents in Oak Park, Rush now offers cancer treatment services at a new medical office building in Lisle, Ill. Physicians from Rush specializing in hematology, breast cancer, lung cancer, melanoma, thoracic surgery, head and neck cancers, gynecologic oncology and brain tumors will now be available to see patients in Lisle. This location also has a new chemotherapy infusion center, expanding services provided at Rush's other centers on the main campus in Chicago and at Rush Oak Park Hospital.

**Rush collaborates with Swedish Covenant Hospital and Rush-Copley Medical Center.** Rush and Swedish Covenant will develop and share cancer treatment protocols and various benchmarks for patient outcomes to improve quality, coordination and cost effectiveness of care provided to cancer patients at both institutions. In addition, patients at Swedish Covenant will have access to the cancer subspecialists at Rush. The collaborative effort will include a tumor board, where physicians from Rush and Swedish Covenant regularly meet to review specific patient cases to arrive at personalized courses of treatment. Rush and Rush-Copley will collaborate on cancer patient conferences, which are designed to improve care by allowing physicians from both organizations to consult one another on cases via real-time, state-of-the-art teleconferencing that includes patient pathology and imaging.

**Commission on Cancer accreditation.** In 2012, Rush received its third consecutive Outstanding Achievement Award from the Commission on Cancer of the American College of Surgeons. Rush is one of only 13 recipients to receive this nationwide award for the third time. The Outstanding Achievement Award recognizes cancer programs that strive for excellence in providing quality care to cancer patients and is given to community-based teaching hospitals that demonstrate a commendation level of compliance with seven standards related to cancer committee leadership, cancer data management, clinical management, research, community outreach and quality improvement.

**Quality initiative.** As part of Rush's ongoing efforts to prevent central line-associated bloodstream infections (CLABSI), Rush formed a multidisciplinary team to recommend and implement changes in Rush's inpatient areas. On the floors in the Tower (which celebrated its first anniversary this year [see p. 2]) that care for patients with cancer, two pilot studies were initiated: one in which nursing staff document line changes directly on the tegaderm dressings to promote better visualization of when lines need to be changed, and one in which Curos port protectors (disinfectant caps) are used on IV access ports and needleless connectors to keep ports clean and protected. These steps along with other initiatives, including staff education regarding line maintenance, are designed to significantly decrease CLABSI rates in the coming year.

I would like to thank the many organizations with whom Rush collaborates as well as the health care providers with whom we partner to provide quality care to patients both in and outside of Chicago. I'd also like to extend my gratitude to my colleagues here at Rush — our physicians, nurses and cancer registry staff — for their dedication and commitment to our patients and their families. This is my last year serving as chair of the cancer committee at Rush, and it has been a truly rewarding experience. I have learned so much from so many during the past three years and have made discoveries of my own that have helped shape my own approach to cancer care.

Michael Liptay, MD
The Mary Denny Weaver Professor of Cancer Research
Chairperson, Department of Cardiovascular-Thoracic Surgery
Chair, Cancer Committee at Rush

# RUSH UNIVERSITY CANCER CENTER IN BRIEF

The Rush University Cancer Center comprises all cancer-related clinical, research and educational efforts at Rush, crossing 20 departments, divisions and sections; inpatient and outpatient areas; professional clinical activities; and the colleges of Rush University.

*Radiation oncologist Aidnag Diaz, MD, MPH (left), and neurosurgeon Lorenzo Muñoz, MD, work collaboratively in the brain tumor clinic. Together, they created an access initiative for patients with metastatic brain cancer (see p. 17).*

## Comprehensive Clinics

Rush, which serves both adults and children with cancer, is home to The Coleman Foundation comprehensive clinics. In these multidisciplinary clinics, a team approach is applied to patient care, with the care team at Rush gathering to discuss the patient's condition, review diagnostic tests and develop a treatment plan, often in collaboration with the patient's diagnosing physician.

The comprehensive clinics are dedicated to the following:

- Blood and bone marrow transplants
- Brain cancer
- Breast cancer
- Chest and lung tumors
- Gastrointestinal cancers
- Gynecologic cancers
- Head and neck cancers
- Inherited susceptibility to cancer
- Leukemia
- Lymphoma
- Melanoma and soft tissue tumors (includes the former Pigmented Lesion Clinic)
- Multiple myeloma
- Myelodysplastic/myeloproliferative neoplasms
- Prostate cancer
- Sarcomas
- Spine tumors

## Support Services

In addition to treating cancer, Rush is committed to helping patients and their families cope with its psychological, emotional and spiritual effects. Support services available at Rush include the following:

- An American Cancer Society patient navigator who meets with patients and families to provide vital support, including information about available treatments, programs and community services.
- The Cancer Integrative Medicine Program, through which patients have access to complementary therapies — such as psychotherapy and nutritional counseling, massage therapy, yoga and acupuncture — that promote their well-being and help maintain their quality of life.
- A recently expanded palliative and supportive care program that offers distress screening, pain management and many other services.
- Survivorship services for lymphoma and breast cancer survivors.

## Strategic Alliances and Outreach Efforts

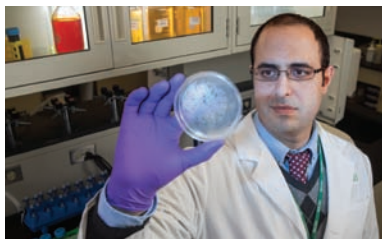
To provide the best possible care for patients across the region, Rush has formed key relationships with other organizations in Chicago and beyond, including the following:

- Argonne National Laboratory
- DuPage Medical Group
- Illinois Institute of Technology
- John H. Stroger, Jr. Hospital of Cook County
- Rush Oak Park Hospital
- Rush-Copley Medical Center
- Swim Across America
- Swedish Covenant Hospital

## Residency and Fellowship Programs

Rush offers a full range of selective residencies and fellowships, including the following programs for physicians interested in caring for patients with cancer:

- Residency in radiation oncology
- Residency in nuclear medicine
- Fellowship in hematology/medical oncology
- Fellowship in orthopedic oncology
- Fellowship in hospice and palliative medicine



*Researcher Abde Abukhdeir, PhD, studies molecular pathways related to breast cancer.*

## Advancing Medicine Through Research

The Rush University Cancer Center fosters research across four broad programs that aim to deepen our understanding of cancer in order to better prevent, detect and treat it. These programs include cancer biology; clinical, behavioral and translational research; molecular signatures and cancer outcomes; and tumor immunology. For a list of cancer clinical trial opportunities, visit www.rush.edu/cancerclinicaltrials.

"In the Tower's perioperative and interventional platform, I often collaborate with the pathologist during my frozen sections and am able to see the slides in real time on a large flat screen in the operating room. This capability allows me to better visualize what the pathologist sees."

— Summer Dewdney, MD, gynecologic oncologist

## Recognition and Accreditations

- Rush has received three consecutive outstanding achievement awards from the Commission on Cancer of the American College of Surgeons.
- The Coleman Foundation Blood and Bone Marrow Transplantation Clinic is accredited by the Foundation for the Accreditation of Cellular Therapy.
- Rush's pathology and clinical laboratories are accredited by the Joint Commission.
- Three times in a row, Rush has received Magnet status — the highest recognition for nursing excellence — from the American Nurses Credentialing Center.
- The Regenstein Breast Imaging Center at Rush is an American College of Radiology-accredited Center of Excellence. This designation is awarded to centers that have received full accreditation in mammography, breast ultrasound, and stereotactic and ultrasound-guided needle biopsies.
- The Association for the Accreditation of Human Research Protection Programs has awarded Rush full accreditation with distinction in Community Programs, giving special recognition to Rush's community-based participatory research.
- Rush has been named among the top hospitals in the country for quality, safety and efficiency four consecutive times by the Leapfrog Group, a national organization that promotes health care safety and quality improvement.

### THE TOWER: RUSH'S NEW HOSPITAL CELEBRATES ITS FIRST ANNIVERSARY

In January, Rush's new hospital, the Tower, celebrated its first anniversary. Since its opening, the Tower has received numerous distinctions for design and was awarded Leadership in Energy and Environmental Design (LEED) Gold Certification by the U.S. Green Building Council, making the hospital the largest new-construction health care project in the world to be LEED gold certified. Rush's patient satisfaction scores from the Hospital Consumer Assessment of Healthcare Providers and Systems reached an all-time high for Rush following the Tower opening. And the new operating room facilities in the Tower's perioperative and interventional platform have all been well-received, with oncologic surgeons collaborating with pathologists to visually evaluate biopsies during procedures thanks to large flat screens in the operating rooms.

# BREAST CANCER

Many breast cancer patients at Rush are seen at The Coleman Foundation Comprehensive Breast Cancer Clinic, the first clinic of its kind in the Midwest. In the clinic, diagnostic data are correlated with a physical exam to determine disease staging and a treatment approach. A multidisciplinary team then meets with patients and families to discuss the best course of treatment. Rush also has a robust breast cancer basic and clinical research program (for more see p. 8).

## HIGHLIGHTS

**PARP inhibitors:** As part of a national trial for women with BRCA mutation-related metastatic cancer, **Lydia Usha, MD,** is investigating the poly (ADP-ribose) polymerase, or PARP, inhibitor veliparib. Researchers hope that this promising new class of drugs will stop the repair of cancer cells treated with chemotherapy in patients with BRCA mutations.

**International study testing site:** For an international study on ductal carcinoma in situ, Rush is testing tumor samples from around the world to identify qualified participants. The study investigates the addition of Herceptin to standard therapy to gauge its radiosensitizing ability. Because there are indications that just a single dose of Herceptin activates immunity against HER2, researchers such as **Melody Cobleigh, MD,** international chair of the study, are also evaluating whether small doses of Herceptin can reduce the risk of cancer in the opposite breast.

**Early T-DM1 studies:** For patients with highly refractory metastatic breast cancer that has progressed on all standard therapy, a new option recently received FDA approval: T-DM1, a molecule that combines Herceptin and a chemotherapeutic drug. Herceptin acts as a "smart drug," according to **Melody Cobleigh, MD,** one of the leaders of early T-DM1 international trials. The Herceptin attaches itself to tumor cells only; the chemotherapeutic drug is then internalized by the cancer cell, destroying itself from within while leaving normal cells alone.

**New breast imaging facilities:** Two new centers at Rush will provide digital mammography in two locations: a screening center for convenient access for routine mammograms, and a diagnostic and biopsy center. According to director **Peter Jokich, MD,** these changes enable his team of specialty trained radiologists to better serve the different needs of each patient population, while providing faster image sharing with other clinicians.

**Innovative radiotherapy:** The Department of Radiation Oncology offers specialized breast cancer irradiation using the prone technique. This technique, developed by **Katherine Griem, MD,** and colleagues at Rush, reduces the amount of radiation delivered to the lung in all patients and reduces the amount to the heart in most patients with left breast cancer.

