DukeMed MAGAZINE

VOLUME 11, ISSUE 1
SUMMER 2011

Soaring in Singapore

As its first class graduates this summer, Duke-NUS Graduate Medical School is flying high. *page 3*

The power of partnership

Little more than eight decades ago, a new hospital, medical school, and nursing school opened in North Carolina, with simple but ambitious goals—to serve the community fully, to make scientific discoveries, and to provide outstanding education. In less than the span of a human lifetime, with a clear vision and hard work from many talented individuals, that fledgling entity grew into Duke Medicine, one of the world's leading academic medical institutions. In 2005, Duke helped to launch another young institution, born of equally outrageous ambition and with equally great promise: Duke-NUS Graduate Medical School. A collaboration with the National University of Singapore, Duke-NUS was founded to develop a new generation of physician-scientists who could be true, transnational leaders in medical research, education, and patient care. This summer, the school graduates its first class of new physicians—and I see that class as the embodiment of an exciting new model of medical education, innovative research, and institutional partnership.

DUKE-NUS

Victor J. Dzau, MD, talks with medical students at Duke-NUS in Singapore. The school is graduating its first class this summer.

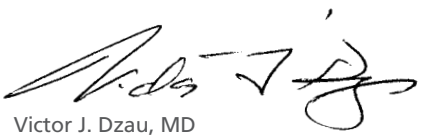
Duke-NUS shares many of the same ideals we count as essential to our own success here at Duke Medicine. The student body is wonderfully diverse—its 186 MD students hail from 21 countries. Its curriculum, while based on that of our own School of Medicine, has also introduced innovative and forward-thinking ideas, incorporating a unique team-based learning model designed to produce leaders. Its cross-continent collaborations with institutions both public and private are helping to accelerate discovery and to move it from theory into practice. You can read much more about Duke-NUS in the special report in this issue, beginning on page three.

Singapore is a crown jewel in Duke Medicine's collaborations, but it's not the only one that we have pursued. Our collaborations today range from global to local. Here at home, we have long worked hand in hand with hospitals and other providers who share our goal of improving care through collaborations such as the Duke Infection Control Outreach Network, the Duke Oncology Network, and the Duke Heart Network. We are continuing to forge new partnerships to strengthen health care delivery and quality in our local communities, such as our recent venture with LifePoint Hospitals (see page 16). On an international level, our partnerships extend across the globe; from Tanzania to China to India, Duke is making lasting connections and working to advance medicine for all people. The benefits of these partnerships are manifold. As we share our strengths in research, education, care delivery, and service, we learn from our partners' unique innovations and efficiencies, and together we are able to better care for the members of our communities.

We can be proud of what we are accomplishing through all of these collaborations. At the same time, we must look forward to the next 80 years and ask ourselves how we can continue to thrive as an institution and to better the health of the world. We know that we are moving toward one global society, where communication is instantaneous and barriers between cultures and continents are dissolving. We know people and ideas are more mobile than ever before—and that no institution can afford to stagnate in isolation. Like Duke's founders, we may not know the exact ways in which medicine will evolve in the future, but we can continue to pursue the possibilities—to be willing to take risks, to build upon the mission and entrepreneurial spirit that have made us the institution we are, and to join forces with others who share our values.

I myself have been a beneficiary of these values. Born in Shanghai, I was accepted to study at McGill University in Canada when I was 18; with hard work, a world of possibilities unfolded before me. I feel fortunate for the opportunities I have had—but I also feel compelled to make sure that the same opportunities will be there for current and future generations of young students. As one of the world's leaders in academic medicine, we have the responsibility to pay these possibilities forward, to look for new ways in which Duke Medicine can serve the world, at home and abroad, today and for generations to come.

At this point in history—both the history of Duke Medicine and the history of humankind—we cannot afford to operate within the confines of our own backyard. We must come together as a society, both local and global, to surmount the challenges we all face and take the next step toward a better, brighter future. That is just what the Classes of 2011 are doing, both at Duke and at Duke-NUS, and I am immensely proud of the role we have played in giving them their start.



Victor J. Dzau, MD

Chancellor for Health Affairs, Duke University
President and CEO, Duke University Health System
James B. Duke Professor of Medicine

DukeMed MAGAZINE
VOLUME 11
ISSUE 1
SUMMER 2011

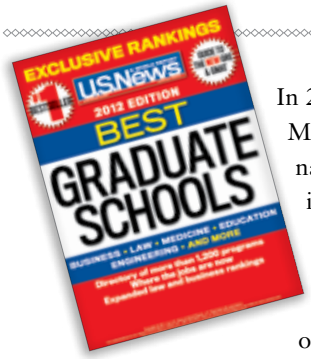
FEATURES

DEPARTMENTS

Congratulations

to the Duke University School of Medicine, School of Nursing, and Physician Assistant Program

on being ranked among America's top graduate schools by *U.S.News & World Report*



In 2011 Duke University School of Medicine ranked #5 among the nation's leading medical schools in research, while the School of Nursing ranked #7 among its peers—its highest ranking ever. Duke's PA program, the first of its kind in the nation, continues to lead the way with a #1 ranking among 123 PA programs in the US today. For details and methodology, visit usnews.com/rankings.

On the cover: This illustration brings together the colors of Duke and the National University of Singapore; the 24 orange wing feathers of the bird-shaped kite represent the 24 graduates of the first class of Duke-NUS Graduate Medical School. In Singapore, kite-flying is a traditional and still-popular form of sport and artistic expression—local and international kite festivals are quite competitive, and colorful kites can often be seen soaring through the skies over Singapore.

***DukeMed Magazine* welcomes comments** from our readers. Write to us via e-mail (dukemedmag@mc.duke.edu) or postal mail:

DukeMed Magazine
DUMC 3687
Durham, NC 27710

VOLUME 11, ISSUE 1, SUMMER 2011

DukeMed MAGAZINE

Editor: Minnie Glymph
Managing Editor: Kathleen Yount
Designer: Jennifer Sweeting
Creative Director: Kevin Kearns
Production Manager: Margaret Epps
Contributing Writers:
Sarah Chun
Carol Harbers
Debbe Geiger
Greg Jenkins
Angela Spivey
Contributing Photographers:
Duke Photography: Chris Hildreth, Jared Lazarus, Megan Morr, and Les Todd
Singapore photos courtesy of Duke-NUS
Christine T. Nguyen
Production Assistance: Rachel Klingenberger

DukeMed Magazine is published twice a year by the Office of Marketing and Creative Services.

DukeMed Magazine
DUMC 3687
Duke University Medical Center
Durham, NC 27710
919-419-3270
dukemedmag@mc.duke.edu
Web: dukemedmag.duke.edu

SPECIAL REPORT

Our School in Singapore

Just a few short years after launch, Duke and the National University of Singapore's bold venture to start up a brand-new medical school has surpassed all expectations. As Duke-NUS prepares to graduate its first class of MDs and embarks on the second phase of its growth, *DukeMed Magazine* takes a look at the school's breathtaking ascent and bright future.

The Rapid Rise of Duke-NUS

This summer, the first class of medical students at Duke-NUS Graduate Medical School in Singapore officially becomes its first graduates—receiving the first joint degrees ever to be granted by its parent schools, Duke University and the National University of Singapore (NUS).

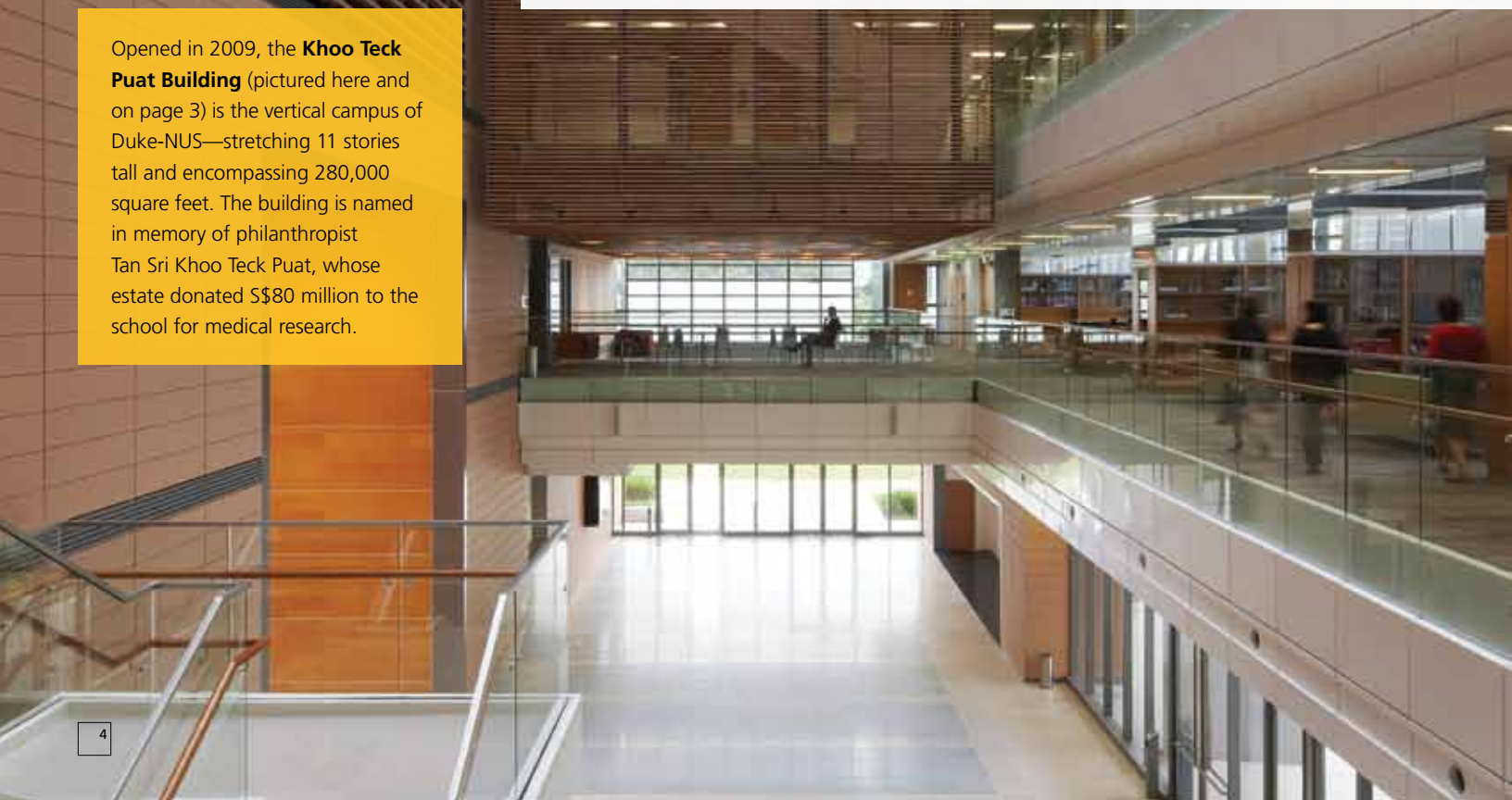
It's a major milestone in the short but action-packed history of Duke-NUS, which has grown in a mere six years from a promise on paper into a dynamic institution that is well on its way to becoming one of the leading medical schools in Asia.

By any account, the school's achievements are remarkable. Since its 2005 launch, it has gone from 16 faculty and staff to more than 850, including 83 regular-rank faculty—many of whom are internationally recognized biomedical researchers. The student body has soared from an entering class of 26 in 2007 to 186 MD and 12 PhD students today, from 21 countries and more than 40 undergraduate institutions including Oxford, Cambridge, Johns Hopkins, Yale, Harvard, Peking University, and Stanford. It has created robust research programs, with faculty attracting more than S$100 million (US$81 million) in competitive research funding and publishing more than 370 papers in international peer-reviewed journals. The school has also generated innovative models of medical education that are drawing interest from programs across the globe.

"Duke has built many relationships with strategic partners around the world, but we will always see Duke-NUS as the crown jewel of our international activities," says Victor J. Dzau, MD, Duke's chancellor for health affairs. "It represents a distinctive achievement by multiple committed and trusting partners—Duke, NUS, and the Singapore government—that is unparalleled."

In fact, the school has zoomed past the initial goals its partners set for it, achieving milestones that had been

Opened in 2009, the **Khoo Teck Puat Building** (pictured here and on page 3) is the vertical campus of Duke-NUS—stretching 11 stories tall and encompassing 280,000 square feet. The building is named in memory of philanthropist Tan Sri Khoo Teck Puat, whose estate donated S$80 million to the school for medical research.



established for its first seven years in just a little over four. In an era when many US universities are attempting to forge global academic collaborations, "Duke-NUS is a real success story," says Michael Merson, MD, director of the Duke Global Health Institute and vice chancellor for Duke-NUS affairs. "What has been accomplished there since its founding is tremendous."

"In terms of university partnerships on a global scale, there are not many like Duke-NUS," agrees Patrick Casey, PhD, senior vice dean for research at Duke-NUS, who was among the school's founding administrators. "In terms of medical school partnerships, there are none."

What has made the difference, he says, is commitment: "The commitment of Duke leaders, Duke faculty, leaders in Singapore—commitment at the highest level. There were many times we could have stumbled, but everyone was committed to succeed and because of that we were able to work through the challenges."

The commitment needed to build a medical school from scratch was no small thing. In 2000, the government of Singapore—a city-state of 5 million people—had launched an ambitious S$3-billion Biomedical Sciences Initiative aimed at establishing the country as the biomedical hub of Southeast Asia. As part of that effort, Singapore sought to create an American-style graduate-level medical school aimed at producing research-trained physician-scientists, complementing its existing British-model undergraduate medical school at the National University of Singapore. Singapore approached Duke as a potential partner in establishing the new school based on its unique research-oriented medical school curriculum and its track record in producing leaders in academic medicine, research, industry, and clinical care delivery.

While the initiative was to be funded entirely by Singapore, it would require a significant investment of time and expertise from Duke. "Many people were skeptics at first," recalls R. Sanders Williams, MD, president of The J. David Gladstone Institutes, who served as dean of the Duke University School of Medicine from 2001 to 2007, and in 2005 became the founding dean of Duke-NUS. "I myself wondered how on earth we could support a serious program halfway around the world when there were so many important things to do in Durham. But over time, as we got to know the remarkable people in Singapore and better envision the opportunities, that skepticism turned into excitement. We became convinced that this partnership could greatly advance medical care, education, and research not only in Singapore but also for Duke."