**Radiotherapy expertise:** As a board member of the American Society of Breast Disease, **Krystyna Kiel, MD,** radiation oncologist, has presented at three international and national symposia on topics such as new approaches to radiation therapy, treatment of brain metastasis and postmastectomy radiation therapy.

*Radiation oncologist Katherine Griem, MD (left), and medical oncologist Melody Cobleigh, MD, are both actively involved in clinical research.*

### CLINICAL SPECIALISTS

**Diagnostic radiologists:**
Anne Cardwell, MD; Carol Corbridge, MD; Janice Dieschbourg, MD; Mireya Dondalski, MD; Peter Jokich, MD; Gene Solmos, MD; Lisa Stempel, MD

**Medical oncologists:**
Melody Cobleigh, MD; Katherine Kabaker, MD; Ruta Rao, MD; Lydia Usha, MD

**Pathologists:**
Paolo Gattuso, MD; Ritu Ghai, MD

**Plastic and reconstructive specialists:**
John Cook, MD; Gordon Derman, MD; George Kouris, MD; Norman Weinzweig, MD

**Radiation oncologists:**
Katherine Griem, MD; Krystyna Kiel, MD

**Surgical oncologists:**
Steven Bines, MD; Kambiz Dowlatshahi, MD; Darius Francescatti, MD; Alicia Growney, MD; Andrea Madrigrano, MD; Thomas Witt, MD; Norman Wool, MD

### BREAST TUMOR CONFERENCE

Mondays, 4 to 5 p.m.
Janet Wolter, MD, Clinical and Educational Conference Room
1010 Professional Building

### CLINICAL RESEARCH

Rush is currently participating in the adjuvant therapy trial AFFINITY in which the antibody pertuzumab is combined with Herceptin plus chemotherapy. For more information about open clinical trials, visit www.rush.edu/cancerclinicaltrials. To enroll a patient in a clinical trial, call (312) 942-3608.

For more information about the breast cancer program or to refer a patient for an initial visit or a second opinion, please call (312) CANCER-1 (226-2371).

# ENDOCRINE CANCERS

*Endocrine surgeon Katy Heiden, MD, and endocrinologist David Baldwin, MD, meet regularly to review cases.*

Rush offers comprehensive care for cancerous and noncancerous tumors of the endocrine system, including adrenal tumors, pancreatic neuroendocrine tumors, parathyroid tumors and thyroid tumors. The endocrine cancer team uses state-of-the-art procedures and imaging techniques to diagnose patients as quickly and accurately as possible. After diagnosis, an individualized treatment plan is developed for each patient. An endocrinologist provides patients with long-term care, including medication dose adjustment and follow-up scans. In cases that require surgery, the endocrine surgeon — who now performs robotic surgeries as well as traditional procedures — collaborates with the endocrinologist to provide this follow-up care.

## HIGHLIGHTS

**Seeing patients in Oak Park:** Surgeon **Katy Heiden, MD,** began seeing patients at Rush Oak Park Hospital this past year. This is part of Rush's larger effort to provide high-quality, geographically convenient cancer care to people living in Chicago's western suburbs.

**BRAF testing for thyroid cancer:** Doctors at Rush can now test for BRAF genetic mutations in patients with thyroid cancer that is resistant to radioactive iodine therapy. Many cells in papillary thyroid cancers have been found to have changes in the BRAF gene, causing these cancers to grow. If patients test positive for the BRAF genetic mutation, tyrosine kinase inhibitors — drugs that target BRAF gene mutations — may be considered as treatment.

**State-of-the-art facilities:** Surgeries for endocrine cancers are performed in Rush's perioperative and interventional platform, located in the Tower, which opened in 2012. The majority of patients undergoing these surgeries also go to extended recovery in the new building, which offers single rooms and city views. The operating rooms house state-of-the-art communication technologies, including an audiovisual system that connects all operating rooms to each other and other departments at Rush. This enables consultations to occur in real time during procedures.

### CLINICAL SPECIALISTS

**Endocrine surgeon:**
Katy Heiden, MD

**Endocrinologists:**
David Baldwin, MD; Tiffany Hor, MD; Chung Kay Koh, MD; Sirimon Reutrakul, MD; Kristina Todorova-Koteva, MD

### ENDOCRINE TUMOR CONFERENCE

Wednesdays (varies each month), 8 to 9 a.m.
250 Professional Building

### CLINICAL TRIALS

For information about open clinical trials, visit www.rush.edu/cancerclinicaltrials. To enroll a patient in a clinical trial, call (312) 942-3608.

For more information about the endocrine cancers program or to refer a patient for an initial visit or a second opinion, please call (312) CANCER-1 (226-2371).

# GASTROINTESTINAL CANCERS

The Coleman Foundation Comprehensive Gastrointestinal Cancers Clinic is an integral part of the gastrointestinal cancers program at Rush, offering the latest diagnostic capabilities as well as leading-edge treatment options. As one of the few places in the Chicago area to provide a full spectrum of care for patients with gastrointestinal cancers, the clinic brings together a team of experts in gastroenterology, hepatology, medical oncology, radiation oncology, pathology, diagnostic and interventional radiology, and surgery. Many new patients meet with this multidisciplinary team. In a single visit, patients leave knowing that there is a well-defined treatment plan designed to meet their specific needs. One of the program's primary goals is to ensure that patients have active roles in deciding their treatment plans.

## HIGHLIGHTS

**Symposium:** The Coleman Foundation Gastrointestinal Cancers Clinic held its annual daylong gastrointestinal cancer symposium Feb. 23, 2013. Some of the topics covered included advances in the treatment of gastrointestinal cancers, palliative care and management of liver metastases. Seven scientific reports were published within the year prior to the symposium.

**Alternative regimens:** In the *Journal of Gastrointestinal Cancer Research,* radiation oncologists **Ross Abrams, MD,** and **Shalini Garg, MD,** as well as medical oncologist **William Leslie, MD,** published a case report of a patient with anal carcinoma. The patient developed a 5-fluorouracil (FU)-induced coronary syndrome early in her radiation treatment, leading doctors to change her chemotherapy treatment to paclitaxel and cisplatin, which was tolerated well. The patient continued to be disease-free five years after treatment, indicating that this approach can be used with radiation therapy in patients who cannot tolerate 5-FU.

**New surgeons:** Rush named surgeon **Bruce Orkin, MD,** from Tufts Medical Center, as chief of the Section of Colon and Rectal Surgery. Orkin specializes in transanal endoscopic microsurgery, robotic colorectal surgery and pediatric colorectal surgery, and he pioneered single-port laparoscopic colorectal surgery. **Joanne Favuzza, DO,** a colorectal surgeon, also recently joined the gastrointestinal cancer team at Rush. Favuzza specializes in minimally invasive surgeries, including laparoscopic procedures.

*Colorectal surgeon Bruce Orkin, MD, specializes in transanal endoscopic microsurgery.*

**Grants for colorectal cancer screening:** Gastroenterologist **Joshua Melson, MD,** received two grants from the American Cancer Society during the past year. One is a grant to develop blood biomarkers to identify patients who have colorectal cancers. The other grant will help fund a study testing the efficacy of a patient navigation program to promote colorectal cancer screenings.

### CLINICAL SPECIALISTS

**Gastroenterologists:**
John Losurdo, MD; Joshua Melson, MD; Sohrab Mobarhan, MD; David Shapiro, MD

**Colorectal surgeons:**
Marc Brand, MD; Joanne Favuzza, DO; Bruce Orkin, MD

**General surgeons:**
Daniel Deziel, MD; Minh Luu, MD; Keith Millikan, MD; Jonathan Myers, MD

**Interventional radiologists:**
Bulent Arslan, MD; Allen T. Chen, MD; Jayesh Soni, MD; Ulku Cenk Turba, MD

**Medical oncologists:**
Mary Jo Fidler, MD; Marisa Hill, MD; William Leslie, MD

**Pathologist:**
Shriram Jakate, MD

**Radiation oncologists:**
Ross Abrams, MD; Krystyna Kiel, MD

**Radiologists:**
John Hibbeln, MD; Claire Smith, MD

**Thoracic surgeons:**
Gary Chmielewski, MD; Michael Liptay, MD; William Warren, MD

**Transplant hepatologists:**
Sheila Eswaran, MD; Nikunj N. Shah, MD

### GASTROINTESTINAL TUMOR CONFERENCE

Tuesdays, 12:30 to 1:30 p.m.
Janet Wolter, MD, Clinical and Educational Conference Room
1010 Professional Building

### CLINICAL TRIALS

Rush is currently participating in a randomized, double-blind, phase III study of the efficacy and safety of gemcitabine in combination with TH-302 compared with gemcitabine in combination with placebo in previously untreated patients with metastatic or locally advanced unresectable pancreatic adenocarcinoma. To enroll a patient in a clinical trial, call (312) 942-3608.

For more information about the gastrointestinal cancers program or to refer a patient for an initial visit or a second opinion, please call (312) CANCER-1 (226-2371).

# GENITOURINARY CANCERS

Specialists at Rush diagnose and treat people with cancers of the urinary tract and male genital tract, including bladder cancer, kidney cancer, prostate cancer and testicular cancer. Urologists offer advanced treatment options — such as da Vinci prostatectomy and minimally invasive cryosurgical procedures for prostate and kidney cancer. Leading-edge radiation treatments are also available, including TomoTherapy, intensity-modulated radiation therapy and both high-dose and traditional brachytherapy. Rush also has an active surveillance program for men with prostate cancer who are not undergoing treatment.

## HIGHLIGHTS

**Comparing treatment regimens:** In a decision analysis published in *Cancer,* **David Sher, MD, MPH,** a radiation oncologist, and a colleague compared the two evidence-based therapies for the treatment of high-risk prostate cancer: external-beam radiotherapy with hormone therapy and radical prostatectomy with adjuvant radiotherapy. Based on their model, the authors concluded that external-beam radiotherapy with hormone therapy was superior and noted that trimodality therapy may have local and distant control benefits leading to optimal outcomes in men with prostate cancer.

**Appointments:** Urologist **Dennis Pessis, MD,** assumed the role of president of the American Urological Association in 2012. Urologist **Christopher Coogan, MD,** was elected in August as secretary/treasurer of the Chicago Urological Society for a one-year term.

**Testis cancer and marriage:** Urologist **Christopher Coogan, MD,** and colleagues evaluated more than 30,000 cases of testis cancer reported to the Surveillance, Epidemiology and End Results database between 1973 and 2005 and found that married status is an independent predictor of improved overall and cancer-specific survival in men with testis cancer. Retroperitoneal lymph node dissection was found to be an additional predictor of improved survival in men with stages I and II nonseminomatous germ cell tumors. These findings were published in *Urological Oncology.*

**Additional technology:** Rush, which was the first Chicago hospital to offer robotic surgery with 3-D in high definition and has now performed more than 1,000 procedures using this approach, has recently acquired additional da Vinci Surgical System technology. The new equipment has dual control capabilities, a key feature in training physicians, and is being used to perform prostatectomies as well as cystectomies to treat bladder cancer.