"The benefits outweighed the hesitations," agrees Rebecca Trent Kirkland, MD, a Duke University School of Medicine alumna and member of the Duke family, who served on the Duke University Board of Trustees during the years leading up to the 2005 partnership agreement and later visited the school on behalf of the Duke University Health System Board of Directors. "We knew that some of our faculty would need to spend a good bit of time in Singapore, but we have been able to weather that and it's actually been beneficial, as our faculty have been able to ally with NUS faculty in many areas. In the end, we believed that this partnership would broaden the reach of the university and provide wonderful opportunities for our students and faculty as well as the students in Singapore. It's truly a partnership where we can grow together."

As the new school took shape, so did a new world of possibilities for global collaboration. Respected Duke faculty relocated to Singapore to help get the school off the ground, including Casey and Ranga Krishnan, MB ChB, then chair of psychiatry and behavioral sciences, who would succeed Williams as dean of Duke-NUS in 2008. They were joined by other distinguished faculty from Singapore and all over the world—including early recruits such as Sir Colin Blakemore, former chair of the British Biomedical Research Council (comparable to the NIH), David Virshup, MD, a noted cancer researcher and pediatric oncologist, and Duane Gubler, ScD, a globally recognized infectious diseases researcher. "We began with a few really good people and like began to attract like," says Krishnan. "Along with the significant scientific resources available in Singapore, I believe that has been a major reason faculty have been drawn to Duke-NUS—having strong potential partners in place for research collaborations, not only within the school but with other research groups in Singapore as well as with faculty at Duke in Durham. It's an environment conducive to good science."

To focus the school's efforts, leaders from Singapore and Duke early on identified five signature areas of research emphasis—emerging infectious diseases, cancer and stem cell biology, neuroscience and behavioral disorders, cardiovascular and metabolic disorders, and health services and systems research. Rather than being lodged in traditional academic departments, faculty have been recruited into these five specialized programs. "We identified these areas because they represent the major

"Our partnership in Duke-NUS underscores our strong commitment to a global mission in research and education that will ultimately speed the translation of scientific discoveries to the bedside, and close the gap in health care disparities worldwide."

—Victor J. Dzau, MD, CHANCELLOR FOR HEALTH AFFAIRS, DUKE UNIVERSITY

health needs of Singapore and Southeast Asia, while also capitalizing on Duke's strengths in research," explains Casey. As notable faculty from Singapore, Duke, and all over the world have converged at the school, they have formed productive new research partnerships in those key arenas (see "Research," page 10).

Progress has been rapid on the education front, as well. The school had a strong foundation to begin with, since the Duke-NUS curriculum is based on that of Duke University School of Medicine—which condenses basic-science study into one year instead of the usual two, giving students earlier clinical experience as well as an entire year devoted to independent research. With the fresh start in Singapore, however, leaders took advantage of the opportunity to innovate, introducing a new, technology-supported model of team-based learning called TeamLEAD that's been hailed as the future of medical education—and a critical factor in the school's success (see "Education," page eight).

"As a faculty, we're asking ourselves how we can promote creativity and critical thinking and how course material will actually be used down the line in the students' professional lives," says Doyle Graham, MD, PhD, former dean of medical education at Duke University School of Medicine, who now directs the TeamLEAD-based Body and Disease course at Duke-NUS. "It's the most powerful learning situation I've ever been in—I consider it the highlight of my teaching career."

Duke-NUS students have proven the power of the approach, scoring well above the mean for all US medical students on both the clinical knowledge and basic science United States Medical Licensing Exams. In 2010, the school expanded its academic offerings, opening an Integrated Biology and Medicine PhD program designed to produce leaders in translational research.

Although the initial 2005 partnership agreement between Duke and NUS was to last seven years, the school's round success prompted both partners to renew their agreement early and enthusiastically, committing in November 2010 to another five-year tie-up (as it's called in the local parlance).

"I would say that this partnership has greatly exceeded our already high initial expectations," said NUS president Tan Chorh Chuan at the signing ceremony. "The second phase…promises to be even more exciting and productive."

A primary goal for the partnership's next half-decade is to more closely integrate Duke-NUS with SingHealth, Singapore's largest health care group, which serves more than 4.3 million patients a year. The school is located on the same campus as SingHealth's 1,500-bed Singapore General Hospital as well as national heart, cancer, and other specialty centers, providing fertile

The history of Duke-NUS: A timeline

2000
Singapore launches a S$3-billion Biomedical Sciences Initiative designed to make the country the biomedical hub of Asia.

2001
A Ministry of Education-appointed Medical Education Review Panel recommends that Singapore establish a graduate medical school to produce the highly trained physician-scientists needed to support the Biomedical Sciences Initiative.

2002
A delegation of leaders from Singapore visit Duke to discuss a partnership to establish the school.

JUNE 2003
Duke University and the National University of Singapore sign a Memorandum of Understanding indicating their willingness to partner in establishing Singapore's first graduate medical school.

APRIL 2005
At a ceremony in Singapore, Duke University and the National University of Singapore formalize their partnership to establish the new medical school.

JULY 2005
Duke-NUS Interim Campus is established on the Outram campus, home to Singapore General Hospital. The first staff are recruited in the summer.

AUGUST 2005
R. Sanders Williams, MD, dean of the Duke University School of Medicine, is officially named founding dean of Duke-NUS.

JANUARY 2007
The Duke University Board of Trustees approves the award of a joint MD degree from both Duke University and the National University of Singapore for the graduates of Duke-NUS.

Duke-NUS receives a S$80 million gift from the estate of the late Tan Sri Khoo Teck Puat to grow the school's biomedical research initiatives. The school later names its permanent building in memory of the philanthropist.

ground for collaboration, says Krishnan. "Our faculty and students are already deeply engaged in these institutions. Many of our faculty serve on their medical staff, our students perform clinical rotations there, and we work together to conduct clinical research."

For example, he notes, Duke-NUS helped establish the SingHealth Investigational Medicine Unit, a 32-bed research unit which opened last year to conduct early-phase clinical studies. Duke-NUS also founded an Office of Clinical Sciences to provide specialized training to third-year medical students and to SingHealth clinicians interested in clinical research. The office is led by vice dean John Rush, MD, who also serves as CEO of the Singapore Clinical Research Institute (modeled after, and in collaboration with, the Duke Clinical Research Institute).

"Our charge in phase 2 of the partnership is to build on this foundation to create a true academic medical center, which will help us connect research efforts inside the school to clinical care delivery and develop next-generation treatments and technologies," Krishnan says.

Already, Duke-NUS and SingHealth leaders have worked together to create academic departments within SingHealth institutions. Graduate medical education is also being strengthened; recently, the US Accreditation Council for Graduate Medical Education (ACGME) established a new international arm that is working with Singapore's Ministry of Health to accredit 38 residency programs at SingHealth and other Singapore hospitals by 2012. These are the first residency programs to be accredited by ACGME-International standards, says William E. Rodak, PhD, ACGME-I's vice president for international accreditation. "We're contributing to improving graduate medical education outside of the United States and in turn, health care in other parts of the world," he says.

The new programs will provide the next step for this summer's graduating class, almost all of whom will complete residency training in Singapore.

"These are wonderful students, and they will be excellent physicians—bright, accomplished, committed to service, and with a truly global perspective," Krishnan says. "We can be very proud of them as the first to graduate under the Duke-NUS banner."

"The graduation gives us an opportunity to pause and truly appreciate the success of this venture," adds Kirkland. "It makes me think of the words of the Indenture that originally established Duke University, which called us to 'provide real leadership in the educational world' and to teach what would 'most help to develop our resources, increase our wisdom, and promote human happiness.' Well, with Duke-NUS, that's just what we've done."

AUGUST 2007
The first 26 Duke-NUS students begin class.

JULY 2008
Ranga Krishnan, MB ChB, chair of the Department of Psychiatry at Duke, is named dean of Duke-NUS.

SEPTEMBER 2009
The 11-story, 280,000-square-foot Khoo Teck Puat building is dedicated as the permanent home of Duke-NUS.

MARCH 2010
Michael Merson, MD, director of the Duke Global Health Institute, becomes Duke Medicine's vice chancellor for Duke-NUS affairs.

AUGUST 2010
Duke-NUS launches a PhD program in Integrated Biology and Medicine that focuses on the preparation of translational research scientists. Twelve students enroll in the inaugural class.

NOVEMBER 2010
Duke and the National University of Singapore representatives sign a phase 2 agreement to launch their next five years of collaboration in medical education and research at Duke-NUS.

JULY 2011
Duke-NUS graduates its first class of new MDs.

Leading with TeamLEAD

From the prime minister of Kazakhstan to representatives from Harvard, more than 100 delegations from all over the world have visited Duke-NUS to learn more about the school's innovative approach to medical education.

Called TeamLEAD (Learn, Engage, Apply, Develop), the method is a radical departure from traditional lecture-based teaching formats. Instead, students are responsible for learning the bulk of the material before class, using recorded lectures from Duke University School of Medicine along with reading assignments from textbooks and medical journals. Once in class, they are tested both individually and in small groups, so instructors can focus the rest of the session on areas of weakness. The teams then work together, with "open-book" access to medical references, to solve clinically oriented questions related to the material.

"The best doctor is no longer the doctor with the best memory," says Robert Kamei, MD, vice dean for education at Duke-NUS. "In an age when information is available anywhere, instantaneously, we want to provide students with the skills they'll need in the future—the ability to find the latest information and apply it to clinical practice. To succeed at the highest level, they need to be able to both work in teams and provide leadership, so our curricular approach focuses on developing those abilities, not just rote memorization."

Although the concept of team-based learning was introduced in business schools in the 1980s, TeamLEAD is the first time it has been adapted for medical education. "It's difficult to introduce a whole new approach within an existing school," says Dean Ranga Krishnan. "In Singapore we had the opportunity to ask ourselves, with everything we know now about medicine, research, and teaching, what is the best way to train our students?"

"There are significant advantages to the TeamLEAD approach," agrees Edward Buckley, MD, vice dean for education at Duke medical school, who helped develop the Duke-NUS curriculum. "It makes more efficient use of the instructor's time and is better suited to the way adults learn, which is by applying new information in a practical context. It's also very good preparation for clinical practice, which is increasingly moving toward multidisciplinary, team-based care."

In fact, the approach is now being adopted in pilot programs at "Duke Durham," as the US school is known in Singapore. This year, first-year medical students in the Brain and Behavior, Molecules and Cells, and Body and Diseases courses participated in team-based learning exercises, and "we plan to adapt more of the methodology going forward, especially after we move into our new Learning Center," says Buckley.

"The opportunity to exchange these kinds of ideas and share experiences is a very rich and rewarding part of this partnership."

Above, Doyle Graham, MD, PhD, former dean of medical education at Duke, teaches first-year students in the TeamLEAD room at Duke-NUS. Duke University School of Medicine's new Learning Center, scheduled to open in 2013, will include a similar room designed to facilitate team-based learning.

At top, students participate in a TeamLEAD problem-solving session.

Duke-NUS students conduct clinical rotations in SingHealth hospitals, located on the same campus as the school. Above, students learn cardiac physiology using one of the state-of-the-art patient simulators available in the Duke-NUS Clinical Performance Center.

Like their counterparts in Durham, Duke-NUS students participate in a signature year devoted to independent research—sometimes even *with* their counterparts in Durham. Eight Duke-NUS students completed their research at Duke this year, including Cheryl Lin (left), who studied with Eric Peterson, MD (far left), an associate director of the Duke Clinical Research Institute.

"Duke-NUS has opened up so many opportunities for me to explore," says Lin, who is also a Duke undergraduate alumna. "I like the fact that students can take the initiative to get the most out of their education—I think it will help us become better doctors."

"People don't always realize it, but Duke has two medical schools—Duke University School of Medicine, which is among the very best American schools, and Duke-NUS, which has rapidly become one of the leading schools in Asia. That gives us wonderful opportunities to bring faculty together across the globe to make new discoveries and educate future leaders."

—Michael Merson, MD
VICE CHANCELLOR FOR DUKE-NUS AFFAIRS AND DIRECTOR, DUKE GLOBAL HEALTH INSTITUTE

Research with a global reach

The opening of Duke-NUS has opened up new opportunities for researchers in both Durham and Singapore to advance biomedical science on a global scale. Nearly a third of Duke-NUS faculty hold joint appointments at Duke, and many other Duke faculty have taken advantage of the rich possibilities for collaboration with scientists on the other side of the world.

"Singapore is an appealing place to conduct research," says Patrick Casey, PhD, senior vice dean for research at Duke-NUS. "The country has made a tremendous investment in biomedical science, which has attracted top researchers internationally and provided opportunities to access unique technologies, such as a chronobiology suite for sleep research that's one of the few of its kind in the world. Singapore also offers access to a well-annotated patient population with different ethnicities and lifestyles than in North Carolina, so it's a great place to conduct comparative clinical studies."

Among the dozens of Duke-Singapore collaborations to date include research focused on:

Dengue fever: A team of researchers at Duke and Duke-NUS led by Mariano Garcia-Blanco, MD, PhD, used gene-silencing technologies to identify dozens of proteins the dengue fever virus relies on—identifying promising new targets to develop antiviral drugs for the devastating mosquito-borne disease. Dengue has been one of the first major research concentrations of Duke-NUS; the school's program in infectious diseases is led by Duane Gubler, ScD, considered the world's foremost expert on dengue fever.

Metabolic disorders: Duke-NUS's Scott Summers, PhD, is studying how a type of lipids called ceramides contributes to the development of insulin resistance and diabetes, working with Christopher Newgard, PhD, of Duke's Stedman Nutrition and Metabolism Center (see page 25).

Parkinson's disease: Tso-Pang Yao, PhD, of Duke's Department of Pharmacology and Cancer Biology, and Kah Leong Lim, PhD, of Duke-NUS and Singapore's National Neuroscience Institute, have elucidated the role of certain disease-causing mutations in the Parkin gene—contributing to understanding of the causes of neuro-degeneration in Parkinson's disease.

Aging: Researchers Angelique Chan of Duke-NUS and Truls Ostbye, MD, PhD, have conducted population-based and longitudinal studies related to the care and well-being of the elderly in Singapore, one of the most rapidly aging countries in Asia.

Sleep deprivation: Neuroscientists led by Michael Chee, MD, of Duke-NUS and Scott Huettel, PhD, of Duke's Center for Interdisciplinary Decision Science found that sleep deprivation can alter strategic preferences in risky decision-making—increasing sensitivity to gains while decreasing sensitivity to losses.

These global collaborations are just a start; over the past year, Duke and Duke-NUS have hosted a series of symposia that bring faculty from Duke and Singapore together to discuss shared research interests and generate ideas for joint projects in areas from heart disease to health services research.

In addition, more than 50 Duke and Duke-NUS faculty have joined a new Duke Cardiovascular Research Center established to advance global basic research objectives. The center is led by Thomas Coffman, MD, chief of Duke's division of nephrology, who also directs Duke-NUS's Cardiovascular and Metabolic Disorders research program.