*Urologist Dennis Pessis, MD — shown here with a patient — was named president of the American Urological Association in 2012.*

### CLINICAL SPECIALISTS

**Medical oncologist:**
John Showel, MD

**Radiation oncologist:**
David Sher, MD, MPH

**Urologists:**
Christopher Coogan, MD; Shahid Ekbal, MD; Lev Elterman, MD; Jerome Hoeksema, MD; Kalyan Latchamsetty, MD; Laurence Levine, MD; Charles McKiel Jr., MD; Dennis Pessis, MD

### GENITOURINARY TUMOR CONFERENCE

Tuesdays, 7 to 8 a.m.
Neurosurgery Conference Room
1115 Professional Building

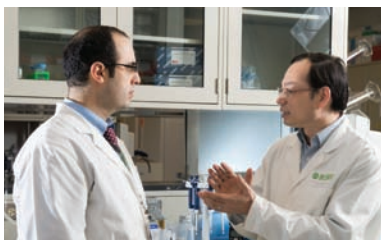
### CLINICAL TRIALS

Rush is currently participating in a clinical trial in which one objective is to determine whether the addition of neoadjuvent and concurrent short-term androgen deprivation to prostate bed radiation therapy (PBRT) improves freedom from progression for five years over that of PBRT alone in men treated with salvage radiation therapy after radical prostatectomy. For more information about open clinical trials, visit www.rush.edu/cancerclinicaltrials. To enroll a patient in a clinical trial, call (312) 942-3608.

For more information about the genitourinary cancers program or to refer a patient for an initial visit or a second opinion, please call (312) CANCER-1 (226-2371).

# EXPLORING STRATEGIES TO COMBAT BREAST CANCER

As any oncologist can tell you: Cancer is not a monolithic disease. Each person's cancer is individual to his or her genetic signature. Instead of a search for "a cure to cancer," there are now myriad questions specific to each cancer and each person: Which drug combination will work best with the tumor's signature? Which mutated genes create drug resistance?



*Researchers Abde Abukhdeir, PhD (left), and Youping Deng, PhD, are both investigating the molecular mechanisms behind the development of breast cancer.*

Breast cancer clinicians and basic researchers at Rush University Medical Center tackle the disease from all these angles — from trying to develop a biomarker for early detection to identifying mutations that lead to acquired drug resistance.

## Catching the disease in its earliest stages

**Youping Deng, PhD,** a bioinformatics researcher at Rush, has a vision: Along with checking a woman's cholesterol and glucose levels, a primary care physician could also determine her breast cancer risk — all through the evaluation of lipids in her routine blood work.

"Lipids have already been used as a biomarker to indicate other kinds of disease — diabetes, heart disease — and we know lipids are very important to cancer," Deng says. "But while many lipids have been studied as a class, few studies have investigated individual lipid species as biomarkers using metabolic lipid profiling and bioinformatics, and even fewer for breast cancer specifically."

Using a combination of around 16 lipids, Deng and his colleagues developed a lipid signature they believe could be used to predict breast cancer. In an initial study looking at 53 cancer patients and 20 benign patients, they were able to detect breast cancer with a sensitivity of 92 percent, and an accuracy of around 94 percent, using this lipid signature. Their next step is to seek additional validation with more samples and to combine the signature with microRNA to improve accuracy.

Deng and colleagues also apply this methodology to investigate signatures for lung and prostate cancers.

## Finding the mutations and the mechanisms behind them

As groundbreaking as Herceptin was, only 20 percent of patients are especially sensitive to Herceptin as a single agent. For basic researchers like **Abde Abukhdeir, PhD,** this relatively low response rate is a call to action. Working with a research model that recapitulates in the lab genetic alterations that occur in the patient, Abukhdeir's goal is to first identify the genetic alterations that may be the cause of this resistance. These alterations can serve as markers that predict which patients should receive therapy. More important, these genetic alterations can serve as novel targets for new therapies that may be able to overcome Herceptin resistance.

Abukhdeir can test this model against samples from patients given only Herceptin, without chemotherapy. As one of the investigators leading the initial Herceptin trials, **Melody Cobleigh, MD,** a medical oncologist at Rush, collected patient samples throughout the trials, including samples from patients treated with Herceptin alone. "Dr. Cobleigh has samples that no one else in the world has, or can ever have," says Abukhdeir. "This is gold. So once we identify the genes that are the most likely culprits for resistance, we can use Dr. Cobleigh's samples to look at how frequently this occurs in actual patient samples."

## Targeting pathways

As a pilot study, Abukhdeir is also taking all the drugs commercially available that target PIK3CA, the most frequently mutated oncogene in breast cancer, and testing them on breast cancers that harbor mutations on other genes within the same pathway. The goal: to see whether drugs that address specific mutations will also affect the entire pathway.

If drugs that work on specific gene mutations can be shown to work on a pathway, patients with rare mutations that currently have no targeted therapies available may one day have more individualized options. "If you add up all the gene mutations within a pathway, it adds up to a significant number," he says. "That's what I'm most excited about: trying to identify the best patient population for targeted therapies, and at the same time expanding the repertoire of drugs available."

" While many lipids have been studied as a class, few studies have investigated individual lipid species as biomarkers using metabolic lipid profiling and bioinformatics, and even fewer for breast cancer specifically."

— Youping Deng, PhD, researcher

### The missing link in cyclin D1 overexpression?

Clinicians know that the protein cyclin D1, a critical component of cell proliferation, overexpresses in several cancers: pancreatic, prostate, lung and breast cancers and leukemia. In fact, more than 50 percent of breast cancer cells have cyclin D1 overexpression.

The missing link, however, is what causes this overexpression. **Di Chen, MD, PhD,** a biochemist at Rush, and his colleagues hypothesize that overexpression occurs because of a defect in sumoylation, a posttranslational modification involved in various cellular processes, including apoptosis. In initial studies, Chen's group has found repeatedly that sumoylation leads to ubiquitination, a process in which the regulatory protein ubiquitin is attached to proteins and labels them for destruction, and then protein degradation — thereby allowing for normal regulation of cyclin D1.

Taking this hypothesis to the next level, Chen and his colleagues hope to find agents that will stimulate ubiquitination. One potential agent: arsenic trioxide, a highly toxic anticancer agent currently used to treat leukemia. Chen is working with a colleague from another institution who is developing material to enable safer, local delivery of arsenic trioxide for the treatment of breast cancer.

### Inheriting a hidden mutation

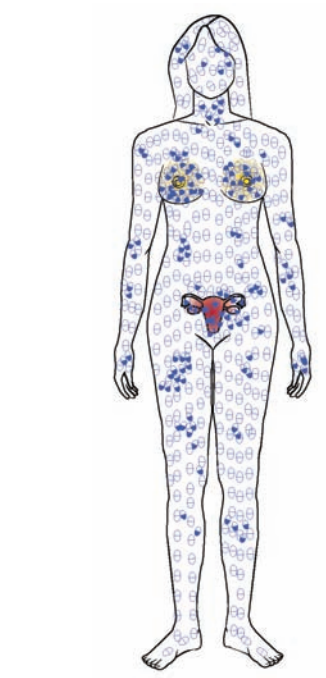
As a medical oncologist who specializes in inherited susceptibility to cancer, **Lydia Usha, MD,** is testing a novel hypothesis about the origin of cancer in relatives of BRCA mutation carriers. She suggests that patients who have a known BRCA 1 or 2 mutation in their families but test negative for it by blood testing, and later develop a tumor consistent with hereditary breast and ovarian cancer syndrome, may in fact have the familial BRCA mutation present in their tumor. Usha hypothesizes these patients had BRCA-positive chimeric cells in their body since birth because their mother or gestational twin transferred these cells to them during pregnancy. "If we confirm this hypothesis, the implications can be far-reaching," says Usha. "There is no explanation for these BRCA phenocopies. Patients are counseled that they do not have an increased risk for cancer, and that is not necessarily true."

The implications could apply to treatment as well as prevention. Some new therapeutic approaches currently being studied for cancer that specifically target BRCA mutations, such as PARP inhibitors (see p. 4), are not offered to patients who test negative for the mutations; however, if this hypothesis is correct and they have hidden BRCA mutations in their tumor, these patients might benefit from these new anticancer treatments as well.

And the potential of chimeric cells might not be limited to cancer: "There are no known diseases associated with chimerism, and if it comes across as a potential mechanism for predisposition to disease, that would be very new and could have potential for other diseases."

*To learn about clinical research on breast cancer, see p. 4.*

**A Woman With BRCA-Mutant Chimeric Cells**




*Lydia Usha, MD, a medical oncologist who specializes in cancer genetics, is currently testing this hypothesis: Patients with known BRCA 1 or 2 mutations in their family but who test negative for it and later develop tumors consistent with hereditary breast and ovarian cancer may have BRCA-positive chimeric cells that were transferred to them during gestation.*

# GYNECOLOGIC CANCERS

As a member of the National Cancer Institute's Gynecology Oncology Group, the multidisciplinary gynecologic oncology team at Rush — which includes gynecologic oncologists and radiation oncologists — participates in numerous clinical trials as well as basic research aimed at improving detection and treatment for gynecologic cancers. Specialists evaluate patients via multidisciplinary consultation and offer a full spectrum of care, from treatment for gynecologic malignancies and complex surgical problems to providing genetic evaluations.

## HIGHLIGHTS

**Etiology of ovarian cancer:** **Jacob Rotmensch, MD,** a gynecologic oncologist, and **Pincas Bitterman, MD,** a pathologist, are investigating the etiology of ovarian cancer in collaboration with numerous academic institutions. Currently, they are working with the Illinois Institue of Technology and Utah State University to evaluate the interaction of stroma and epithelium to determine the cause of ovarian cancer. In a cooperative effort with University of Missouri and Utah State University, Rotmensch is also studying viral phage technology in an effort to develop diagnostic tools and treatments for ovarian cancer.

**Examining molecular differences:** **Alfred Guirguis, DO,** a gynecologic oncologist, is looking at ovarian and endometrial tumor tissue at the molecular level, using gene profiling and expression microarrays, to identify biomarkers. Along with researchers **Animesh Barua, PhD;** and **Sanjib Basu, PhD,** pathologist **Pincas Bitterman, MD,** and fetal and neonatal ultrasound specialist **Jacques Abramowicz, MD,** Guirguis has evaluated the expression of glucose-regulated protein 78 (GRP78) and its regulator microrna-181 during the development and progression of ovarian cancer.

**Improving outcomes:** Gynecologic oncologist **Summer Dewdney, MD** — who has a special interest in health disparities with respect to endometrial cancer and has recently investigated familial relationships between uterine serous cancer and endometrial, ovarian and pancreatic cancers — is helping establish a collaboration between national cancer organizations to improve quality measures and outcomes. She is currently leading a pilot program at Rush to evaluate quality outcomes in gynecologic malignancies.