"The ties between Duke and Singapore provide a unique opportunity to bridge researchers who are literally a half world apart," he says. "We hope to create an environment that amplifies the quantity and quality of research across both campuses."

Duke-NUS has formed a wide network of research partners, from faculty at Duke and NUS to government agencies and health care organizations to pharmaceutical and biotech companies, with a focus on translating discoveries from the lab bench to the bedside.

DUKE-NUS RESEARCH BY THE NUMBERS

83 regular-rank research faculty (45 full-time, 24 hold joint appointments at Duke)

$81 million+ (S$100 million+) in competitive funding awarded for faculty research

370+ faculty research papers in peer-reviewed journals

16 invention disclosures filed

8 patents filed (2 have received commercial licensing interest)

1 biotech company started up by 2 Duke-NUS faculty

"Duke-NUS connects Duke to what is truly a global health care research enterprise in one of the fastest-growing places in the world." —*Ranga Krishnan, MB ChB,* DEAN OF DUKE-NUS

Neuroscientist Michael Chee is one of many Duke-NUS faculty who have conducted joint research with Duke scientists. The school's signature research program in neurosciences is led by Dale Purves, MD, former chair of neurobiology at Duke.

This spring, faculty members from Duke visited Singapore to discuss collaborations focused on Health Services and Systems Research, a signature program at Duke-NUS led by David Matchar, MD (left)—who also directs the Center for Clinical Health Policy Research at Duke. "Although Singapore is a small country, it experiences many of the same problems we do in the US—a rise in obesity, an aging population," says Eric Finkelstein, PhD (right), who also holds joint appointments at both schools. "It's great to do work that supports both of our needs."

David Virshup, MD, heads the Duke-NUS signature research program in Cancer and Stem Cell Biology, which focuses on cancers prevalent in Asia—such as gastric cancer, chronic myeloid leukemia, hepatocellular carcinoma, and breast and renal cancer.

Members of the Class of 2011 celebrated the completion of medical school on May 28 (see page 14).

Meet the pioneers

In August 2007, a couple dozen twenty-somethings from all over the world started classes in the temporary quarters of a brand-new medical school. With bachelor's, master's, and PhD degrees from a host of leading universities, such as NUS, Nanyang Technological University, Cornell, the University of Sydney, and Imperial College London, they had been carefully chosen from a pool of nearly 400 applicants eager to be part of the new Duke-NUS Graduate Medical School.

As the pioneer class, the students played a key role in establishing the new school.

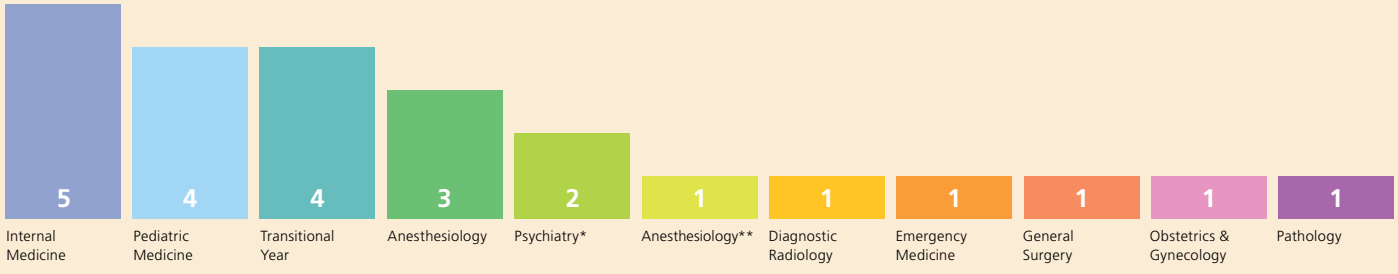
"We have been able to witness the school start at the interim campus, the completion of the new campus and opening by Prime Minister Lee Hsien Loong, and the solid growth of the research community at Duke-NUS," says Dixon Grant, a magna cum laude graduate of Utah State University and member of the inaugural class. "I also served as an academic representative and was able to see the professors discuss ways to deal with issues and improve each year. It is truly remarkable what our professors have been able to accomplish in terms of both starting a new curriculum and successfully training us to be doctors."

The Class of 2011 has shined academically, with excellent performance on the rigorous United States Medical Licensing Examination and in individual research. Of the 24 graduates, 21 have submitted abstracts and 13 have published research papers, many in tier 1 journals. They have also demonstrated commitment to using their medical training to make a difference, initiating several community-service projects.

"I want to be part of a concerted effort by local clinician-scientists to take clinical research to the next level and improve clinical care for diseases peculiar to our part of the world," says Vincent Tay, a graduate of the National University of Singapore and member of the Duke-NUS class of 2011. "As graduates of Duke-NUS, I know that we will not just make a name in clinical service and research, but also become leaders and movers in wider community for social causes."

After graduation this summer, the students will go on to residency training in a wide variety of specialties. See below for details, and page 14 for coverage of the pioneer class's graduation celebration.

RESIDENCY POSTINGS OF DUKE-NUS 2011 MD GRADUATES



All residencies with SingHealth Services except: *National Healthcare Group, **Duke Medicine

Another pioneer class: In August 2010, 12 students became the first to enroll in Duke-NUS's new PhD program in Integrated Biology and Medicine, which focuses on translational research and grooming students to become research team leaders. Above, PhD student Neo Shu Hui works with cancer researcher Koji Itahana, PhD.

DUKE-NUS MD STUDENTS BY THE NUMBERS*

186 MD students

57% females

43% males

24.25 average age

16% of MD students hold master's or PhD degrees

21 countries represented: Singapore, Malaysia, Indonesia, Vietnam, Burma, Philippines, Sri Lanka, Pakistan, Bangladesh, India, China, Taiwan, Nepal, Zimbabwe, Japan, South Korea, United Kingdom, Poland, Greece, Canada, United States

*Demographic information is for 2011–2014 MD classes as of time of admission.

100% of the 2011 graduating class passed the United States Medical Licensing Examination, at a higher mean score than the US average. **50%** have published their third-year research.

Duke medical student Luke Bulthuis (right) conducted his third-year research at Duke-NUS, studying diabetes and insulin resistance at the cellular level and in animal models with endocrinologist Scott Summers, PhD. To date, six Duke medical students have traveled to Singapore to complete part of their studies at Duke-NUS.

A diverse bunch, Duke-NUS students hail from countries from England to Zimbabwe. Although competitive scholars, less than half are from premedical backgrounds, and many have already accumulated professional experience. Pictured above are a few members of the student body, whose peers include PhDs, a dentist, accomplished athletes, nationally ranked debaters, and engineers.

Camp Simba was started in 2009 by students from Duke-NUS and Yong Loo Lin School of Medicine to provide a few days of fun for children of cancer patients in Singapore. Duke-NUS students have also initiated community service projects in Thailand and Indonesia.




Celebrating the first graduating class of Duke-NUS

On May 28, 2011, Duke-NUS celebrated the achievements of its first class of medical students with a pre-graduation celebration and Hippocratic Oath and hooding ceremony.

"There are very few people who ever earn the privilege of being true pioneers in their fields of endeavor, but there is no question that each of you whom we honor today has achieved that distinction," Duke Chancellor for Health Affairs Victor J. Dzau, MD, told the graduating class at the ceremony. "You have paved the way for future generations of clinicians, clinician-scientists, and leaders in medicine who will study and graduate from this outstanding institution."

The official presentation of degrees will take place on July 4, as part of National University of Singapore graduation ceremonies, with Duke University President Richard H. Brodhead in attendance.

"At Duke-NUS I feel like I've gotten a cultural education as well as a medical education, and I think that's going to be increasingly important. The world's only getting smaller and smaller, and the better we understand how to work together the more we can accomplish."

—Dixon Grant, DUKE-NUS CLASS OF 2011

Top row, left to right:
The class of 2011 begins the procession to the ceremony.

Guest of honor Ng Eng Hen, MBBS, Singapore Minister of Defense, with Duke Chancellor Victor J. Dzau, MD.

Graduands Dixon Grant and Karrie Ko.

Duke medical school alumnus Lewis T. "Rusty" Williams, MD, executive chair and founder of FivePrime Therapeutics, delivers the keynote speech.

Below:
The graduating class of 2011 with Duke-NUS administration and special guests.

Alliances across Asia

Since the 2005 launch of Duke-NUS Graduate Medical School in Singapore, Duke Medicine has established ties with institutions across the Asian continent.

"Tremendous opportunities have opened for Duke Medicine because of our success in Singapore," says Robert Taber, PhD, vice chancellor for corporate and venture development at Duke. "Our involvement in Duke-NUS has raised Duke's profile in the region significantly."

To better evaluate these growing opportunities and to develop and implement its broader global strategy, Duke Medicine created a new organization, Duke Medicine Global, in 2009. Headed by Krishna Udayakumar, MD, the office coordinates a range of collaborations, including:

India:

- Duke Medicine in February finalized its joint venture partnership with Medanta–The Medicity, a 1,500-bed conglomeration of multispecialty institutes near New Delhi, to establish the Medanta Duke Research Institute (MDRI). Opening this fall, MDRI seeks to transform the global framework for clinical development and evaluation of human biology, diseases, drugs, and devices by leveraging cutting-edge technologies and applying systems biology and molecular medicine to clinical research. The MDRI's 60-bed, 27,000-square-foot clinical research unit will collaborate with similar units at Duke and in Singapore, forming a global network for studies of new interventions in genetically diverse populations.
- Duke Medicine has signed a Memorandum of Understanding to collaborate with Tata Medical Center, a 167-bed cancer hospital in Kolkata, to advance cancer care, research, and education. As an initial step, Duke will provide radiation oncology training to visiting faculty from India and also explore collaborations in information technology related to cancer care.
- Duke Clinical Research Institute partnered with Kaplan EduNeering in February to provide high-quality, Internet-based clinical research training. Initially focused on India, the partners plan to expand to China and other areas where there are shortages of well-trained clinical research staff.

China: Duke's extensive collaborations in China include a seven-year partnership with Peking University Health Science Center (PUHSC) to advance clinical care, medical management practices, and global health, including a joint Global Health Diploma organized by the Duke Global Health Institute (DGHI) and PUHSC. Duke and Peking University faculty are leading Fogarty International Center-funded training programs in stroke research and bioethics. DGHI and the George Institute for Global Health share an NIH Center for Excellence grant which supports research to prevent hypertension and its complications in populations living in rural areas of China, while other Duke-led pilot programs focus on obesity prevention.

Kazakhstan: Duke and Astana Medical University recently collaborated to provide 15 MBA students from Kazakhstan with health-care management training through the Duke Medicine Global Healthcare Management Development Program; Duke Medicine Global will also provide strategic guidance to Nazarbayev University and National Medical Holding as they work to develop an integrated academic health system in Kazakhstan.

"By working closely with carefully selected partners who share our vision and values, in Asia and around the globe, Duke Medicine is advancing its goals of improving medicine and health worldwide," says Victor J. Dzau, MD, chancellor for health affairs.

Learn more about Duke's many global collaborations in education, research, policy engagement, and service at ***globalhealth.duke.edu****.*

The changing landscape

FROM A GARDEN ON THE ROOF to a linear accelerator in the sub-basement, the shape of the new Duke Cancer Center building is coming into view. Architects and planners are turning their attention to finalizing the building's interior layout, with the help of Duke Medicine faculty and staff.

The Cancer Center facility, currently on schedule to open to patients by the first of March 2012, will help answer the needs for convenient, efficient, multidisciplinary care for the ever-growing cancer patient population in North Carolina and across the country. The 267,000 square feet of new space, which will include 123 clinical exam rooms and 73 infusion stations, will be focused on providing patients a healing environment that meets their emotional and spiritual needs. Special patient-centered features include a rooftop garden where patients can opt to receive infusion treatment, a patient resource center, and a patient boutique. The facility was also specifically designed to foster greater collaboration and operational synergies among faculty, caregivers, and clinical researchers.

Construction of the new Duke Medicine Pavilion, meanwhile, is also moving along on schedule. Although the building's superstructure hasn't fully taken shape, planning for the specifics of the interior spaces is well under way. As with the Cancer Center facility, mock-ups of inpatient and operating rooms are allowing faculty and staff to give input on the final configuration. The Duke Medicine Pavilion will open in mid-2013, adding 18 operating suites and 160 critical care and intermediate beds.

*Learn more at **dukemedicine.org/construction**.*

STAFFING UP: As construction progresses, so does planning for human resources needs—a complex task, says Steve Smith, chief human resource officer for Duke Medicine. "We need the right staff to take care of patient and visitor needs," he says, "and 'the right staff' comprises a combination of values and skills, as well as numbers." Construction itself has created more than 580 new hires as of March 31, 2011, and hundreds of new employees will be hired as the new buildings open and as patient volume grows.

For more information about jobs at Duke Medicine, visit:
hr.duke.edu
dukenursing.org
medicalstaffrecruitment.duke.edu

Duke and LifePoint
A new network for health care

DUKE UNIVERSITY HEALTH SYSTEM AND LIFEPOINT HOSPITALS, a hospital operations company with 52 hospital campuses in 17 states, announced in January the formation of DLP Healthcare LLC, a joint venture designed to strengthen and improve patient care statewide by creating flexible affiliation options for community hospitals.

DLP Healthcare has acquired a substantial majority of the North Carolina operations of MedCathPartners. Its six hospital-based catheterization labs, including one at Duke Raleigh Hospital, and three mobile catheterization services will now operate as DLP Cardiac Partners. In addition, Maria Parham Medical Center in Henderson, North Carolina, and Roxboro-based Person Memorial Hospital have each signed a Memorandum of Understanding with DLP Healthcare to become part of the network.

For new DLP affiliates, LifePoint will bring a range of financial and operational resources, including access to capital for ongoing investments in new technology and facility renovations. Duke will offer guidance in clinical service development and support for enhancing quality systems as well as access to highly specialized medical services to help meet their communities' needs. Duke/LifePoint hospitals also will have the ability to share their own best practices with hospitals, clinics, and health care providers throughout the Duke and LifePoint systems.

"Duke and LifePoint share a commitment to working collaboratively with communities, physicians, and hospital staffs to optimize the availability of innovative health care services locally, while applying proven operational strategies that are more important than ever in the era of health care reform," says William J. Fulkerson Jr., MD, executive vice president of Duke University Health System.

*Learn more at **dlphealthcare.com**.*

Infection control

High-tech cleaning of high-touch surfaces

A DEVICE RESEMBLING a tall, slender R2-D2 from *Star Wars* bathes a room in blue light, which streams through the blinds into the hallway of the patient care unit. Inside ensues a battle of good versus evil, light versus infection.

"This is a new, big thing," says Duke's Luke Chen, MD. Chen is co-investigator of a study that will test the effectiveness of standard chemical cleaning practices compared to standard chemical cleaning plus a new ultraviolet light technology for cleaning hospital rooms and reducing the spread of health-care-associated infections. "This portable ultraviolet light device creates a radiation sea that can clean almost all surfaces in a room in 20 minutes," says Chen. "In the case of hardier bacteria like *C. difficile*, the cleaning takes approximately 40 minutes."

The technology is part of a Duke study funded by a $10-million grant from the Centers for Disease Control and Prevention's Prevention Epicenter Program, which supports efforts to develop and test innovative approaches to reducing infections in health care settings. The ultraviolet light devices, called Tru-D (for total room ultraviolet disinfection), will be placed in the rooms of patients (after they've been discharged) who had contagious conditions or infections due to drug-resistant organisms like MRSA. Investigators use fluorescent markers to identify high-touch areas in hospital rooms, such as bedrails. Afterwards, black light is used to assess how well the room was cleaned.

"We know that cleaning in a hospital is important, but the actual methods and techniques have been poorly and inadequately studied," says Daniel J. Sexton, MD, principal investigator of the study and director of the Duke Infection Control Outreach Network (DICON), a collaboration between Duke and 39 community hospitals focused on improving infection control programs.

This method will be utilized in several DICON-affiliated hospitals, Duke University Health System hospitals, UNC Hospitals, and the Durham VA Medical Center. The information gained from using these new cleaning methods will be applied in DICON hospitals and could potentially impact other hospitals across the country.

"Prior small-scale studies suggest objects in patient rooms, such as television remotes, bedrails, and equipment, commonly become contaminated with bacteria," says Sexton. "We have to be certain that these items are clean when a new patient enters the room in order to reduce the risk of spreading infections. A study like this is every bit as important as a study of safety in a Boeing 747."

PHOTO COURTESY OF LUMALIER CORPORATION

> "This portable ultraviolet light device creates a radiation sea that can clean almost all surfaces in a room in 20 minutes. In the case of hardier bacteria like *C. difficile*, the cleaning takes approximately 40 minutes."
>
> —LUKE CHEN, MD

Considering a new weight-loss cocktail

Q&A with Kishore Gadde

KISHORE GADDE, MD, director of Duke's obesity clinical trials program, talks about the promising results of a recent multicenter clinical trial* that showed a new combination of existing drugs may help some patients who are struggling with obesity.

What's the story of this trial in a nutshell?
We showed that a combination of phentermine and topiramate, drugs which are already approved to treat obesity (phentermine) and migraine and epilepsy (topiramate), achieves about 19 more pounds of weight loss than placebo—or up to a 10 percent weight loss—in obese people over the course of one year. The participants who took the combo also showed significant improvements in blood pressure, blood sugar measurements (hemoglobin A1C), cholesterol, triglycerides, and inflammatory markers, including C-reactive protein.

Is this drug combo an improvement over orlistat?
The drug combo appears to be more effective than orlistat, which is the only drug currently available for the long-term treatment of obesity. Meta-analysis studies have shown that treatment with orlistat, at maximum strength, can lead to approximately seven-pound greater weight loss than placebo after one year.

How does the drug combination work?
We believe it works mainly by reducing hunger and increasing satiety. Phentermine increases the release of norepinephrine, a brain chemical that may influence hunger and satiety. Topiramate has numerous mechanisms of action including effects on sodium channels, glutamate and GABA transmission, and carbonic anhydrase inhibition, although the mechanism responsible for weight loss is not clearly known.

There may also be an independent effect on glucose control: More patients on placebo developed diabetes during one year than patients who were on the combination drug. More patients on the combination drug were also able to reduce the number of their diabetes and blood pressure medicines.


Kishore Gadde, MD

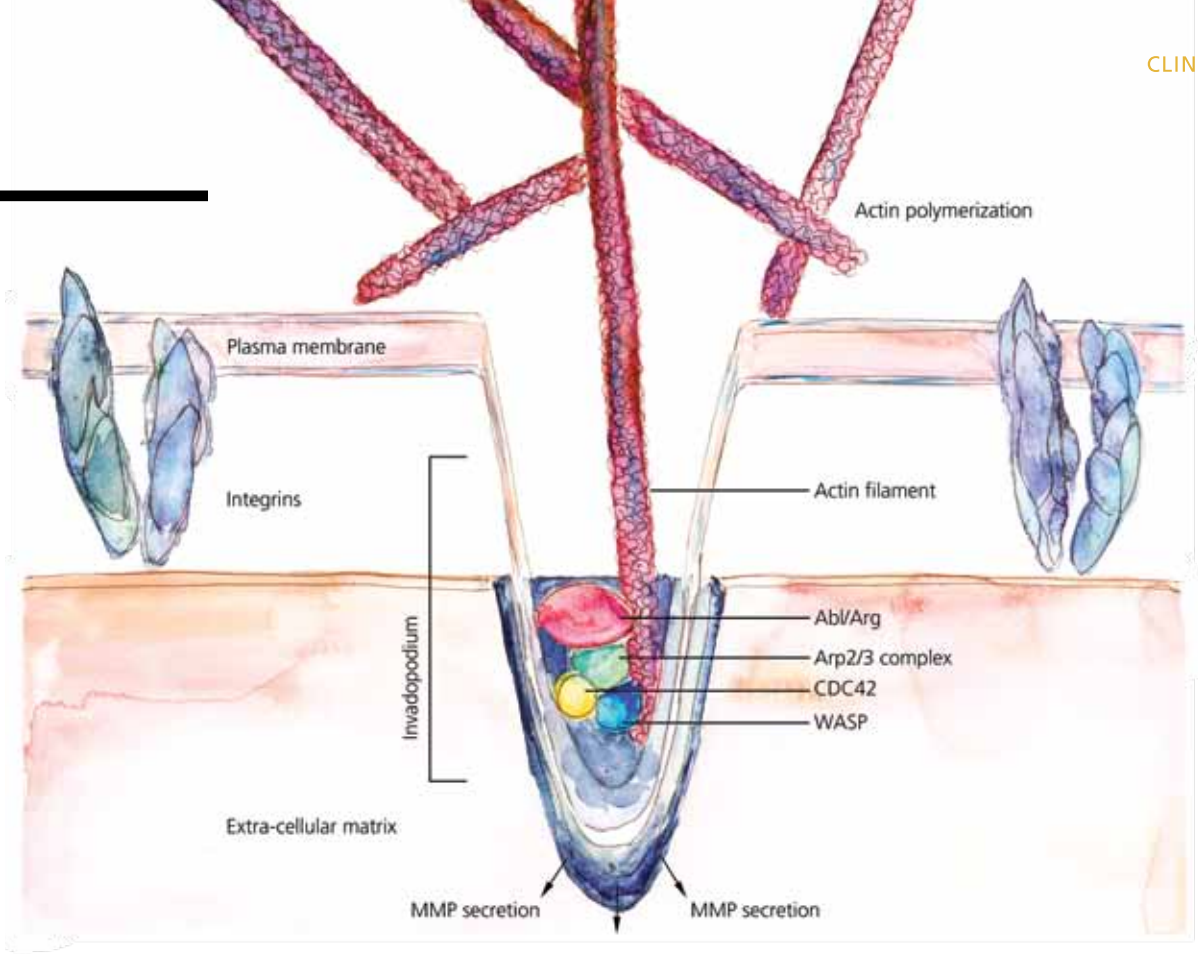
> "This kind of weight loss, coupled with significant reductions in heart and metabolic risk factors, could be an important advancement in the management of obesity."

This study was funded by Vivus, which is seeking FDA approval to market the combination therapy under the trade name Qnexa. In October 2010, the FDA asked the company for more safety data. Why, and does this study satisfy those concerns?
In March, the FDA issued a warning regarding the use of topiramate during pregnancy, stating that pregnant women who take the drug are at increased risk of having babies born with cleft lip or cleft palate. Thirty-four women became pregnant while in Qnexa clinical trials, and no birth defects were reported for the babies born—but pregnant women would not be candidates for use of this drug; there is no reason for women to use weight loss drugs while they are pregnant or trying to become pregnant.

What other patients should not take this drug?
Topiramate has also been associated with memory problems and mood changes, including depression and anxiety, and we did see a dose-specific increase in depression and anxiety during the study. Though the overall incidence of these events was relatively small, it's still something to consider in terms of which patients are good candidates for this formulation.

Why are you excited about this drug?
This kind of weight loss, coupled with significant reductions in heart and metabolic risk factors, could be an important advancement in the management of obesity. Two-thirds of Americans are overweight or obese, and for obese patients who have failed to achieve meaningful weight loss with diet and exercise, we have just one available drug—orlistat—to try before jumping to bariatric surgery. We need more treatment options that work via different mechanisms.

**The 56-week, phase 3 study was conducted in 93 US centers with 2,487 patients who had a BMI of 27 to 45, and two or more comorbidities such as diabetes, hypertension, and high triglycerides. Patients in the study also received diet and exercise advice in addition to the drugs. The study was published in April in* Lancet. *Gadde was a paid consultant to Vivus until 2008.*



RACHEL KLINGENBERGER

A SIMPLIFIED DIAGRAM OF AN INVADOPODIUM

Ann Marie Pendergast, PhD

Cutting off cancer at its…knees?

SCIENTISTS NOW KNOW THAT SOME CANCER CELLS use their "feet"—cellular structures called invadopodia—to spread throughout the body. But researchers at Duke Cancer Institute have discovered a way to short-circuit their travels by preventing the development of these invadopodia. What's more, blocking these "feet" also blocks proteins in the feet that allow cancer cells to move through intact tissue and spread to distant organs.

The study, published in December 2010 in the *Journal of Biological Chemistry,* could lead to a treatment to prevent cancer metastasis, which could be combined with a treatment that kills the cancer cells, says lead author Ann Marie Pendergast, PhD. "A combination like this would be more effective than either treatment given alone."

The team found that a family of protein kinases (comprising two proteins, Abl and Arg) are required for the formation and function of the invadopodia. "If we can find a way to block the kinases, we'll find a way to keep the feet from forming correctly—and that will keep the cells from moving," Pendergast says. "And FDA-approved compounds that have inhibitory activity against the Abl kinases are already available."

The researchers also made a new connection between these Abl and Arg kinases and the regulation of a matrix metalloproteinase (MMP)—a family of proteins that can create openings for cancerous cells to escape through on their way to becoming a metastasis. "When you lose the functions of the Abl and Arg kinases, you also lose the function of at least one type of MMP protein, which 'chew' through the matrix surrounding cells and tissues," Pendergast says.

"We have been working for years in rehabilitation to develop the most effective interventions for walking recovery."

—PAMELA WOODS DUNCAN, PHD, PT

Home or lab

Where do stroke victims re-learn best?

FOR STROKE VICTIMS struggling to re-learn walking, which is better: home-based physical therapy or treadmill training done in a physical therapy lab? According to a Duke study published in May in the *New England Journal of Medicine*, the two work equally well.

"We have been working for years in rehabilitation to develop the most effective interventions for walking recovery," says Duke's Pamela Woods Duncan, PhD, PT, principal investigator of the trial. "Until now, there has not been a major phase 3 trial to systematically evaluate different interventions."

The NIH-funded study, Locomotor Experience Applied Post-Stroke (LEAPS), was completed over five years at multiple sites to compare a specialized locomotor training program, which includes body-weight-supported treadmill training with multiple physical therapists, to an in-home progressive strength and balance program with a single therapist. Each group received either the locomotor training (at two months or six months post-stroke) or home exercise for 90 minutes, three times a week for 12 weeks. Each patient's improvement in walking was evaluated one year after their stroke and 52 percent of patients in all the groups made significant improvement.

All groups did equally well, achieving similar gains in walking speed, motor recovery, balance, social participation, and quality of life. "This is important because the home-based intervention is more accessible and more feasible," says Duncan. She notes that the home-based intervention is also associated with fewer risks; the treadmill training was associated with minor increased dizziness and faintness, as well as increased falls in patients whose disabilities are more severe.

To CABG or not to CABG

More insights from STICH

HIGH-RISK HEART FAILURE PATIENTS who have coronary artery disease are often overlooked as candidates for bypass surgery. But new results from the STICH (Surgical Treatment for Ischemic Heart Failure) trial suggest that when done in combination with optimal medical therapy, surgery can reduce the risk of death and hospitalization.

STICH is the largest study to date that compares outcomes among those high-risk heart failure patients who had coronary artery bypass grafting (CABG) while taking guideline-recommended medications and those taking medication alone. The latest results from the megatrial, published in April in the *New England Journal of Medicine*, found that coronary bypass surgery should be considered in addition to medical therapy.

"These findings have the potential to change clinical practice," says Duke cardiologist Eric J. Velazquez, MD, the study's lead author. "The current approach for making treatment decisions for many heart failure patients today either ignores the potential treatable contribution of coronary artery disease or, if it is discovered, places patients on an express train toward surgery. STICH should give physicians and patients comfort that decisions about surgery should not be avoided but do not need to be rushed. In other words, the message should be: take the local train."

Duke surgeon Robert Jones, MD, study co-author, adds that "While there is an early hazard associated with surgery, optimal medical therapy in conjunction with surgery can be performed safely in this high-risk patient population and should be considered, especially for patients with potentially longer time horizons."

Patch work

Building new heart tissue—from scratch to patch

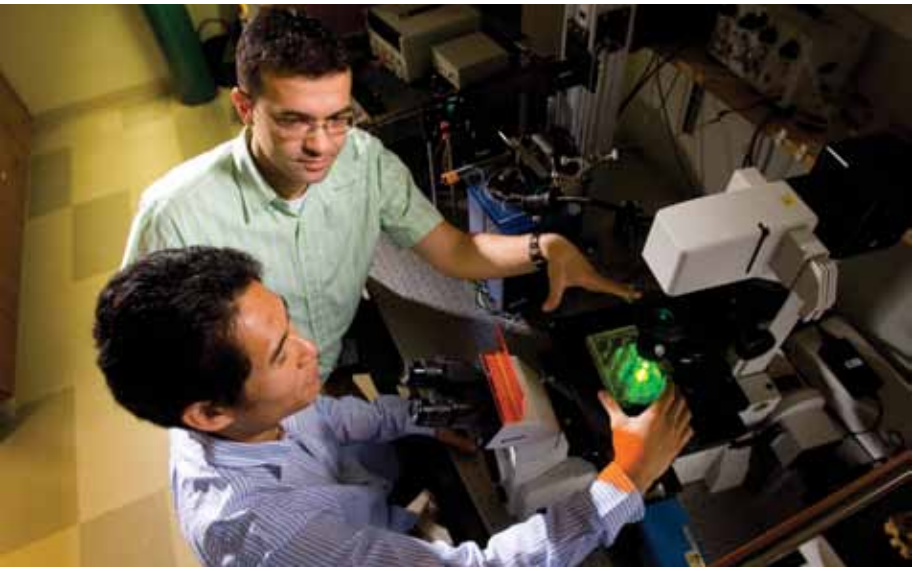
IMAGINE A PATCH—MADE OF FULLY FUNCTIONAL CARDIAC TISSUE—that could safely and effectively restore function to heart muscle injured by a heart attack or plagued by an arrhythmia.