*Gynecologic oncologists at Rush — including Alfred Guirguis, DO, who is shown here using the da Vinci surgical system — are actively involved in clinical and basic research at Rush.*

**Genetic counseling:** Medical oncologist **Lydia Usha, MD,** leads the Rush Inherited Susceptibility to Cancer (RISC) clinic, where she counsels people on their personal and family risks for developing cancer, and provides information on prevention and early detection. Studies have shown that women who test positive for BRCA 1 and BRCA 2 gene mutations have a high risk of developing breast or ovarian cancer by the time they turn 70. In the RISC clinic, patients are checked with a blood test for mutations in these and other genes known to cause cancer.

### CLINICAL SPECIALISTS

**Gynecologic oncologists:**
Summer Dewdney, MD; Alfred Guirguis, DO; Jacob Rotmensch, MD; Edgardo Yordan, MD

**Medical oncologist:**
Lydia Usha, MD

**Pathologists:**
Pincas Bitterman, MD; Ritu Ghai, MD

**Radiation oncologist:**
Krystyna Kiel, MD

### GYNECOLOGIC TUMOR CONFERENCE

Fridays, 7 to 8 a.m.
Pathology Conference Room
562 Jelke Building

### CLINICAL TRIALS

Rush is currently participating in many clinical trials related to gynecologic malignancies, including a phase II evaluation of temsirolimus in combination with carboplatin and paclitaxel followed by temsirolimus consolidation as first-line therapy in the treatment of clear cell carcinoma of the ovary. For more information about open clinical trials, visit www.rush.edu/cancerclinicaltrials. To enroll a patient in a clinical trial, call (312) 942-3608.

For more information about the gynecologic cancers program or to refer a patient for an initial visit or a second opinion, please call (312) CANCER-1 (226-2371).

# HEAD AND NECK CANCERS

The head and neck cancers program at Rush offers patients the highly specialized expertise and therapies necessary to treat these rare tumors — including those found on the underside of the brain, or skull base, which represent only about 3 percent of cancers in patients in the United States. To detect and treat cancer as well as check for recurrence, doctors use the most advanced technology available. In fact, Rush was the first hospital in Chicago to use a PET scan, the most accurate way to diagnose head and neck cancer and monitor the effectiveness of therapy.

## HIGHLIGHTS

**Multidisciplinary approach:** The Coleman Foundation Comprehensive Head and Neck Tumor Clinic meets regularly with patients to tailor care to each individual. The team includes neurosurgeons, otolaryngologists, medical oncologists and radiation oncologists. Patients also benefit from the expertise of dedicated specialists in radiology, plastic and reconstructive surgery, and oral oncology.

**Evaluating treatment for salivary gland tumors:** Radiation oncologist **David Sher, MD, MPH,** and colleagues from other institutions evaluated a single-institution experience of patients with salivary gland tumors who had undergone adjuvant intensity-modulated radiotherapy (IMRT), with or without concurrent chemotherapy. They found that postoperative IMRT was well-tolerated in patients and that there was a high rate of local control. In addition, they noted excellent local control with chemoradiotherapy in a subgroup of patients who had adverse prognostic factors, such as stage T3/T4 disease, nodal positivity and positive margins. Findings were reported in the *International Journal of Radiation Oncology, Biology, Physics*.

**Radiation oncology expertise:** Rush has two radiation oncologists, **Aidnag Diaz, MD, MPH,** and **David Sher, MD, MPH,** who specialize in treating head and neck cancers. This expertise is especially important with these cancers because of their proximity to the brain and spine. At Rush, radiation oncologists have access to multiple tools, including 3-D conformal radiotherapy — which allows radiation oncologists to use multiple beams of radiation to fit the size and shape of the tumor — and TrueBeam STx, a radiosurgical technology that delivers larger doses of radiation to well-defined tumors while sparing surrounding tissues.

**Support group:** In collaboration with Gilda's Club Chicago, a throat cancer networking group meets at Rush monthly. The meetings, which consist of discussions, question and answer periods, and education, are open to those who themselves have cancer or are supporting a loved one with cancer.

**Otolaryngology department names acting chairperson:** Rush University has appointed **Paul J. Jones, MD,** as acting chairperson of the Department of Otolaryngology/Head and Neck Surgery. Jones is currently director of pediatric otolaryngology at Rush.

*Medical oncologist Mary Jo Fidler, MD, treats patients with head and neck cancers as well as patients with lung cancer.*

### CLINICAL SPECIALISTS

**Medical oncologists:**
Mary Jo Fidler, MD; John Showel, MD

**Neurosurgeons:**
Richard Byrne, MD; Roham Moftakhar, MD; Lorenzo Muñoz, MD

**Neuroradiologist:**
Miral Jhaveri, MD

**Neurotologist:**
R. Mark Wiet, MD

**Otolaryngologists/head and neck surgeons:**
Joseph Allegretti, MD; David Caldarelli, MD; Paul J. Jones, MD; Andrew Lerrick, MD; Thomas Nielsen, MD

**Radiation oncologists:**
Aidnag Diaz, MD, MPH; David Sher, MD, MPH

### HEAD AND NECK TUMOR CONFERENCE

First and third Wednesdays, 7 to 8 a.m.
Janet Wolter, MD, Clinical and Educational Conference Room
1010 Professional Building

### CLINICAL TRIALS

Researchers at Rush often investigate new therapies for head and neck cancers. For more information about open clinical trials, visit www.rush.edu/cancerclinicaltrials. To enroll a patient in a clinical trial, call (312) 942-3608.

For more information about the head and neck cancers program or to refer a patient for an initial visit or a second opinion, please call (312) CANCER-1 (226-2371).

# HEMATOLOGIC CANCERS

Hematologists, hematologist/oncologists, bone marrow transplant specialists and other blood cancer experts at Rush all share a commitment to exploring every available path toward the best possible outcomes. This commitment propels research on new treatments — such as targeted therapies, immunoconjugates (e.g., radioimmunotherapy and other novel compounds), chemoimmunotherapy and stem cell transplantation. It also inspired the launch of patient-centered clinics to promote the most effective delivery of these treatments.

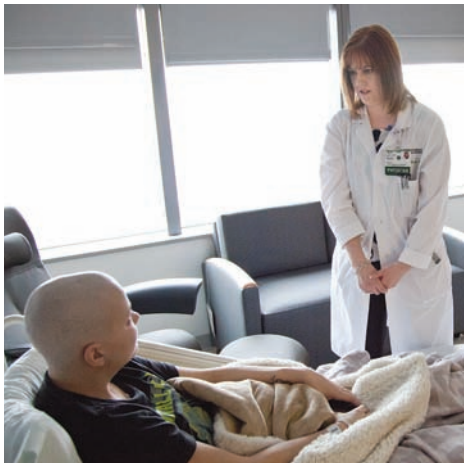
## HIGHLIGHTS

**Board appointment:** The Lymphoma Research Foundation elected hematologist **Stephanie Gregory, MD,** to its scientific advisory board. The 45-member board reviews grant proposals and makes recommendations regarding research priorities and funding to the foundation.

**Improving hematopoietic stem cell transplantation efficiency:** This past year, **Stephanie Gregory, MD,** hematologist; **Henry Fung, MD,** stem cell transplantation specialist; and other researchers published a study in *Experimental Hematology* regarding a strategy designed to improve hematopoietic stem cell transplantation efficiency. Their findings suggest that there may be clinical therapeutic benefit to using CD26 inhibitors to improve engraftment of unfractionated mobilized peripheral blood cells as well as cord blood cells.

**Transplantation conditioning study:** Stem cell transplantation specialist **Elizabeth Shima Rich, MD, PhD,** participated in a phase I/II study of transplantation conditioning with clofarabine-melphalan-alemtuzumab for patients with advanced hematologic malignancies. While the conditioning promoted promising responses and duration of responses, the investigators found that renal toxicity poses a considerable risk particularly in older patients. The study was published in *Biology of Blood Marrow Transplantation.*

**Unique approach to indolent lymphomas:** In a study published in *Clinical Lymphoma, Myeloma and Leukemia,* hematologist/oncologist **Reem Karmali, MD,** evaluated the safety and efficacy of combination chemoimmunotherapy followed by radioimmunotherapy consolidation and rituximab maintenance as front-line treatment in indolent lymphomas. It was found that the treatment was well-tolerated, improving complete response rates and maintaining durable responses. The study's co-authors included hematolgist/oncologists **Parameswaran Venugopal, MD; Jamile Shammo, MD;** and **Stephanie Gregory, MD;** as well as stem cell transplantation specialist **Henry Fung, MD.**



*Hematologist/oncologist Melissa Larson, MD, cares for patients in Rush's new hospital, the Tower.*

**Center of Excellence:** Rush has been designated a Center of Excellence by the Myelodysplastic Syndrome (MDS) Foundation. To be recognized, institutions must meet specific criteria, including having morphologic expertise in MDS, ongoing research and available cytogenetics and/or molecular genetics. Hematologist/oncologist **Jamile Shammo, MD,** is director of the MDS program at Rush.

**New staff:** The hematologic cancer team welcomed two new members over the past year: hematologist/oncologists **Reem Karmali, MD,** and **Agne Paner, MD.**

### CLINICAL SPECIALISTS

**Dermatologist:**
Warren Piette, MD

**Geneticist:**
Wei-Tong Hsu, MD

**Hematologist/oncologists:**
Sefer Gezer, MD; Stephanie Gregory, MD; Reem Karmali, MD; Melissa Larson, MD; Agne Paner, MD; Jamile Shammo, MD; Parameswaran Venugopal, MD

**Hematopathologists:**
Jerome Loew, MD; Brett Mahon, MD; Ira Miller, MD

**Radiation oncologist:**
Ross Abrams, MD

**Radiologists:**
Amjad Ali, MD; David Turner, MD

**Stem cell transplantation specialists:**
Henry Fung, MD; John Maciejewski, MD, PhD; Sunita Nathan, MD; Elizabeth Shima Rich, MD, PhD

*For a listing of pediatric hematologist/oncologists, go to p. 18.*

### HEMATOLOGIC CANCER CONFERENCES

**Lymphoma**
Thursdays, 8 to 9 a.m.
1010 Professional Building

**Leukemia**
Mondays, 1 to 2 p.m.
1010 Professional Building

**Myelodysplasia/Myeloproliferative Disorders**
Alternate Fridays, 9 to 10 a.m.
1010 Professional Building

**Multiple Myeloma**
Alternate Fridays, 8 to 9 a.m.
1010 Professional Building

*All conferences are held in the Janet Wolter, MD, Clinical and Educational Conference Room.*

### CLINICAL TRIALS

Investigators at Rush are participating in a randomized, phase III study of PCI-32765 in combination with bendamustine and rituximab to treat patients with relapsed or refractory b-cell chronic lymphocytic leukemia and small lymphocytic lymphoma. For more information about open clinical trials, visit www.rush.edu/cancerclinicaltrials. To enroll a patient in a clinical trial, call (312) 942-3608.