This is the work of Duke biomedical engineer Nenad Bursac, PhD, and his team in the Cardiac Electrophysiology and Tissue Engineering (CETE) lab. They're using undifferentiated stem cells to build functioning patches of heart tissue that can directly replace damaged or malfunctioning heart-muscle cells (cardiomyocytes).

The work offers a different approach than injecting stem cells into hearts, which is another experimental technique to achieve the same goal. Bursac notes that injected cells frequently can't be placed in the optimal location, and they often don't survive or function correctly. A patch, however, can place the needed tissue in the best location, optimizing the likelihood of cell integration and survival. "It helps to go in with a defined tissue structure," Bursac says. "So while implanting a cardiac patch is more invasive surgically than injecting cells into the heart, it will hopefully be more functional."

The federally funded CETE lab—a component of the Pratt School of Engineering's Biomedical Engineering program—is investigating the structural and functional interactions among implanted heart muscle cells and other cells. "We're trying to see how well these cells connect with the myocardium and contract with the rest of the heart," Bursac says. The goal is for these cells to integrate well enough with existing heart tissue that they will be electrically and mechanically in sync—contracting and conducting signals as if they were part of the heart.

A recent study of experimental patches using embryonic stem cells from mice—now submitted for publication—shows the current models to be "working beautifully," Bursac says. Duke cardiologists Howard Rockman, MD, and Lan Mao, MD, who implant the patches in mice and rats in Rockman's laboratory, believe the patches have the potential to be of great benefit to people with cardiac damage and disease.



Nenad Bursac, PhD (top), in his lab with graduate student Brian Liau

Ken Poss, PhD

Taking cues from zebrafish

Duke cell biologist Ken Poss, PhD, and colleagues have uncovered the molecular mechanisms by which zebrafish are able to regenerate injured tissue (including new heart, fin, and eye parts) and avoid scarring—a critical step toward developing stem-cell therapies to repair muscle and nerve damage caused by heart disease, Alzheimer's disease, and spinal-cord injuries.

The team observed natural occurrences of heart regeneration in injured zebrafish hearts and identified a population of heart muscle cells—activated near the injury site—that expands and proliferates. "This is an essential piece of information in terms of the signal that activates that source," Poss says. "We're getting at the most basic mechanisms of cardiac regeneration, and this helps to inform the types of patches that Nenad Bursac's team [left] is building." Poss also works with Duke cardiologist Howard Rockman, MD, comparing his injury models of damaged heart tissue from zebrafish with those in mammals, which regenerate cardiac muscle very poorly.

Walking away from pins

Advances in foot surgery

THIS IS NOT YOUR GRANDMOTHER'S BUNION TREATMENT.

Thanks to advances in implants, treatment of hammertoes and bunions is becoming much easier on patients. Although pins and plaster casts are not out the door yet, more and more Duke patients are enjoying a better quality of life post-op.

Duke orthopaedic surgeon Selene Parekh, MD, corrects hammertoe, the most common deformity of the lesser toes, with an implant called SmartToe, which is made of an alloy that changes with body temperature. (The material was originally developed for cardiovascular stents.) "You implant the device in a frozen state and as it warms up, it expands and captures the bone," he says. The implant holds the toe in its corrected position until the bone can heal to itself.

"Patients no longer have pins sticking out of their toes for four to six weeks," Parekh says. "From a quality-of-life perspective, it's a big difference. Patients love it. I've had a few who have had corrections done both ways, and they prefer the implant."

Patients not suited for the implant include those with bone infections in the toe, diabetic neuropathy, and severe osteoporosis.

Meanwhile, Duke's James DeOrio, MD, who has been treating bunions since 1986, has developed a titanium plate called the BLP (bunion locking plate). The implant solved the problem of holding the bunion in place after correction. Patients who choose the BLP procedure are back in shoes after about six weeks—and in three months, not just shoes, says, DeOrio, but shoes that they like. "People with painful bunions are appropriate candidates for surgery," says DeOrio, "and the patient satisfaction rate with these newer techniques is over 90 percent."

Learn more at ***dukehealth.org/orthopaedics***.

James DeOrio, MD

Above, above left: A patient with severe bilateral bunions after the surgical repair of the right foot. The implanted bunion locking plate holds the bunions in place after surgery.

Left: This X-ray shows a patient with both the SmartToe implant and pins. The SmartToe implant allows the patient's toe to heal without a protruding pin.

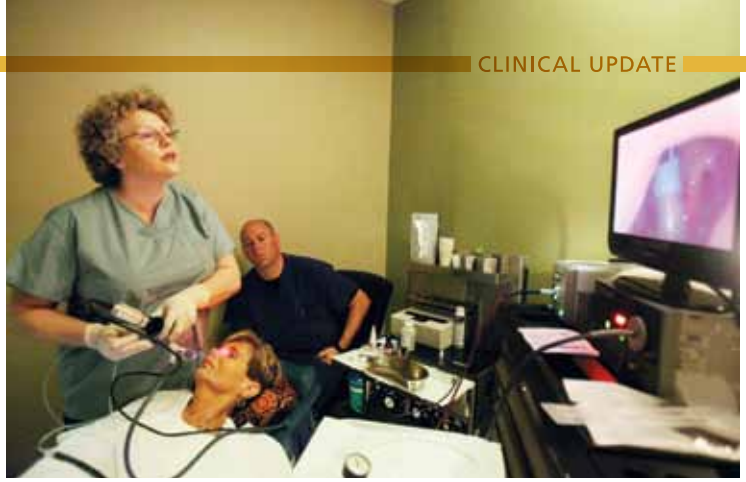
Arthritis

The uric acid connection

URIC ACID HAS LONG BEEN KNOWN as the agent of action in gout, a type of arthritis in which uric acid builds up and crystallizes in the joints and other tissues, causing painful inflammation. But a new Duke study has shown that levels of uric acid in one's joints may also increase the likelihood of severe osteoarthritis, the most common form of arthritis worldwide.

The researchers looked at 159 people who had knee osteoarthritis but no history of gout, and found the severity of their osteoarthritis to be strongly correlated with the amount of uric acid in their knees. The results, which were published in January in *Proceedings of the National Academy of Sciences*, show above normal uric acid levels in 39 percent of the study population, and evidence of the form of inflammation in the joints that is typically triggered by uric acid crystals.

"In a non-gout population, this provides some of the very first evidence that uric acid level is a potential cause of inflammatory events



THE HERALD-SUN

In May, Donna Sharpe, MD, became the first physician in North Carolina to perform balloon sinuplasty in an office setting.

and joint degeneration in osteoarthritis," says Duke rheumatologist Virginia Kraus, MD, PhD, senior author of the study. "Now we can continue research to see if lowering uric acid levels in an osteoarthritis sufferer could actually slow down the progression of their osteoarthritis and bring about a meaningful change in the course of their disease."

There are a lot of different markers for osteoarthritis that are indicative of disease severity. Because the uric acid was so strongly associated with the severity of disease and linked to disease progression over time, Kraus says it is not only a marker of the amount of disease, but also a mediator of the disease process. And given the many drugs available for lowering uric acid, Kraus says, "I haven't been this excited about anything I've ever done—it's so innately treatable."

Virginia Kraus, MD, PhD

Balloon sinuplasty

Cutting-edge sinus surgery with no cutting involved

THE LIGHTS ARE TURNED down low in the balloon sinuplasty room at Duke Otolaryngology of Durham. Relaxing music plays softly. A 63-year-old woman with a lifelong history of painful chronic sinusitis lies back in a reclining chair.

Otolaryngologist Donna Sharpe, MD, inserts a flexible catheter into her patient's right nostril. Using the endoscopic image on a nearby video monitor, along with a previous CT scan of the patient's sinuses, Sharpe carefully guides the tiny catheter into the inflamed and mucus-filled frontal sinus. She follows that with a lighted guide wire that illuminates the hollow cavity. The patient's forehead glows like a firefly, confirming that Sharpe has reached her target.

The physician inserts a small balloon, similar to those used for cardiac angioplasty, along the wire inside the catheter. Once the balloon is properly positioned in the blocked ostium, Sharpe inflates it, dilating the sinus opening. As she removes the deflated balloon, the sinus drains. The patient feels a decrease in pain and pressure, and the procedure is over.

In many cases, that's it. As needed, Sharpe will irrigate the sinus to flush out stubborn mucus or other material, but often, the relief is immediate. The patient is pain-free, breathing well, and ready for normal activity right away. No incision, no mechanical debriding of tissue or bone, little or no bleeding, and a patency rate exceeding 90 percent. "It's a pretty awesome technology," Sharpe says.

Despite its success rate, outpatient balloon sinuplasty is not for all chronic sinusitis sufferers. Patients must possess the anatomy to allow access via the catheter (blockages such as a deviated septum or sinus polyps are disqualifiers), and need the temperament to tolerate surgical work inside their head under local anesthesia.

In May, Sharpe became the first physician in North Carolina to perform balloon sinuplasty in an office setting. She performed it for three years in an operating room on patients under general anesthesia, which is still an option for patients who are otherwise qualified for the procedure, but are too anxious to sit still for it. During that time, she spoke often to colleagues about the possibility of doing the procedure on an outpatient basis. Recently, technology caught up with the ambition of Sharpe and other like-minded otolaryngologists, allowing the technique to be comfortable and easily used in an office.

Balloon sinuplasty follows the trend of other surgeries that have become more accessible once they became less invasive. Approved by the Food and Drug Administration as well as the Centers for Medicare & Medicaid Services, the procedure costs about one-tenth as much as an office procedure as it does in an operating room. And patients such as Sharpe's lifelong sinusitis sufferer leave her office ready to return to their day—sinus-pain free, says Sharpe. "That patient went home and cleaned her house, and she entertained guests that night."

Sharpe performs outpatient balloon sinuplasty at her office, Duke Otolaryngology of Durham; she performs the inpatient procedure at the James E. Davis Ambulatory Surgical Center and at Durham Regional Hospital. To learn more or make an appointment, call ***919-220-2020****.*

Jeffrey Marcus, MD (far left), says that Duke's cleft team strives to keep the number of surgeries their patients must undergo to a minimum. To date the team has never had to revise a cleft palate repair.

Rebuilding smiles

Updates in cleft lip and palate repair

JEFFREY R. MARCUS, MD, director of the Duke Cleft and Craniofacial Program, says that in treatment of cleft lip and palate, less really is more. In decades past it was not unusual for a child with a cleft lip and palate to undergo 10 or more procedures before age 12. "Our primary goal will always be to achieve the very best result possible," he says. "However, it is no longer necessary or reasonable to have a child go through so many steps."

For procedures that are necessary, the Duke cleft team creates a clinical plan for each child according to the most up-to-date protocols. Less surgery means less recovery time, less exposure to anesthesia, and fewer related risks.

"We strive with every patient to consolidate and coordinate procedures and to avoid the need for revisions," Marcus says. "Revisions are almost never as good as a perfect first surgery, so when we do anything, we do it to last a lifetime." Over the past eight years, the Duke cleft team has not had to revise a cleft palate repair, and only rarely must revise a cleft lip repair.

Since the program began offering an innovative presurgical orthopaedic therapy, outcomes are better than ever. The process—called nasoalveolar molding, or NAM—greatly facilitates the primary lip, palate, and nose repair many cleft patients undergo.

Craniofacial orthodontist Pedro E. Santiago, DMD, helped develop the technique in the mid-1990s and brought it Duke two years ago, making Duke's program one of few in the United States to offer NAM and the Southeast's most experienced NAM program. When NAM is appropriate and desired by a family, Santiago's team sees infants at about a week old. He evaluates the cleft and makes an impression of the baby's upper jaw, a three-minute procedure that doesn't require anesthesia. The impression is used to make an acrylic molding plate—similar to an orthodontic retainer—that is inserted and then adjusted weekly for three to four months to narrow the cleft.

Unlike other presurgical orthopaedic techniques, NAM brings the nose up and lengthens the skin between the nostrils, laying the groundwork for optimal outcomes when surgeons perform the primary nose and lip surgeries. "Lip repair alone cannot solve the stigma of the cleft nasal deformity," says Santiago. "Once the lip and bony segments are close together, we add a nasal extension to the plate to mold the deformed nasal cartilages," he explains. "This improves nasolabial symmetry and balance, and is critical to facial aesthetics."

It takes few days for families to get used to the plate, but "by week two, mom and dad are experts at managing it," Santiago says. "Babies aren't crazy about it at first, but it doesn't hurt them, they get used to it, and it's pretty easy to spot problems. If a particularly bothersome issue should arise, parents can always take the plate out while we make adjustments."

Some children with clefts aren't candidates for NAM—but their outcomes are also good, says Marcus. Regardless of a child's age or condition, "Duke offers options for every scenario," adds Santiago. "We like to meet the child, meet the family, and discuss their unique situation, goals for treatment, and resources, so that we can develop a comprehensive and realistic plan of action that's appropriate for that family."

As children grow up, they continue to see their same surgical team for monitoring, an important practice that provides long-term consistency of care as patient needs evolve. "We stick with our patients throughout their lives, and those relationships really grow," Marcus says. "Of all the things I do in medicine, caring for kids with clefts is probably the most rewarding. There is no greater sense of meaning than to look at a child with a cleft and to know that you have an opportunity to help him or her be like other children."

Santiago agrees. "It makes my life more meaningful to be able to get to know these patients and families, and make such an important impact on their lives."

*Call the Duke Cleft Line at **919-684-3815** to speak with program coordinator Ann Mabie or to reach any team member with questions or concerns.*

Mighty metabolites

Metabolomics research is on the fast track.

TWO MEN WALK INTO their doctor's waiting room, and with them arrives the puzzle that plagues so many physicians. The men are of similar build, age, and ethnic background. They have the same general diet and lifestyle habits. However, in two years, one of these men will die of a heart attack. The other will live for many years with no heart disease. How does the doctor know which man is at immediate risk?

Two of our most intractable diseases—heart disease and diabetes—are widely accepted as having a "multifactorial" origin in most patients. They can't be explained by genetics alone, and the mishmash of contributing behavioral causes are not only maddeningly variable from patient to patient but also nearly impossible to measure accurately over the decades it takes for their impact to play out. So far, the best laboratory tests still cannot identify with any reliability just who will get sick from these illnesses and who won't.

But what if they could?

This is the goal of metabolomics: a relatively new field of studying the chemicals produced by the many metabolic processes in the body. "Your body is in a constant state of metabolism," explains Duke cardiologist Svati Shah, MD. "These are the processes that help regulate the sugars, protein, and fat that you eat, and the conversion of these fuels to energy." The goal of metabolomics is to try to measure the byproducts of these processes and use those measurements as biomarkers for the health—or illness—of the body.

Metabolomics serves as the integrated readout for the other "-omics" sciences, such as genomics or proteomics, says Duke researcher Chris Newgard, PhD. "Genomics and proteomics have been big areas of research," he says. "But the metabolites are at the end of the funnel: mRNA is the product of the genes, the protein is the product of the mRNA, and the metabolic signature is the integrated readout of how all the individual genomic and proteomic variations affect a person's physiology. So to me it is the most precise measurement of the phenotype of the individual."

He skips a beat and says, "Of course, I'm biased." But the results of studies published in the last two years have so far backed his claims with hard data, showing that certain clusters of metabolites may be specific and reliable indicators of heart disease and impending diabetes at the individual level. In fact, their levels in the bloodstream may even predict which heart disease patients will soon have a heart attack.

Gizmos and numbers

Measuring metabolites is hard to do, scientifically speaking. They are tiny and exist in the bloodstream in very low concentrations—micromolar and nanomolar amounts. There are also lots of them—an estimated 6,500 discrete metabolites in humans. And when you're measuring anything in the blood, it's like trying to categorize multicolored sand. "Your blood is full of the coffee that you drank this morning, the cheeseburger you ate last night, the medicine you take," says Shah. "So trying to isolate these metabolites among all the other molecules in the blood is a little like being in Times Square and trying to pick out one person."

The techniques used to measure metabolites have taken years to develop. Newgard, who directs the Sarah W. Stedman Nutrition and Metabolism Center, came to

continued on page 26

Chris Newgard, PhD, and Svati Shah, MD

Duke in 2002, after 15 years of working with metabolic technology at University of Texas Southwestern in Dallas. Once at Duke he worked with David Millington, PhD, and Robert Stevens, PhD, both specialists in inborn errors of metabolism, and other key members of the Stedman Center team, including James Bain, PhD, Brett Wenner, PhD, Michael Muehlbauer, MD, PhD, and Olga Ilkayeva, PhD, to build what is today one of the world's most sophisticated metabolic labs. The Stedman laboratory collaborates with researchers from all over the world (including colleagues at Duke-NUS—see page 10), who know the group for providing a level of data specificity that is not available in most labs.

Metabolomics researchers use mass spectrometry to identify and measure a wide array of small-molecule metabolites. "A lot of labs will do a mass spec analysis and get a pattern that shows metabolite levels, then compare the patterns among a group of patients," Shah says. But the Stedman lab goes further, adding standards to provide a truly quantitative measure of a sample's components. So instead of patterns, what comes out of the Stedman lab are numbers—measurements of metabolites in their exact amounts. "The Stedman lab can tell you what's in your blood, and exactly how much of it there is," says Shah.

"Many metabolomics labs are built by either instrument jockeys or statisticians," says Newgard. "We take the perspective of the biochemist, the molecular biologist, and the physiologist. To me it's important to know what I'm measuring and in what concentrations. Our lab has been built so that we can say here's exactly what's in the sample—so that we can also eventually say this is the significance of it, and this is what it portends."

Small molecules, big predictions

The data generated by the Stedman lab are beginning to paint very clear profiles of certain high-risk metabolic biomarkers for both heart disease and diabetes. Part of the group's success involves a home-field advantage: Duke's CATHGEN biorepository, which holds health records and blood samples from nearly 10,000 patients who have come to Duke over the past eight years for heart catheterization. This wealth of samples allowed Newgard and Shah to develop a first-of-its-kind investigation, which showed that the levels of certain clusters of metabolites could predict imminent cardiovascular events, including heart attack and even death.

Through a series of studies, the team has shown that metabolic profiles are heritable—more heritable than other indicators of heart disease such as BMI, cholesterol, and C-reactive protein. They compared the profiles of 174 patients who were diagnosed with heart disease and went on to have a cardiac event in the next two years with 174 other heart disease patients who were as closely matched as possible in terms of physical and demographic history, but who had no events over a 10-year period. Among those groups, a specific metabolite cluster was elevated among patients who had heart events. Then they looked at a group of 2,000 patients who came to Duke for concerns about heart disease, and who have been followed every year regardless of diagnosis. "We did analysis on the full 2,000, and the exact same metabolites were present in people who had heart events," says Shah. "I was totally dumbfounded. I really didn't think it would validate."

"There was some element of gamble," says Newgard. "It was a sort of dream, that we would set this toolbox up and it would reveal metabolic patterns that hadn't been characterized and that were so telling. We couldn't know whether the methods would be precise enough, or whether we'd be swamped out by human variance—mood, behavior, all the things that go into being human, would those things make it impossible to see the chemistry of disease?"

But cardiologist William Kraus, MD, a co-investigator on these trials and a co-founder of CATHGEN, says that the experiments were hardly a shot in the dark. "We specifically selected clusters of metabolites that we know are involved in multiple pathways of lipid, protein, and glucose metabolism—pathways that are often disrupted in heart disease—and we found that they are indeed associated with heart disease and subsequent risk of cardiac events," Kraus says. "These metabolic profiles may be a long way from routine clinical use, but we feel they are a good first step in that direction."

Chris Newgard, PhD, and his colleagues at the Stedman Center are working to determine whether clusters of tiny molecules called metabolites can be used as effective early markers of heart disease and diabetes.

Making sense of signatures

Newgard and Laura Svetkey, MD, director of clinical research at the Stedman Center, had previously identified a different discrete cluster of metabolites, dominated by the branched-chain amino acids (BCAA), as a player in insulin resistance. "The data have shown very clearly that the higher the level of this factor, the higher the level of insulin resistance in the patient—even after adjusting for factors including weight," says Svetkey. When the team looked at whether insulin resistance improved with weight loss, she says, it showed that the higher the BCAA factor in a patient, the more that patient's insulin resistance improved with weight loss—again, even after adjusting for weight. Kraus says a forthcoming study shows that metabolites can help predict who will most benefit from exercise training, in terms of reducing insulin resistance.

The factors controlling levels of these metabolites in the body are downright mysterious: a recent study that Svetkey, Shah, and Newgard participated in showed that the levels of this cluster dropped significantly after gastric bypass surgery—more so than after weight loss induced by dietary intervention. "We don't know some very fundamental things that will help us interpret our results," Svetkey says. "For example, BCAA comes from meat, and we don't know how meat consumption or the duration of fasting before we do the blood tests will affect the metabolomics profiling results. We also still need to understand the extent to which this factor differs by age, sex, race, and so forth. Some of these questions can be addressed with the data we already have, and some will require new research."

And finding a reliable pattern isn't enough, says Newgard. "When we see those signatures, we want to understand what they do mechanistically. What does this mean at the level of the cells, at the level of the pathways, and can we do anything to change these patterns," he says. Newgard is continuing research in animal models to see how changing the diets of rats may affect their levels of BCAA metabolites—and also their clinical outcomes. Shah is working to identify the genetic makeup that may put people at risk for the metabolomic profiles that presage insulin resistance, type 2 diabetes, and cardiovascular disease.

"The ultimate utility of this kind of investigation remains to be seen," says Svetkey. An analogy, she says, is the genomics revolution: while genetic discoveries may have had significant and direct impact on several diseases, none have yet made a dent in any of the major public health problems of our day—hypertension, obesity, heart disease, diabetes. "Chris would argue, and I'd agree, that metabolomics approach is more likely than the other 'omics' to lead to clinical impact. Because while genes are static, metabolites are mutable—they can be altered by drugs, by behaviors. It's something we may be able to affect, to use to help our patients."

Articles for further reading:

Shah et al. Branching out for detection of type 2 diabetes, *Cell Metabolism*, 2011.

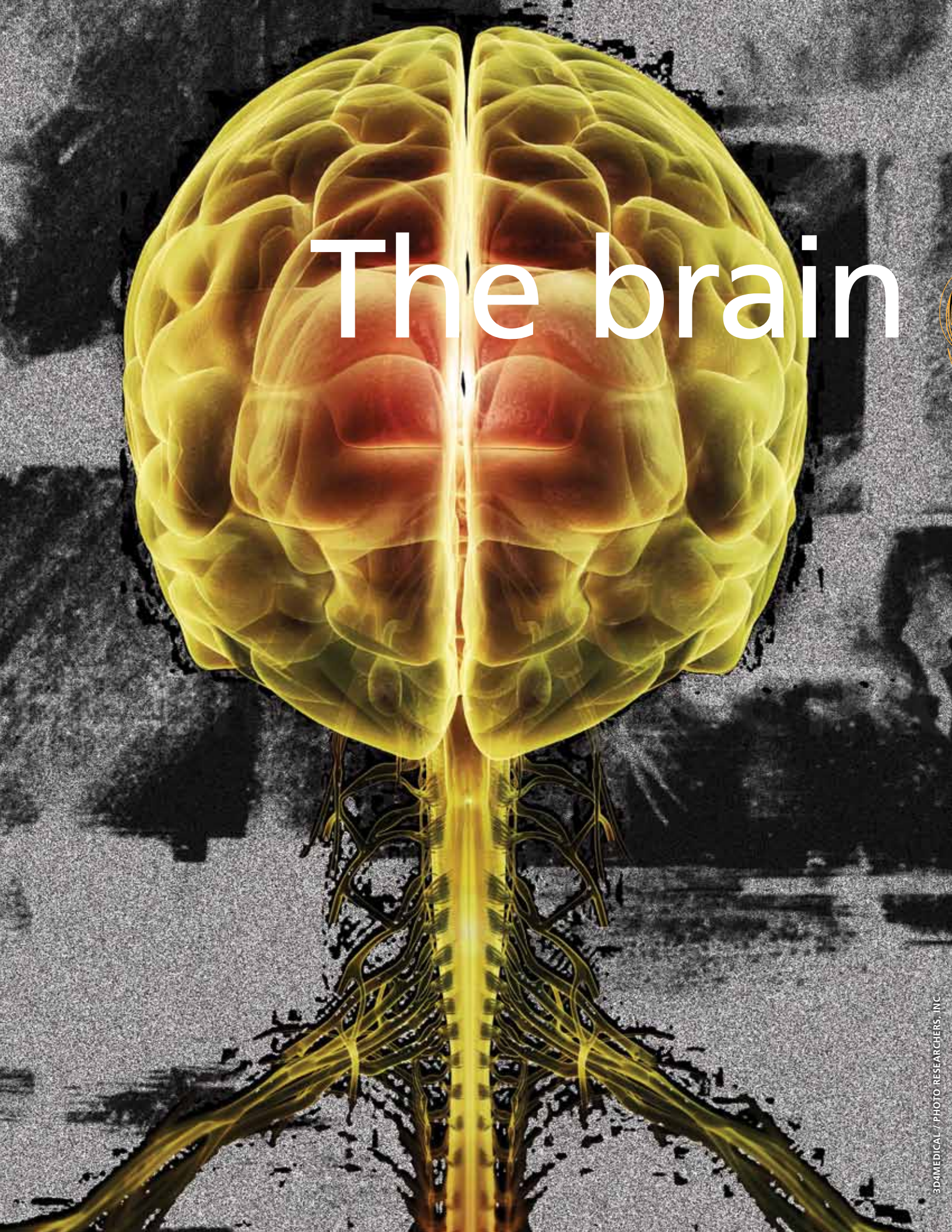
Laferrére et al. Differential metabolic impact of gastric bypass surgery versus dietary intervention in obese diabetic subjects despite identical weight loss, *Science Translational Medicine*, 2011.

Shah et al. Association of a peripheral blood metabolic profile with coronary artery disease and risk of subsequent cardiovascular events, *Circulation Cardiovascular Genetics*, 2010.

Huffman et al. Relationships between circulating metabolic intermediates and insulin action in overweight to obese, inactive men and women, *Diabetes Care*, 2009.

Newgard et al. A branched-chain amino acid-related metabolic signature that differentiates obese and lean humans and contributes to insulin resistance. *Cell Metabolism*, 2009.

The brain



3D4MEDICAL / PHOTO RESEARCHERS, INC

electric

Could electricity be the key to controlling the symptoms of some neurological diseases?

by KATHLEEN YOUNT *photography by* JARED LAZARUS

Rigid posture, tremor, postural instability, shuffling gait. These are the technical terms you might apply to the man with advancing Parkinson's disease as he struggles to descend the stairs outside his front door and staggers down his driveway, shoulders hunched, balancing himself precariously between his cane and the car door as he makes his way toward the mailbox at the end of the drive.

The same man on the same day, with his brain stimulator turned on, can walk down the stairs while putting on his jacket, step easily into his car, and drive to the post office. If you saw him on the street, you wouldn't know he was sick at all.

"It's a striking outcome, but it's by no means unusual," says Duke biomedical engineer and neuroprosthetics expert Warren Grill, PhD. Brain stimulators, which are devices that deliver steady electrical currents to certain structures in the brain, have been implanted in more than 80,000 patients worldwide. Most commonly used to suppress the symptoms of severe tremor and some cases of Parkinson's disease, brain stimulation was also recently approved by the FDA for use in medication-resistant obsessive-compulsive disorder. It's being explored for treatments of other brain-born illnesses as well, such as epilepsy and depression.

Brain stimulation offers an alternative to medical therapies, which work mostly to block or boost the release and uptake of chemicals that affect neural function. But the brain is an electrical organ as well as a chemical one, and the field of brain stimulation seeks to explore and expand the use of electrical current as a tool for treating disease. It may even improve the understanding of how the brain does what it does, so that we may better fix it when something goes awry.

THE PERKS

In deep-brain stimulation (DBS), electrodes are implanted into carefully chosen places in the brain—for Parkinson's disease the subthalamic nucleus, an almond-sized structure in the middle of the head, is the usual place—and a battery-operated pulse generator, implanted just below the clavicle, delivers a steady electric current of about 130 pulses per second through the electrodes. When the physician finds the right spot and the right frequency, the symptoms go away.

"Unlike with ablation, you're not killing any tissue when you use DBS—so you can undo it at any time—and you can modulate the frequency of the current," says Duke neurologist Mark Stacy, MD, who along with fellow Duke neurologists Burton Scott, MD, PhD, and Julia Johnson, MD, refers eight to 10 patients a month for the surgical procedure. The impact on patients' quality of life can be astounding, especially after medical therapies have failed. "In the people whom you know are going to do well, it's exciting to know they're going to have their lives changed," says Stacy.