For more information about the hematologic cancers program or to refer a patient for an initial visit or a second opinion, please call (312) CANCER-1 (226-2371).

# LUNG AND THORACIC CANCERS

Physicians in Rush's lung and thoracic oncology program apply the most advanced technologies and techniques — including video-assisted thoracoscopic surgery, intensity-modulated and stereotactic radiation therapy and novel biologic therapies — to treat a full spectrum of thoracic cancers. At The Coleman Foundation Comprehensive Lung Cancer Clinic, a multidisciplinary team meets with patients to address conditions such as lung cancer, mesothelioma, chest sarcomas, thymomas and lung metastases.

## HIGHLIGHTS

**Evaluating BKM120:** Medical oncologist **Mary Jo Fidler, MD,** who was recently appointed to the Chicago Medical Society's board of trustees, is the principal investigator at Rush of a two-stage phase II study assessing the efficacy of the PI3K-inhibitor — BKM120 — in patients with pretreated metastatic non-small cell lung cancer that exhibits PI3K pathway activation.

**Age-related regulation of p16:** Pathologists **Paolo Gattuso, MD,** and **Mark Pool, MD;** thoracic surgeon **Michael Liptay, MD;** medical oncologist **Philip Bonomi, MD;** and researchers **Sanjib Basu, PhD,** and **Lela Buckingham, PhD,** evaluated the epigenetic influences and promoter methylation of selected tumor suppressor genes in early stage non-small cell lung cancer in patients 30 to 87 years of age. They found that p16 promoter hypermethylation was associated with a worse outcome in patients 60 years of age or younger at the time of diagnosis, but it was not associated with the same outcome in the 60 and older age group. Findings were published in *Diagnostic Molecular Pathology.*

**Detecting early stage lung cancer:** Rush's lung cancer screening program continues to be a study site for the International Early Lung Cancer Action Program, which aims to recruit subjects at increased risk of developing lung cancer into a study of lung cancer screening using low-dose chest CT.

**Lung nodule clinic:** The lung nodule clinic at Rush is led by pulmonary and critical care specialist **Betty Tran, MD, MS.** The clinic provides patients with lung nodules or concerns about lung cancer a complete evaluation and plan with input from specialists in pulmonary medicine and critical care, thoracic surgery and radiology. Cases are discussed at a weekly board meeting, comprising Tran and thoracic radiologist **Palmi Shah, MD.**

**Front-line therapy:** Rush was one of two sites in Illinois to participate in a small cell lung cancer phase III study comparing progression-free survival in patients treated with carboplatin/etoposide and patients given carboplatin/etoposide with palifosfamide, a novel and very well tolerated agent. Medical oncologist **Marta Batus, MD,** was the lead Rush investigator.

*Left to right: Radiation oncologist David Sher, MD, MPH; medical oncologist Philip Bonomi, MD; clinical nurse specialist Irene Haapoja, RN, MS; and clinical nurse coordinator Mary Ellen Hand, BSN, RN, participate in The Coleman Foundation Comprehensive Lung Cancer Clinic.*

### CLINICAL SPECIALISTS

**Medical oncologists:**
Marta Batus, MD; Philip Bonomi, MD; Mary Jo Fidler, MD

**Pathologists:**
Mark Pool, MD; Paola Gattuso, MD

**Pulmonary and critical care medicine specialists:**
Robert Balk, MD; Michael Silver, MD; Betty Tran, MD, MS; Mark Yoder, MD

**Radiation oncologist:**
David Sher, MD, MPH

**Thoracic radiologist:**
Palmi Shah, MD

**Thoracic surgeons:**
Gary Chmielewski, MD; Michael Liptay, MD; William Warren, MD

### LUNG AND THORACIC TUMOR CONFERENCE

Thursdays, 10 to 11 a.m.
Janet Wolter, MD, Clinical and Educational Conference Room
1010 Professional Building

### CLINICAL TRIALS

Rush is currently participating in a clinical trial to assess the impact of prophylactic treatment on the incidence of adverse events (after chemotherapy) in patients with advanced non-small cell lung cancer when treated daily with dacomitinib as a single agent. For more information about open clinical trials, visit www.rush.edu/cancerclinicaltrials. To enroll a patient in a clinical trial, call (312) 942-3608.

For more information about the lung and thoracic cancers program or to refer a patient for an initial visit or a second opinion, please call (312) CANCER-1 (226-2371).

# **GIVE AND TAKE:** PHYSICIAN-SCIENTIST COLLABORATIONS OPEN DOORS TO DISCOVERY

Jeff Borgia, PhD, and Jun Sun, PhD, chose to go into cancer research for the same reason: They wanted to help people. And they both realized that doing so meant finding ways to translate their scientific discoveries into tools that clinicians can use to improve outcomes for patients. "As a scientist, you have to think beyond the confines of your lab," says Sun. "You have to ask, how can I contribute and make a difference in the real world?"

*Gastroenterologist Ali Keshavarsian, MD, shares his clinical perspective with researcher Jun Sun, PhD.*

## Putting colon cancer under the microscope

**Jun Sun, PhD,** a biochemist, hopes to contribute to the understanding of how the vitamin D receptor (VDR) is involved in the pathogenesis of colon cancer — a discovery that could ultimately lead to better prevention and treatment for the disease.

Vitamin D exerts its role via VDR, a chemical sensor; without proper VDR function, vitamin D can't be metabolized, causing a deficiency. Sun has noted a consistent link between low vitamin D/VDR and high intestinal inflammation; and low VDR expression and diminished vitamin D/VDR signaling in the intestine have been observed in many patients with both inflammatory bowel disease and colon cancer.

In preliminary research, Sun and her colleagues discovered that mice lacking VDR had hyperproliferation, intestinal inflammation and a higher incidence of colon cancer than mice with normal VDR function. "We showed in the animal model that VDR has a protective role," she says. "Our hypothesis is that the same is true in people: We believe lack of intestinal VDR or suboptimal VDR signaling promotes inflammation and colon cancer in susceptible individuals. Our preliminary data are very promising, but now we need to translate these findings to the clinic."

## Connecting the dots

To make that happen, Sun reached out to gastroenterologist **Ali Keshavarzian, MD,** who specializes in inflammatory diseases and has been involved in numerous translational studies of colon cancer.

Keshavarzian helped to ensure that Sun's hypothesis was testable in a human clinical context, and they collaborated on the design of an ex-vivo study that will utilize Keshavarzian's vast repository of tissue samples to test whether the phenomena Sun observed in her mouse model are also present in humans. Discovering the mechanisms that regulate intestinal VDR may, Sun and Keshavarzian believe, enable the development of therapies that can modulate VDR signaling, which would reduce inflammation and possibly prevent colon cancer.

"Right now our current understanding of VDR signaling is insufficient to identify therapeutic targets for colon cancer," Sun says. "Within a few years, I'm confident we'll know more, and that we'll be able to help a lot of patients."

## A team approach to lung cancer research

Just as Sun partnered with a clinician, when researcher **Jeff Borgia, PhD,** set out to address some of the clinical challenges associated with lung cancer, he sought input from the physicians at Rush who care for lung cancer patients.

"It's important for scientists to understand what clinicians need to combat this disease because we don't want to develop tests that aren't clinically relevant," says Borgia, who is director of the Rush Proteomics and Biomarkers Core Facility. "And it's just as vital for physicians to understand what we're capable of producing in the lab so they don't set unrealistic expectations."

That's the spirit behind Rush's Thoracic Oncology Research Group, which brings together medical oncologists, thoracic surgeons, radiation oncologists, pathologists and researchers from multiple labs. The multidisciplinary group convenes weekly for the sole purpose of advancing lung cancer research: "We put everything on the table, ask questions and share knowledge," Borgia says.

## Using biomarkers to enhance diagnosis

This give-and-take is facilitating several projects with game-changing potential — including the potential to improve early diagnosis and boost survival rates.

Most notably, Borgia's lab is working on a simple and cost-effective blood test that will allow clinicians to readily screen for non-small

"It's important for scientists to understand what clinicians need to combat this disease because we don't want to develop tests that aren't clinically relevant, and it's just as vital for physicians to understand what we're capable of producing in the lab so they don't set unrealistic expectations."

— Jeff Borgia, PhD, researcher

cell lung cancer. The blood test is capable of differentiating early stage non-small cell lung cancer from benign lung nodules by measuring a panel of serum biomarkers. As Borgia's team discovered, these serum proteins induce the production of circulating antibodies in response to specific molecules shed by lung cancer tumors.

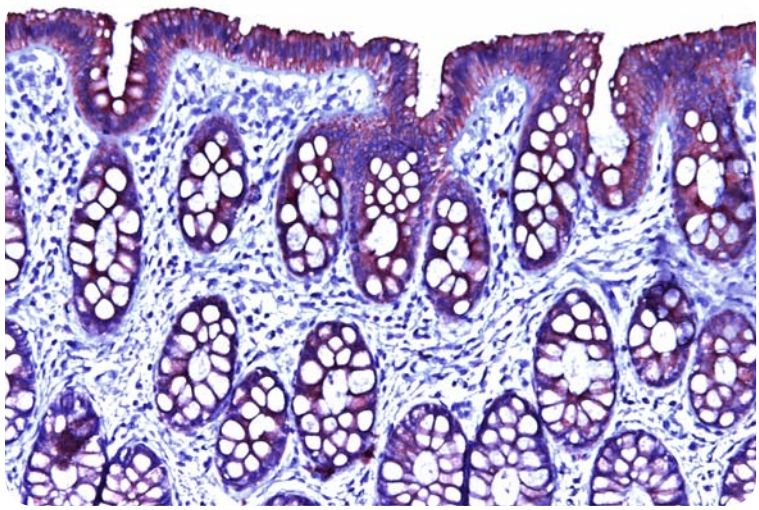
"The most immediate application of this blood test would be as a companion for low-dose spiral CT; it could also be used initially to indicate who should undergo a CT scan," Borgia says. "We have found that the combination of CT-based preoperative staging with our biomarker panel was superior at identifying patients with locally advanced disease than either method alone."

### On the horizon

With further improvement and refinement, the serum panel could ultimately be used in conjunction with CT scans or on its own. The team will begin validation studies later this year. In the meantime, they are developing additional blood tests that can assess the nature of lesions detected by CT scanning and can help predict whether a patient will have a positive response to a particular treatment. "With lung cancer, you don't have time to keep trying different treatments," Borgia says. "Getting it right the first time gives patients the best chance at survival."

Fortunately, for scientists like Borgia and Sun, finding the right solutions is all in a day's — and a life's — work.