If the brain were a battery, and you could tap all the electricity the neurons are generating, you'd have just enough power to turn on a flashlight.

Biomedical engineer Warren Grill is investigating ways to improve DBS technology—to help decrease side effects, prolong the (expensive) battery life, and perhaps even to create a device that, like a pacemaker for the heart, can sense the brain's abnormal signals and send electrical current as needed to suppress them. But the process of learning to measure these signals is complex, especially in patients with implanted DBS devices. As Grill says, trying to interpret the brain's signals against the 200-pulse-per-second backdrop of a DBS device is like trying to hear a piccolo playing at an Iron Maiden concert.

Some patients with essential tremor or dystonia don't get any relief from medication, so for those patients DBS is a real lifeline. In Parkinson's patients who do respond well to their medication, DBS can be an excellent extender of treatment, especially after these patients see the inevitable drop in the effectiveness of the drugs. For them, DBS is a way to turn back time; Stacy says it takes the clock back about five years in terms of motor-control symptoms. DBS does not replace medication in Parkinson's patients—it works synergistically with their medication to provide more functional hours in the day. "As your medicine works, your symptoms ebb and flow," explains Stacy. "Levodopa [the most commonly prescribed drug for Parkinson's patients] has a four-hour time of benefit, and it's very difficult to be on such a tight dosing schedule." And since any variability leads to mobility problems, it's almost impossible to prevent this ebb-and-flow effect. DBS allows these patients to stay better longer, with far fewer interruptions in motor function.

Other patients may begin having significant side effects from medication over time. Stacy was the first person to identify a particularly troubling side effect of the class of drugs—dopamine agonists—that are used in Parkinson's patients: impulse control disorders such as compulsive gambling or other high-risk compulsive behaviors. In about 15 percent of patients, the dopamine effect leads to behavioral problems that are significant enough to make staying on the drugs a practical impossibility. For these patients, DBS is also an ideal option, says Stacy. "The effect of DBS treatment on tremor is the most dramatic, but treatment of Parkinson's may be the most rewarding, because these people have real mobility problems, and with treatment their mobility problems improve."

MECHANISMS UNKNOWN

According to Grill, DBS is "the closest thing I've seen in my life to a miracle." But, in typical miracle fashion, it has yet to be explained—no one knows why stimulation of the brain causes these dramatic changes to occur, and there's still much disagreement about what's going on.

The debilitating spasticity and rigidity of bodies that suffer from brain disorders such as Parkinson's disease, essential tremor, and dystonia come from highly organized neural firing patterns that interrupt the brain's ability to generate normal movement in the body. In Parkinson's disease, for reasons still unknown, cells in the basal ganglia that produce dopamine begin to die; as levels of dopamine drop, neurons start to fire in synchronous bursts, "like a *popopopop*," says Grill. "In a normal brain, there are very few of these kinds of firing patterns." DBS somehow disrupts the pathologic *popopopop*.

"We've done a good job of eliminating some hypotheses about how DBS works," says Grill, such as the early thinking that the neurons were being blocked by the artificial electrical current. Grill theorizes that the stimulated neurons are firing in lockstep with the DBS stimulation, which prevents those neurons from transmitting

PEOPLE WHO CHOOSE DBS TOLERATE IT VERY WELL, BECAUSE DBS IS IMPERCEPTIBLE TO THE PATIENT AFTER IMPLANTATION. BUT NEUROSURGEON DENNIS TURNER EMPHASIZES THAT DBS IS NOT A CURATIVE PROCEDURE.

During a DBS (deep brain stimulation) surgery at Duke University Hospital, performed by neurosurgeon Dennis Turner, physician assistant Lynne Gasperson tests the device to see if the electrical current is improving mobility in Parkinson's disease patient George Gotwalt.

Not-so-deep brain stimulation

When Sarah Hollingsworth Lisanby, MD, joined Duke as the new chair of psychiatry last October, she brought with her a prodigious lab that has been instrumental in developing new devices for psychiatric disorders. Among them is a form of brain stimulation called transcranial magnetic stimulation (TMS), which, thanks to a study led by Lisanby, earned FDA approval in 2009 as a treatment for depression in patients who have failed medical therapy.

"TMS has been around since 1985 as a neuroscience tool," says Lisanby, and recent advances in bioengineering have allowed TMS to transition from a basic tool of discovery to a therapeutic application. It works on the principle of electromagnetic induction, through which magnetic fields induce electrical fields. "Powerful magnets that are turned on and off very rapidly will induce a small electrical eddy current in a conducting medium," Lisanby says—and the fluid-filled brain is the perfect medium.

There's a network of brain areas that are underactive in depressed patients, says Lisanby. "It's not as crisply defined as the neural loop in motor disorders," she says, noting the wide array of life experiences and biological pathways that feed into each individual case of depression. "But functional imaging shows us that this same network of brain areas comes up again and again in depression patients. If we can go in and change the function of these areas, perhaps we can affect depression like DBS does for motor disorders."

Sarah Hollingsworth Lisanby, MD (right), demonstrates transcranial magnetic stimulation with colleague Rosa Jou-Zhang.

Shaped like a paddle and held on the head, the magnetic coils of the TMS device send a magnetic field through the skull that stimulates an area of the brain beneath the left side of the forehead known as the left dorsolateral prefrontal cortex. Making that area more active can reduce symptoms of depression in some patients—in the clinical trial led by Lisanby, patients who received TMS had greater declines in symptoms (as measured by Montgomery-Åsberg Depression Rating Scale, Clinical Global Impression Severity of Illness Scale, and Inventory of Depressive Symptoms–Self-Report scores) than patients who did not.

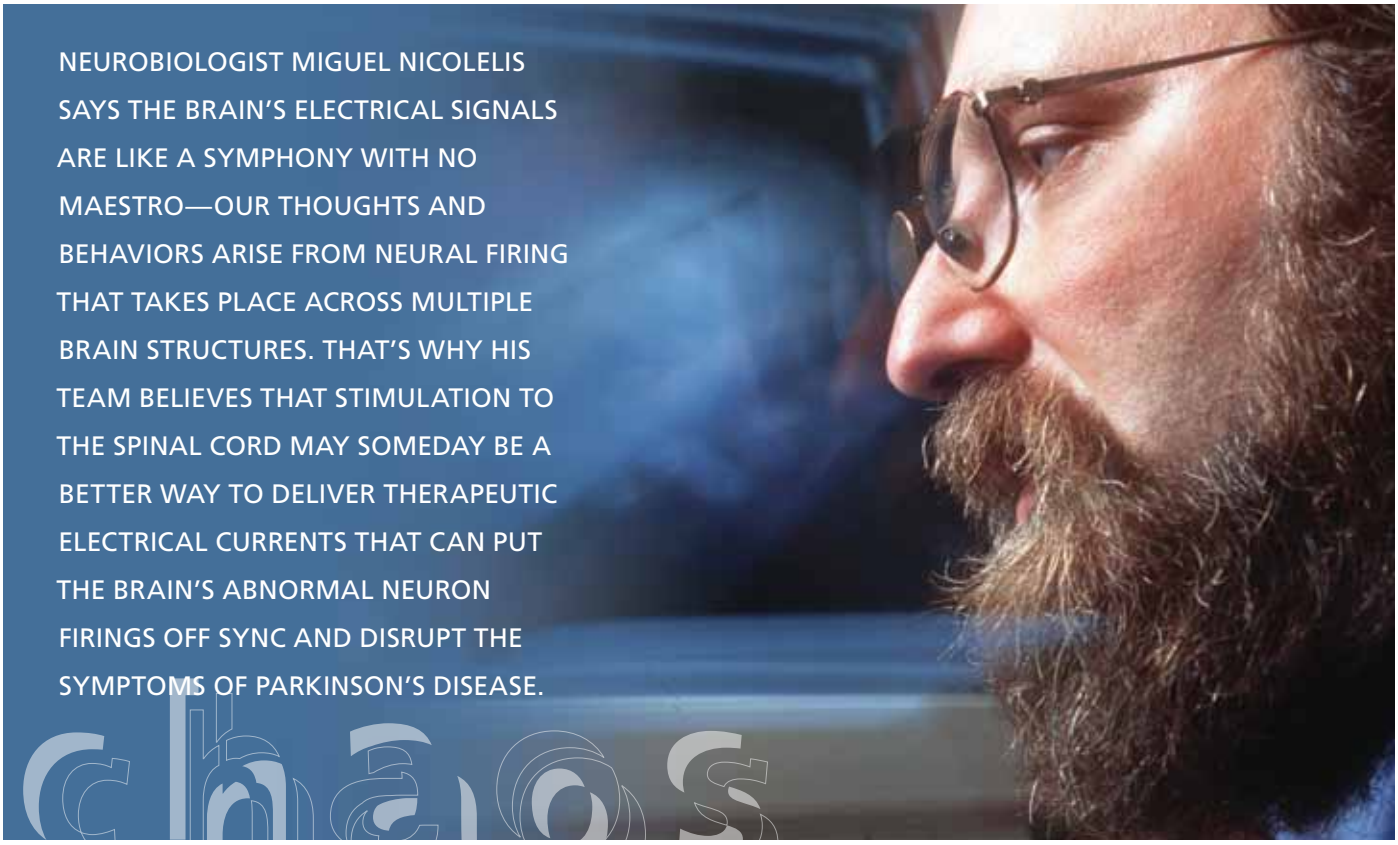
The effects of TMS are moderate, and about the same order of magnitude as that seen with antidepressant medications, though less significant than those of electroconvulsive therapy [ECT]—which uses much stronger electrical current to induce a brain-wide seizure in order to alleviate depressive symptoms. Also unlike ECT, TMS is completely noninvasive; during the hour-long treatment, the patient sits in a reclining chair and does not need anesthesia. It hasn't been found to affect memory or cognition, and the side effects—such as scalp discomfort or headache—are generally mild.

Typically, patients go for one-hour sessions daily for a series of weeks, and then follow up with medication or continued, less-frequent TMS. The effects of the treatment also last for several months, and Lisanby says the repeated doses may help make the brain more amenable to future treatment. "When a person does anything repeatedly, like practicing the piano or trying to memorize a sequence of behaviors, the person is repeatedly using a particular circuit," she explains. "This is the concept of neuroplasticity: repeatedly using a circuit makes it easier to engage that circuit in the future."

Lisanby considers TMS a solid step toward developing new and newly effective angles for treatment of depression. "Refractory depression is a very serious illness, and we need more technologies for these kinds of disorders," she says. "TMS is radically different from current treatments for depression, and we want physicians to know that TMS is out there as an option for patients who are suffering from depression and for whom other treatments were intolerable or ineffective."

Lisanby and her team are also studying ways to make magnetic stimulation more effective through the induction of focal seizures. This technique, called magnetic seizure therapy (MST), was developed by Lisanby's team and promises to retain the efficacy of ECT, the most effective treatment for depression, but without the undesirable side effect of memory loss. Clinical trials on MST are under way now at Duke and other universities in the United States, Europe, and Australia.

Duke offers a weekend CME training on TMS that includes didactics and hands-on training. For more information, contact Rosa Jou-Zhang at rosa.jouzhang@duke.edu or go to ***cmetracker.net/DUKE/Courses.html****. To refer a patient for TMS, or for a research study involving brain stimulation, contact Lis Bernhardt at lis.bern@duke.edu or call* ***888-ASK-DUKE****.*



Miguel Nicolelis, MD, PhD

any information. That's because neural communication is like vocal communication in this way, says Grill—it's not just the sound of your voice but the modulation of that sound that creates meaning, which is why we talk and sing instead of just drone to one another. Grill says the same concept is at work in neural communication, and DBS locks an otherwise misfiring neuron into a sort of neural monotone, shutting down the pathological *popopopop*.

Grill wants to understand how DBS works because he wants to improve it. For example, like any treatment, DBS has a "dose"—an optimal frequency, somewhere between 100 to 200 pulses per second, to control the patient's symptoms with minimized side effects—and the physician has to program the output. But for DBS, the number of potential doses is enormous. There are 30,000 possible parameters, Grill says, and which dose will work best for which patient is hard to know.

While the side effects of DBS are generally preferable to those of medications, and certainly preferable to the symptoms themselves, they are not negligible. "Some side effects are overt: unwanted movements, especially in the eyes; disruptions in speech; problems talking, swallowing, or walking," says Grill. "Also there are more subtle, less understood cognitive side effects, such as decline of verbal memory and changes in mood."

The side effects are exacerbated at higher frequencies—as is battery consumption. Most DBS patients have to have their batteries replaced every four years or so; and when a battery costs $25,000 and requires a surgery to replace, prolonging its life is especially valuable. "If we could figure out how achieve symptom control at 50 pulses per second instead of 130, we could reduce both battery consumption and side effects," Grill says.

His team is developing computer models of new lower-frequency firing patterns. After testing them in rat models Grill works with Duke neurosurgeon Dennis Turner, MD, to take those experimental models into humans as quickly as possible, through a unique testing protocol in patients who have to come in for their battery change. During the window in which these patients are "unplugged" from their current device, Grill can test his models. This has been done in about 60 patients so far, and the group is also working with Emory and Wake Forest universities to add to the patient pool. "It's been a really productive approach to getting our discoveries into humans quickly," Grill says.

NOISE IN THE SYSTEM

Duke neurobiologist Miguel Nicolelis, MD, PhD, offers a different explanation for how brain stimulation works: he believes that electrical stimulation disrupts the misfiring neurons' synchronous pattern, to get those cells off phase and restore the chaos that the brain needs in order to initiate movement. "The pathological signal in Parkinson's is very organized," he says. "It's like hearing a pure tone." If their rhythm were drawn on a computer screen, the misfiring neurons would pile up on top of each other, making one big

Dennis Turner, MD

sine wave. And though a sinus rhythm might look good on a heart monitor, the brain needs less organization in its neurons in order to organize movement in the body. "The brain likes chaos," he says. "So we're inserting noise to disorganize the brain, because that's how the brain gets things done."

More important, Nicolelis believes that instead of targeting the brain itself, electrical stimulation may be more effective if it's delivered to the spinal cord. Spinal cord stimulation, in which the electrical current is delivered to the top of the spinal cord, has been used since the 1960s for treatment of pain—in fact, deep brain stimulation as a technology was originally developed for pain patients who didn't respond to spinal cord stimulation. Nicolelis's team has conducted successful studies of spinal cord stimulation in mice with depleted dopamine and Parkinson's symptoms, which showed that the technique disrupted those symptoms. The team is currently finishing studies of the technique in primates; based on preliminary results from those trials, Nicolelis expects to start human trials of his spinal cord stimulation protocol as early as 2012.