**Vitamin D Receptor in Intestine**



*Brown stain indicates the location of human vitamin D receptor in the intestine.*

# MELANOMA AND CUTANEOUS CANCERS

The melanoma and cutaneous cancers program, which includes the multidisciplinary Coleman Foundation Comprehensive Melanoma and Soft Tissue Clinic, provides specialized care for patients with cutaneous malignancies, such as melanoma, skin cancer, cutaneous t-cell lymphoma (CTCL) and other soft tissue carcinomas. The team provides a full spectrum of care, including advocating prevention strategies, evaluating patients for skin cancer risk, detecting early signs of malignancy and providing treatment (such as Mohs micrographic surgery for basal and squamous cell cancers and extracorporeal photopheresis to treat CTCL), for all stages of disease. Investigators are actively involved in basic and clinical research studying innovative approaches, such as vaccines and targeted therapies, to improve outcomes.

## HIGHLIGHTS

**Phase I melanoma research:** Led by surgical oncologist **Howard Kaufman, MD,** Rush is currently participating in a phase I study to evaluate the safety and immune effects of a new oncolytic vaccine called Cavatak in subjects with advanced melanoma.

**Future implications:** Rush and Loyola University have collaborated to develop a treatment vaccine that could prevent and reverse the depigmentation that occurs in autoimmune vitiligo. Rush researcher (and the study's lead co-author) **Andrew Zloza, MD, PhD,** hopes the findings — which were published in *Science Translational Medicine* — can be applied to the treatment of melanoma. The study's findings suggest that delivering a modified form of the HSP70 gene (HSP70i) and forcing cells to produce the resulting HSP70i protein could be a potential treatment for vitiligo.

*Plastic and reconstructive surgeon Gordon Derman, MD (left); radiation oncologist Ross Abrams, MD (center); and surgical oncologist Howard Kaufman, MD (right), are members of the multidisciplinary team.*

**Melanoma Surveillance Clinic:** Led by dermatologist **Arthur Rhodes, MD, MPH,** the Melanoma Surveillance Clinic at Rush monitors high-risk patients for early and curable melanoma. For patients deemed to be very high-risk based on prior evaluation and risk assessment, Rhodes conducts a specialized procedure called "melanoma surveillance using comparison to baseline total cutaneous photographs," or MSCP. This approach allows physicians to compare in real time all visible moles and all anatomic sites to digital photographic baseline using a high-resolution monitor. The physician and patient may then focus on new or changing lesions, avoiding surgery for photographically stable and benign-appearing nevi.

**Comparing approaches:** Rush is participating in a phase III multicenter study to compare sentinel lymphadenectomy and complete lymph node dissection with sentinel lymphadenectomy alone in cutaneous melanoma patients with molecular or histopathological evidence of metastases in the sentinel node. The study is sponsored by the John Wayne Cancer Institute and the National Institutes of Health.

**Caring for cutaneous t-cell lymphoma:** The multidisciplinary cutaneous t-cell lymphoma (CTCL) clinic at Rush, which is headed by dermatologist **Warren Piette, MD,** provides inpatient and outpatient consultation, assessment and treatment of patients with CTCL, Sézary syndrome and graft-versus-host disease. Treatments include topical and systemic approaches as well as extracorporeal photopheresis, one of the most effective treatments for CTCL. Rush is one of the few centers in the Midwest offering this treatment.

### CLINICAL SPECIALISTS

**Dermatologists:**
Jeffrey Altman, MD; Sheetal Mehta, MD; Marianne O'Donoghue, MD; Warren Piette, MD; Arthur Rhodes, MD, MPH; Michael Tharp, MD

**Dermatopathologists:**
Lady Dy, MD; Vijaya Reddy, MD

**Diagnostic radiologist:**
Joy Sclamberg, MD

**Immunologists:**
Amanda Marzo, PhD; Carl Ruby, PhD; Andrew Zloza, MD, PhD

**Medical oncologist:**
Marta Batus, MD

**Neurosurgeon:**
Lorenzo Muñoz, MD

**Plastic and reconstructive surgeon:**
Gordon Derman, MD

**Radiation oncologists:**
Ross Abrams, MD; Krystyna Kiel, MD

**Stem cell transplantation specialists:**
Henry Fung, MD; John Maciejewski, MD, PhD; Sunita Nathan, MD; Elizabeth Shima Rich, MD, PhD

**Surgical oncologists:**
Steven Bines, MD; Howard Kaufman, MD; Keith Monson, MD

### MELANOMA AND SOFT TISSUE TUMOR CONFERENCE

Wednesdays, 11 a.m. to noon
Janet Wolter, MD, Clinical and Educational Conference Room
1010 Professional Building

### CLINICAL TRIALS

Rush is currently participating in numerous clinical trials for cutaneous malignancies, including a study to compare the drugs ipilimumab and high-dose interferon-2b in patients with high-risk resected melanoma. For more information about open clinical trials, visit www.rush.edu/cancerclinicaltrials. To enroll a patient in a clinical trial, call (312) 942-3608.

For more information about the melanoma and cutaneous cancers program or to refer a patient for an initial visit or a second opinion, please call (312) CANCER-1 (226-2371).

# NEUROLOGICAL CANCERS

The neurological cancers program at Rush benefits from the expertise of neurologists, neurosurgeons, neuroradiologists and many other specialists. In addition to pooling their knowledge each week at The Coleman Foundation comprehensive brain tumor and spine tumor clinics, these experts continually investigate new therapies and search out the latest technology in an effort to match patients with the best possible treatments for their complex, challenging conditions.

## HIGHLIGHTS

**IGF-1 receptor study:** Neuro-oncologist **Robert Aiken, MD,** at Rush is the principal investigator for a phase I treatment study for people who have recurrent, malignant astrocytomas. Aiken is investigating the oral drug picropodophyllin (AXL 1717) for its ability to inhibit the IGF-1 receptor; Aiken reports that so far the treatment has been well-tolerated with few side effects.

**New spine tumor clinic:** Led by neurosurgeon **John O'Toole, MD,** and radiation oncologist **Aidnag Diaz, MD, MPH,** The Coleman Foundation Comprehensive Spine Tumor Clinic provides individualized, comprehensive care for malignant and benign spinal tumors, including stereotactic radiosurgery and minimally invasive surgical procedures.

**New neuro-oncologist:** Neuro-oncologist **Nina Paleologos, MD,** recently joined Rush. In addition to extensive experience, Paleologos brings to Rush membership in the Brain Tumor Trials Collaborative, a network of medical centers that participate in clinical trials investigating new treatments for malignant brain tumors. She is also chair of the neuro-oncology accreditation exam committee for the United Council of Neurologic Subspecialties.

**Metastatic disease access initiative:** For cancers metastisized to the brain, neurosurgeon **Lorenzo Muñoz, MD,** and radiation oncologist **Aidnag Diaz, MD, MPH,** created an access initiative that allows patients to be seen by both specialists back-to-back within one business day of a referral. Muñoz and Diaz can be reached through a dedicated phone line answered directly by the physicians.


*Neuro-oncologist Nina Paleologos, MD, is investigating new treatments for malignant brain tumors.*

**National leadership:** Neurosurgeon **Richard Byrne, MD,** holds numerous leadership positions: president-elect of the Illinois State Neurosurgical Society, and treasurer of the Neurosurgical Society of America, and he serves on the Congress of Neurological Surgeons Executive Committee.

**Skull base expertise:** Neurosurgeon **Roham Moftakhar, MD,** joined the skull base surgery team at Rush, collaborating with neurotologist **R. Mark Wiet, MD,** and radiation oncologist **Aidnag Diaz, MD, MPH.** Fellowship trained in skull base and complex brain tumors, Moftakhar has extensive experience with acoustic neuromas, meningiomas, brain stem tumors, vascular legions and pituitary tumors, among other brain and skull base abnormalities.

### CLINICAL SPECIALISTS

**Neuro-oncologists:**
Robert Aiken, MD; Nina Paleologos, MD

**Neuropathologist:**
Sukriti Nag, MD, PhD

**Neuroradiologists:**
Sharon Byrd, MD; Miral Jhaveri, MD; Mehmet Kocak, MD

**Neurosurgeons:**
Richard Byrne, MD; Roham Moftakhar, MD; Lorenzo Muñoz, MD; John O'Toole, MD

**Neurotologist:**
R. Mark Wiet, MD

**Pediatric hematologist/oncologist:**
Paul Kent, MD

**Radiation oncologist:**
Aidnag Diaz, MD, MPH

### BRAIN TUMOR CONFERENCE

Tuesdays, 11:30 a.m. to 12:30 p.m.
Janet Wolter, MD, Clinical and Educational Conference Room
1010 Professional Building

### SPINE TUMOR CONFERENCE

Thursdays, 9 a.m. to noon
Woman's Board Cancer Treatment Center
500 S. Paulina St.

### CLINICAL TRIALS

Researchers at Rush are investigating a variety of new therapies for patients with brain and spine tumors, including a dendritic cell vaccine trial for patients with newly diagnosed glioblastomas. For more information about open clinical trials, visit www.rush.edu/cancerclinicaltrials. To enroll a patient in a clinical trial, call (312) 942-3608.

For more information about the neurological cancers program or to refer a patient for an initial visit or a second opinion, please call (312) CANCER-1 (226-2371).

# PEDIATRIC CANCERS

*Pediatric hematologist/oncologist Paul Kent, MD (shown here with a patient and her mother), participates in the National Institutes of Health's Pharmaceuticals for Children Act.*

Home to one of the largest pediatric sarcoma programs in the Midwest and an active research program in children's oncology, the pediatric oncology program at Rush is staffed by clinicians and clinical researchers dedicated to the care of all young people — from infancy through young adulthood — with pediatric hematologic malignancies, including leukemias and lymphomas, solid tumors and sarcomas, and many rare cancers.

## HIGHLIGHTS

**Raising money for research:** Pediatric hematologist/oncologist **Paul Kent, MD,** joined individuals and other organizations that support pediatric cancer research to advocate a change to schedule G of the 2012 Illinois state tax forms. Thanks to their efforts, the Childhood Cancer Research Fund was among the options listed for voluntary charitable donations, giving taxpayers the opportunity to donate $1 to this pediatric cancer research fund by checking a box on their tax form.

**Bear visit:** The Chicago Bears' Charles Tillman visited Rush Children's Hospital this past year. Tillman's Cornerstone Foundation, sponsored by Fifth Third Bank, set out to brighten the lives of chronically and critically ill children and their families through "Charles' Locker." Tillman distributed Build-a-Bears and signed footballs to entertain patients while they are undergoing or recovering from treatment.

**Pet therapy:** At Rush, clinicians recognize pets as important members of the family. To further promote family-centered care and help alleviate the emotional burden of life-threatening and long-term illnesses, Rush encourages families to bring pets to visit seriously ill children as well as other patients at Rush.

**Collaboration:** Rush, the John H. Stroger, Jr. Hospital of Cook County and the University of Illinois Medical Center are a part of the largest pediatric oncology network in Chicago. These institutions bring their clinical research programs together to promote access to clinical trials and streamline patient recruitment. Since the network's inception in 2008, the combined clinical trial enrollment for the three institutions has climbed from fewer than 20 patients to nearly 100.

### CLINICAL SPECIALISTS

**Orthopedic oncologist:**
Steven Gitelis, MD

**Pediatric hematologist/oncologists:**
Lisa Boggio, MD, MS; Paul Kent, MD; Allen Korenblit, MD; Mindy Simpson, MD; Leonard Valentino, MD

**Pediatric neuroradiologists:**
Sharon Byrd, MD; Mehmet Kocak, MD

**Pediatric neurosurgeon:**
Lorenzo Muñoz, MD

**Radiation oncologists:**
Ross Abrams, MD; Aidnag Diaz, MD, MPH

### CLINICAL TRIALS

At Rush, the National Cancer Institute (NCI) and the Children's Oncology Group have open protocols that enroll patients up to age 50 as part of a Rush and NCI initiative to enroll, study and improve outcomes for adolescents and young adults with cancer, a group recognized as having inferior outcomes. For more information about open clinical trials, visit www.rush.edu/cancerclinicaltrials. To enroll a patient in a clinical trial, call (312) 942-3608.

For more information about the pediatric cancers program or to refer a patient for an initial visit or a second opinion, please call (312) CANCER-1 (226-2371).

# SARCOMAS AND SOFT TISSUE TUMORS

Rush has one of Illinois' largest volumes for bone and soft tissue sarcomas, offering comprehensive evaluation and treatment for adult and pediatric patients. The multidisciplinary team, which features orthopedic surgeons, medical oncologists, pediatric and adult hematologist/oncologists, radiation oncologists, radiologists and pathologists, collaborates to create the optimal treatment protocol for each patient. The team's expertise includes managing metastatic bone disease to maintain function, minimize bone loss and decrease pain. A key component of the program is the Limb Preservation Center at Rush, the only center of its kind in the region. Physicians at the center are leaders in the use of allografts for limb reconstruction as well as the development of state-of-the-art bone substitutes.

## HIGHLIGHTS

**Studying drug combinations:** As part of a multicenter, phase III study, **Marta Batus, MD,** a medical oncologist, is comparing the effectiveness and safety of eribulin with dacarbazine in patients with soft tissue sarcoma.

**Image-guided radiotherapy:** Radiation oncologist **Ross Abrams, MD,** is an investigator in a phase II trial of image-guided preoperative radiotherapy for the treatment of primary soft tissue sarcomas of the extremities. Specialized radiation therapy that delivers a lower dose of radiation directly to the tumor may kill more tumor cells and cause less damage to normal tissue.

**SARC trial:** Medical oncologist **Marta Batus, MD,** is an investigator in a phase III, international, randomized clinical trial comparing the efficacy and safety of TH-302 in combination with doxorubicin to doxorubicin in patients with advanced soft tissue sarcoma. Batus is working on the trial with the Sarcoma Alliance for Research Through Collaboration.

*Medical oncologist Marta Batus, MD, is investigating treatment options for patients with soft tissue sarcomas.*

### CLINICAL SPECIALISTS

**Diagnostic radiologists:**
John Meyer, DO; Anthony Zelazny, MD

**Medical oncologist:**
Marta Batus, MD

**Orthopedic oncologist:**
Steven Gitelis, MD

**Pathologists:**
Jerome Loew, MD; Brett Mahon, MD; Ira Miller, MD; Vijaya Reddy, MD

**Pediatric hematologist/oncologists:**
Paul Kent, MD; Allen Korenblit, MD

**Pediatric physiatrist:**
Laura Deon, MD

**Radiation oncologists:**
Ross Abrams, MD; Krystyna Kiel, MD

**Surgical oncologists:**
Steven Bines, MD; Howard Kaufman, MD

### SARCOMA CONFERENCE

Wednesdays, 9 to 10 a.m.
Janet Wolter, MD, Clinical and Educational Conference Room
1010 Professional Building

### CLINICAL TRIALS

Rush is participating in a phase III randomized controlled study of Yondelis (trabectedin) or dacarbazine for the treatment of advanced liposarcoma or leiomyosarcoma previously treated with anthracycline and ifosfamide. For more information about open clinical trials, visit www.rush.edu/cancerclinicaltrials. To enroll a patient in a clinical trial, call (312) 942-3608.

For more information about the sarcoma and soft tissue tumors program or to refer a patient for an initial visit or a second opinion, please call (312) CANCER-1 (226-2371).

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# 2011 CANCER REGISTRY REPORT

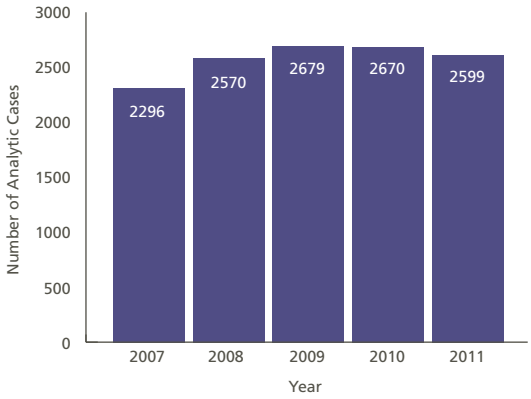
| Primary Site | Total | Analytic | Nonanalytic | Male | Female |
|---|---|---|---|---|---|
| **Oral Cavity & Pharynx** | **136** | **121** | **15** | **97** | **39** |
| Lip | 2 | 2 | 0 | 1 | 1 |
| Tongue | 53 | 47 | 6 | 37 | 16 |
| Salivary Glands | 8 | 8 | 0 | 4 | 4 |
| Floor of Mouth | 4 | 4 | 0 | 2 | 2 |
| Gum & Other Mouth | 26 | 24 | 2 | 15 | 11 |
| Nasopharynx | 3 | 1 | 2 | 3 | 0 |
| Tonsil | 20 | 15 | 5 | 17 | 3 |
| Oropharynx | 17 | 17 | 0 | 15 | 2 |
| Hypopharynx | 3 | 3 | 0 | 3 | 0 |
| **Digestive System** | **505** | **409** | **96** | **253** | **252** |
| Esophagus | 28 | 21 | 7 | 15 | 13 |
| Stomach | 53 | 40 | 13 | 31 | 22 |
| Small Intestine | 17 | 12 | 5 | 6 | 11 |
| Colon (excludes rectum) | 140 | 112 | 28 | 59 | 81 |
| Rectosigmoid Junction | 14 | 12 | 2 | 9 | 5 |
| Rectum | 88 | 73 | 15 | 48 | 40 |
| Anus, Anal Canal & Anorectum | 11 | 10 | 1 | 6 | 5 |
| Liver & Intrahepatic Bile Duct | 55 | 45 | 10 | 40 | 15 |
| Gallbladder & Other Biliary Tract | 22 | 18 | 4 | 10 | 12 |
| Pancreas | 65 | 54 | 11 | 25 | 40 |
| Retroperitoneum | 5 | 5 | 0 | 4 | 1 |
| Peritoneum, Omentum, Mesentery & Other Digestive Organs | 7 | 7 | 0 | 0 | 7 |
| **Respiratory System** | **461** | **398** | **63** | **225** | **236** |
| Nose, Nasal Cavity & Middle Ear | 7 | 7 | 0 | 5 | 2 |
| Larynx | 40 | 30 | 10 | 30 | 10 |
| Lung & Bronchus | 412 | 359 | 53 | 189 | 223 |
| Trachea, Mediastinum & Other Respiratory Organs | 2 | 2 | 0 | 1 | 1 |
| **Bones & Joints** | **18** | **16** | **2** | **8** | **10** |
| **Soft Tissue** | **48** | **43** | **5** | **20** | **28** |
| **Skin (excludes basal & squamous cell carcinomas)** | **119** | **91** | **28** | **69** | **50** |
| **Breast** | **466** | **402** | **64** | **7** | **459** |
| **Female Genital System** | **345** | **294** | **51** | **0** | **345** |
| Cervix Uteri (excludes carcinoma in situ) | 67 | 49 | 18 | 0 | 67 |
| Corpus & Uterus, NOS | 185 | 168 | 17 | 0 | 185 |
| Ovary | 57 | 47 | 10 | 0 | 57 |
| Vagina | 4 | 2 | 2 | 0 | 4 |
| Vulva | 24 | 21 | 3 | 0 | 24 |
| Other Female Genital Organs | 8 | 7 | 1 | 0 | 8 |
| **Male Genital System** | **145** | **112** | **33** | **145** | **0** |
| Prostate | 137 | 105 | 32 | 137 | 0 |
| Testis | 6 | 5 | 1 | 6 | 0 |
| Penis | 2 | 2 | 0 | 2 | 0 |
| **Urinary System** | **122** | **109** | **13** | **94** | **28** |
| Urinary Bladder | 43 | 39 | 4 | 33 | 10 |
| Kidney & Renal Pelvis | 74 | 65 | 9 | 57 | 17 |
| Ureter & Other Urinary Organs | 5 | 5 | 0 | 4 | 1 |
| **Eye & Orbit** | **7** | **7** | **0** | **5** | **2** |
| **Brain & Other Nervous System** | **203** | **186** | **17** | **85** | **118** |
| **Endocrine System** | **102** | **93** | **9** | **42** | **60** |
| Thyroid | 70 | 65 | 5 | 23 | 47 |
| Other Endocrine (includes thymus) | 32 | 28 | 4 | 19 | 13 |
| **Lymphomas** | **211** | **134** | **77** | **117** | **94** |
| Hodgkin Lymphoma | 23 | 15 | 8 | 11 | 12 |
| Non-Hodgkin Lymphoma | 188 | 119 | 69 | 106 | 82 |
| **Multiple Myeloma** | **61** | **45** | **16** | **33** | **28** |
| **Leukemias** | **153** | **109** | **44** | **77** | **76** |
| **Mesothelioma** | **9** | **8** | **1** | **8** | **1** |
| **Unknown Primary** | **16** | **12** | **4** | **8** | **8** |
| **Ill-Defined & Unspecified** | **10** | **10** | **0** | **8** | **2** |
| **Other and Unspecified (Kaposi Sarcoma)** | **1** | **0** | **1** | **1** | **0** |
| **Total** | **3,138** | **2,599** | **539** | **1,302** | **1,836** |

Analytic: Cases diagnosed and/or received all or part of first course of care at Rush University Medical Center.

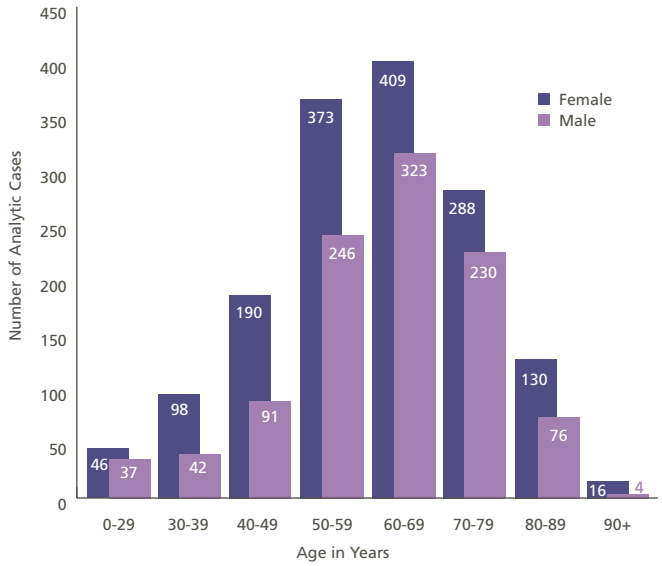
Nonanalytic: Cases diagnosed and all first course treatment complete elsewhere.

# 2011 CANCER REGISTRY REPORT

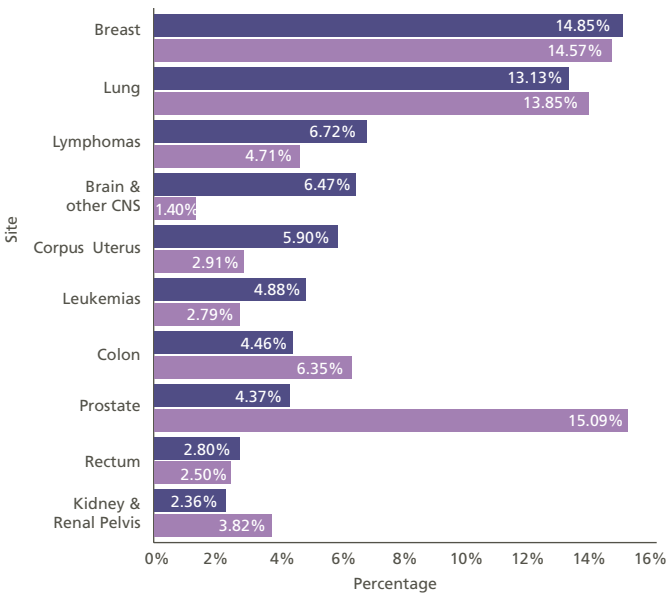
## NEW CANCER INCIDENCE BY FIRST CONTACT YEAR, 2007 - 2011




## ANALYTIC CASE DISTRIBUTION BY GENDER AND AGE AT DIAGNOSIS, 2011



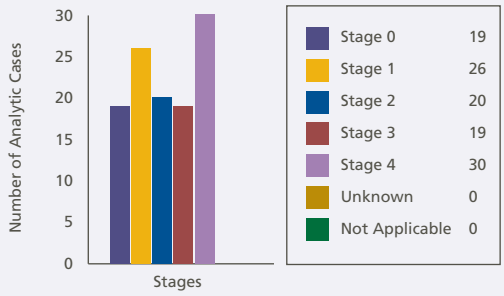

## TOP 10 NATIONAL ANALYTIC SITES, 2011



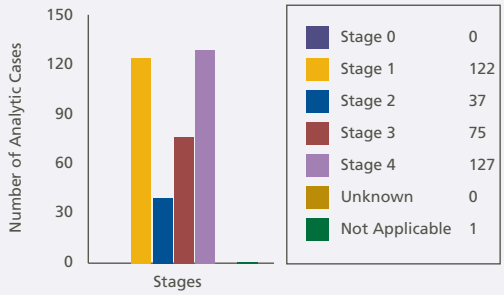

*Note: The graph compares USA data with that from Rush for the top 10 national analytic sites.*

## TOP 5 RUSH ANALYTIC SITES, 2011

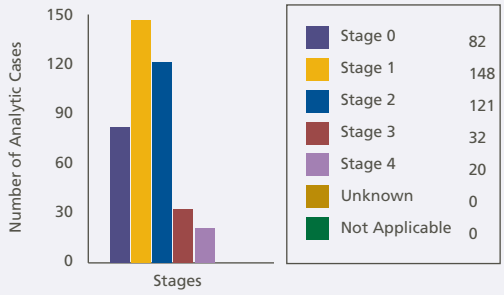
Colon



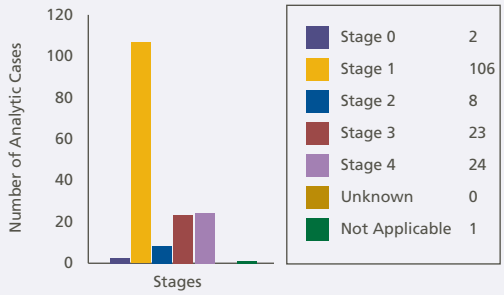

Lung



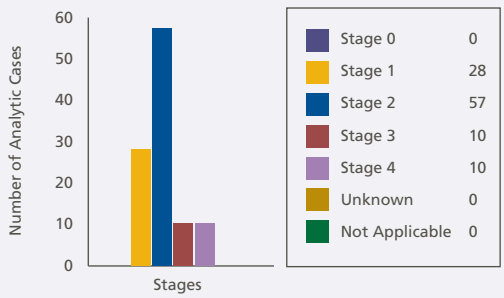

Breast




Corpus Uteri

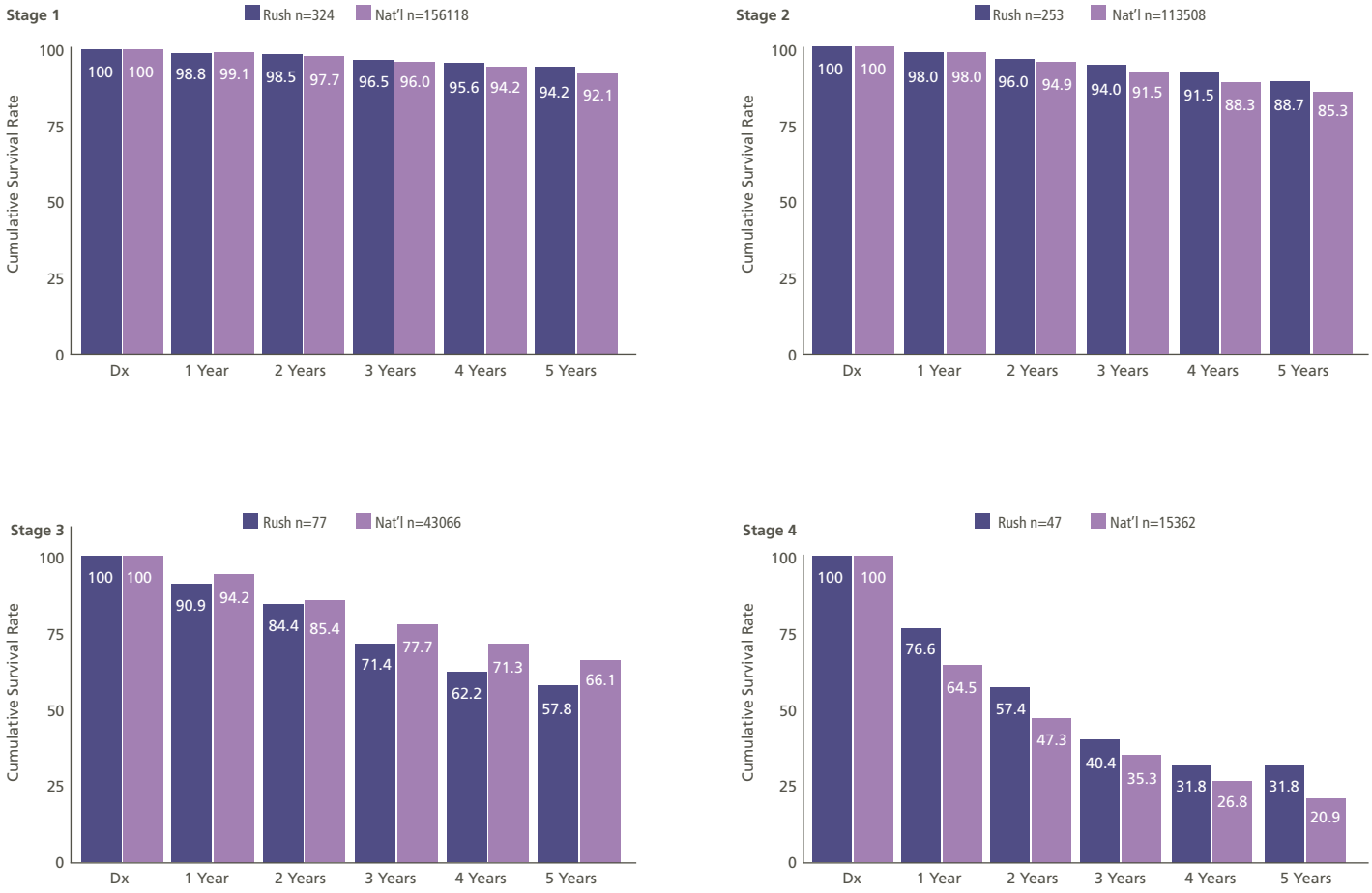



Prostate




*Note: Data based on stage as defined by the American Joint Committee on Cancer (AJCC).*

## OBSERVED SURVIVAL FOR BREAST CANCER CASES DIAGNOSED, 2003 - 2005




## CANCER MORTALITY (INPATIENT) AT RUSH, FY12*

| | Actual mortality rate | Predicated mortality rate | Risk-adjusted mortality index as published by UHC | Compared with top cancer hospitals (*U.S. News*)** |
|---|---|---|---|---|
| Surgical oncology | 2.09 | 2.67 | 0.78 | 8th out of 19 |
| Medical oncology | 2.13 | 3.03 | 0.70 | 3rd out of 19 |
| Bone marrow transplant | 0.91 | 3.06 | 0.30 | 2nd out of 19 |

* Actual mortality = number of deaths per 100 discharges; predicted mortality = deaths expected based on how sick the patients are, per 100 discharges; mortality index = actual rate/predicted rate (index <1 means fewer patients died than predicted).

** Comparison is with hospitals ranked in the top 20 by *U.S. News & World Report*, which ranks hospitals based on a number of different measures including in-hospital mortality (Rush is not ranked in this list; of the top 20, one hospital does not submit data to the University HealthSystem Consortium [UHC]).

Source: University HealthSystem Consortium clinical database, FY 2012 data.

RUSH UNIVERSITY
CANCER CENTER

The Rush University Cancer Center comprises all of the cancer-related clinical, research and educational efforts at Rush, crossing 20 departments, divisions and sections; inpatient and outpatient areas; professional clinical activities; and the colleges of Rush University.

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PLEASE NOTE: All physicians featured in this publication are on the medical faculty of Rush University Medical Center. Some of the physicians featured are in private practice and, as independent practitioners, are not agents or employees of Rush University Medical Center.

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M-3064 7/13