The concept for the spinal-cord stimulation device came from "a moment of sudden insight," Nicolelis explained when the results of the rodent study were published in *Science* in 2009. While analyzing the brain activity of mice with symptoms of Parkinson's disease, Nicolelis was reminded of some research he'd done in the epilepsy field a decade earlier. The rhythmic brain activity he saw in these animals resembles the mild, continuous, low-frequency seizures that characterize some types of epilepsy in humans.

One way to disrupt the seizure activity in some epilepsy patients is to stimulate the peripheral nerves, which conduct communication between the spinal cord and the limbs, so Nicolelis applied the same concept to Parkinson's. "In our studies, we found that the synchronous firing of neurons occurs in different locations throughout the brain," Nicolelis says. He calls the brain's normal electrical signals a symphony with no maestro—our thoughts and behaviors arise from neural firing that takes place across multiple brain structures. "While the motor cortex is probably where most of it is happening, the spinal cord has access to all structures in the brain," making it the best location for stopping any bad signaling from the brain. "Also, accessing the spinal cord is much less invasive, it's easier to do, and it requires less battery power." All this means it's also much more affordable; Nicolelis says it would be so cheap that DBS for movement disorders might become obsolete.

A FUTURE UNKNOWN

Turner agrees that, although DBS is an esoteric surgery, its main problem is not its invasiveness, but its cost. Except for the United States, France, and Germany—countries where it's covered by insurance—it is a self-pay or charity-pay procedure, with the bill being around $120,000 (plus a cool $25,000 every four years for battery replacement). "It's a real question, then," he says. "Is it a lasting therapy if it's something that most people in the world, even in developed nations, cannot afford?"

Mark Stacy was the first researcher to document that some Parkinson's patients who are taking dopamine agonists develop impulse control disorders such as compulsive gambling, which can make it impossible to stay on their medications. For patients like these, DBS may be their best option for maintaining motor function.

IS DBS AN OPTION FOR YOUR PATIENT?

Duke neurologist Mark Stacy, MD, says DBS can make a big difference in patients with advanced tremor or idiopathic Parkinson's disease (PD), but it's important to identify the right patients for the procedure. Physicians might consider referring their patients who meet the following criteria:

- **Tremor patients:** poor response to medical therapy
- **PD patients:** Levodopa responsive, with good "on" period function
- **Troublesome symptoms,** despite optimized pharmacotherapy:
  - Troublesome bradykinesia, rigidity, tremor, or gait in off periods
  - Unpredictable on-off phenomena
  - Motor fluctuations
  - Bothersome dyskinesia
- **No dementia** or significant untreated depression
- **Realistic expectations** of what the treatment can—and cannot—do

*To refer a tremor or PD patient for a DBS evaluation, call **919-668-2493**.*

Even in the United States, where DBS is covered by insurance, about three-fourths of Parkinson's and tremor patients who are good candidates don't want it. Because, well, it's brain surgery. Turner's proficiency at this procedure keeps his patients' complication rates very low, but as he says, "they're not zero. And we try hard not to minimize these risks, so that people have an honest view of what they're getting into." Most neurologists are reluctant to recommend brain surgery, says Turner, citing epilepsy as a good parallel example—for an epilepsy patient, their disease is not degenerative like Parkinson's, so effective symptom control could be almost like a cure. "There have been several NIH consensus conferences where everybody agrees that after about two years, if the epilepsy patient isn't responding to medication, they should be referred for surgical treatment. But the actual time to referral for surgery averages at 17 years. Elective surgery for things that are chronic is not easy for most people, even physicians, to swallow."

People who do choose DBS tolerate it very well, Turner says, because DBS is imperceptible to the patient after implantation. But Grill, Turner, and Stacy all emphasize that DBS is not a curative procedure. The specific symptom control that the device offers is durable, says Turner—for patients with degenerative diseases such as Parkinson's, motor-control symptoms don't get worse—but other symptoms (dementia, balance problems) will progress, because the brain is continuing to die around the device.

"DBS works very well," says Turner. "It's very successful, but everybody would really rather treat the disease than the symptom. Most of the efforts to treat Parkinson's still focus on approaches such as cell therapy or gene therapy." According to Turner, the closest idea to a cure is gene therapy—he and Stacy are among several teams working on clinical trials of gene therapies that can produce a lifelong improvement in the neurons that are degenerating in Parkinson's diseases. "These are the most promising approaches right now—meaning we could have possible FDA approval within less than five years," he says. "That would ultimately be much more satisfying, to find a single treatment that's lasting."

Nicolelis suggests that in the future, the use of electrical current could be a similarly lasting therapeutic tool. "We want to pursue the idea that by disrupting this pathological signal you could somehow disrupt the degenerative process. Think of it as a feedback loop—cells die, which causes more cells to die. By altering this pathological pattern we might allow some cells to survive, or to even slow down the process as a whole. We don't have proof of this yet, but that's a theory we want to explore."

According to Nicolelis, all neurological disorders—and psychiatric disorders—can be treated as diseases of timing. "It's the timing of neuronal firing that's key. The only difference among all these diseases is where and how this timing acts on the brain. So correcting the misfiring of neurons might be the most essential treatment in any neurological disorder—and it might be that electricity is the key."

by DEBBE GEIGER
photography by JARED LAZARUS

Rethinking primary care

FACED WITH RISING COSTS, RAMPANT CHRONIC ILLNESS, AND GOVERNMENT REFORMS, DUKE MEDICINE IS MAKING RADICAL CHANGES ON THE FRONT LINES OF HEALTH CARE

LAST YEAR, HIGH BLOOD PRESSURE, OBESITY, AND UNCONTROLLED DIABETES were slowly killing 46-year-old Phil Smith.* He wasn't using his insulin properly and couldn't seem to stick to an exercise regimen or a healthy diet.

There's nothing unusual about this story so far. In fact, now that a quarter of the US population suffers from chronic illnesses like heart disease, diabetes, or asthma, most providers see some version of it play out every day. Unfortunately, caregivers too often come in only at the end of the story—when patients show up at the doors of the clinic or emergency room with advanced disease or life-threatening complications that are both damaging to their health and extremely expensive to wrestle back under control.

In Smith's case, though, there's a plot twist. Drew O'Donnell, MD, Smith's physician at Family Medical Associates of Durham, invited him to take part in a pilot program for patients with uncontrolled diabetes. Rather than being left to manage his condition alone in between check-ups, Smith was assigned a personal care manager—Margarette Wrenn, RN. Wrenn showed Smith how to keep a blood sugar diary, and now reminds him to bring it in before his scheduled doctor's appointments. She calls Smith two weeks after each appointment to make sure he's following his doctor's advice. If he's having trouble doing so, Smith gets help from Wrenn in accessing nutrition, exercise, and behavioral counseling services and providers.

Within four months of joining the program Smith lost 25 pounds, but his blood sugar remained uncontrolled. Wrenn dug a little deeper, and discovered Smith wasn't able to keep good tabs on his blood sugar because he couldn't afford glucometer test strips.

"A lot of our patients don't realize the seriousness of diabetes complications or what resources are available to them," says Wrenn, who was able to help Smith get the supplies he needed. "They tell me things they don't mention to their doctor. It gives them another chance to ask questions."

This pilot program represents a whole new approach to diabetes management in the primary care setting—and a growing effort by Duke Primary Care to take a more active role in managing patients' health. It's a big change from the time when doctors simply waited for patients to come to the office, treating problems as they arose, says Scott Joy, MD, medical director of Duke Primary Care Pickett Road. "Now we work as a team to provide care that's integrated and proactive. We're setting up safety nets to catch our patients so they don't fall through the cracks."

By making preventive care more accessible and more effective, these tactics aim to help patients avoid more costly health problems down the line. They're also drawing a road map for navigating the uncharted territory of health care reform.

"We're entering a time that presents many opportunities and challenges," says William J. Fulkerson Jr., MD, executive vice president of Duke University Health System (DUHS). "We're trying to anticipate what we need to look like in five years and what we need to change in order to be successful as we move forward. Our primary care providers, perhaps more than any others, are best prepared to help us define the best care delivery models for the years ahead."

*Patient name changed.

downtown Hillsborough, NC

"In a prior era, we would have said, 'Let's wait and see what the lab work shows.' Now, the lab work can often be done before I see my patient. . . . It gives us time to talk about how they can modify their lifestyle in a way we couldn't do before." —JANE SATTER, MD, *Hillsborough Family Practice*

Predicting the future

Redesigning health care has been talked about for some time, but it's taken on a new, pragmatic sense of urgency following passage of the Affordable Care Act last year. Since most of the health care reform provisions in that act have yet to be implemented, no one can say with certainty what care models will eventually emerge to meet health care reform's goals of greater access and efficiency. Nevertheless, everyone agrees that redesigning care is a necessity. Not only are health care costs spiraling, sweeping changes in reimbursement are about to collide with an increased demand for services as 32 million currently uninsured patients are set to gain coverage under health care reform.

"A lot of indicators point to a future in which reimbursement mechanisms will shift the financial risk of caring for patients away from employers and insurers and toward providers," says Fulkerson. Broad cuts in Medicare and Medicaid reimbursement are forecast too. "We anticipate providers will eventually be financially rewarded for delivering high-quality, low-cost care, and penalized when they don't."

The stage is set for a fundamental shift away from the current fee-for-service model, which pays doctors for episodes of care, diagnostic tests ordered, and procedures performed regardless of outcomes. But how and when that transformation will occur remains unclear. A more value-driven financial model, which emphasizes quality and encourages hospitals, doctors, and other providers to work together to deliver patient care more efficiently, is the subject of much discussion in medical journals as well as in leading newspapers.

Realizing that model is the ultimate goal behind DUHS's "top to bottom commitment and effort to redesign care," says Michael Cuffe, MD, DUHS vice president for medical affairs.

"Our mandate is to increase access to high-quality care while controlling costs," he says. "To do that, we need to prevent unnecessary emergency room visits, hospitalizations, and readmissions. We need to improve transitions of care between primary care, specialists, and the hospital. We need to equip ourselves

downtown Durham, NC

"I didn't come to Duke with the intention of studying primary care, but I feel that longitudinal patient care aligns more with my ideal of medicine, and also with the way I hope to practice medicine—with an eye toward the patient's whole life, not just this visit, this week in the hospital." —CHRISTOPHER DANFORD, *Duke Primary Care Leadership Track*

to better manage different populations of patients with chronic disease. Ultimately, we need to create a more patient-centered experience."

Home, sweet medical home

That's a tall order given that health care has traditionally been fragmented among independent primary and specialty care offices and hospitals—with the traditional fee-for-service payment structure providing little financial incentive to coordinate care services among them.

One of the most promising models to emerge is what's been dubbed the "patient-centered medical home." Sometimes described as primary care on steroids, medical homes create well-oiled teams of physicians, advanced-practice providers, nurses, social workers, and other caregivers who work together to manage all of a patient's needed care services, both within the practice and beyond its walls.

Endorsed in recent years by organizations from the American Medical Association to the National Committee for Quality Assurance (NCQA), the medical home model has its roots in pediatrics, where practices often coordinate care for children from birth though adulthood.

"We've always organized our patients' medical care as well as their psychosocial care," says Elaine Matheson, a pediatric nurse practitioner at Durham Pediatrics. "Medical homes also involve creating real partnerships between providers and patients, which has been a defining feature of pediatrics—we involve the whole family in the decision-making process."

An early pioneer in the medical homes movement, Duke began in the 1990s to move the concept into the adult-care arena. "We recognized the need for a fundamental shift in the way we provided care that focused on comprehensive treatment for our patients, not just their acute situation," says Lloyd Michener, MD, chair of the Department of Community and Family Medicine.

Realizing that the medical-homes model would need to be backed by supportive reimbursement policies, the department worked with the State of North Carolina in 1997 to pilot one of the first networks that pays care teams to coordinate health services for Medicaid patients—$2 to $3 per enrollee per month. Today, there are 14 networks statewide, known as Community Care of North Carolina (CCNC); estimates indicate

Primary Care 101

The field is changing fast—and so is caregiver training.

As one of the first medical students to participate in Duke's Primary Care Leadership Track pilot program, Chris Danford is gaining a new perspective on how medicine is practiced.

While his peers spend most of their second year rotating through the hospital, Danford, 28, follows a set panel of patients from the hospital into the outpatient arena. "I hear the team's thought process while the patients are hospitalized, as well as the goals they set for long-term care," says Danford. "After discharge, I see how much actually happens. I'm surprised at how disjointed the transition can be."

Showing students how the health care delivery system works through patients' eyes is the intent of the newly launched Primary Care Leadership Track (PCLT). The four-year curriculum will require coursework and on-the-ground experiences in epidemiology and leadership training, community engagement, and the patient-centered medical home. Students work as part of caregiver teams involved in Durham community projects such as LATCH, which serves people without insurance, and Project Access, which helps low-income patients obtain costly specialty care.

"These experiences will help our students think outside of the traditional clinical settings," says Barbara Sheline, MD, MPH, assistant dean for primary care. "By working in the community, understanding it, and researching it, they will come to appreciate some of the current problems in the health care system and, ideally, find ways to improve it."

PCLT—which offers students a $10,000-per-year scholarship in exchange for committing to a career in primary care—reflects a push by medical, nursing, and physician assistant schools nationwide to attract, nurture, and train primary care professionals—a critical goal, given national forecasts for provider shortages across the spectrum of primary care.

Duke Medicine has been helping to lead the charge. Last year, leaders from Duke and the University of North Carolina joined with other national health-care experts to call for dramatic changes in the way primary care is valued, delivered, and integrated into health care systems. Their report, sponsored and funded by the Josiah Macy Jr. Foundation, stressed the need to improve educational models and advance science, teaching, practice, and policy development related to primary care as a foundation for expanding the ranks of primary care professionals.

> "We want to help our students think outside of the traditional clinical settings. By working in the community, understanding it, and researching it, they will come to appreciate some of the current problems in the health care system and, ideally, find ways to improve it."
>
> BARBARA SHELINE, MD

The PCLT is one of the only such programs in the country to combine opportunities for community service with a strong emphasis on community-engaged research. It complements a revamped training program for Duke family medicine residents, which was reorganized in 2007 to emphasize community-based medicine and innovative models of care such as medical homes.

"Even before health care reform came into play, we knew some real changes needed to occur in how we care for patients and train future physicians in these new models of care," explains Dev Sangvai, MD, chief of Duke's Division of Family Medicine. "We needed to enhance the way residents approach patient care, and get them thinking about health care across the continuum of needs rather than from an episodic perspective. Providers also should be thinking about their patients from a population health perspective. These approaches to patient care are generally not taught in the traditional residency model, but they are in our program."

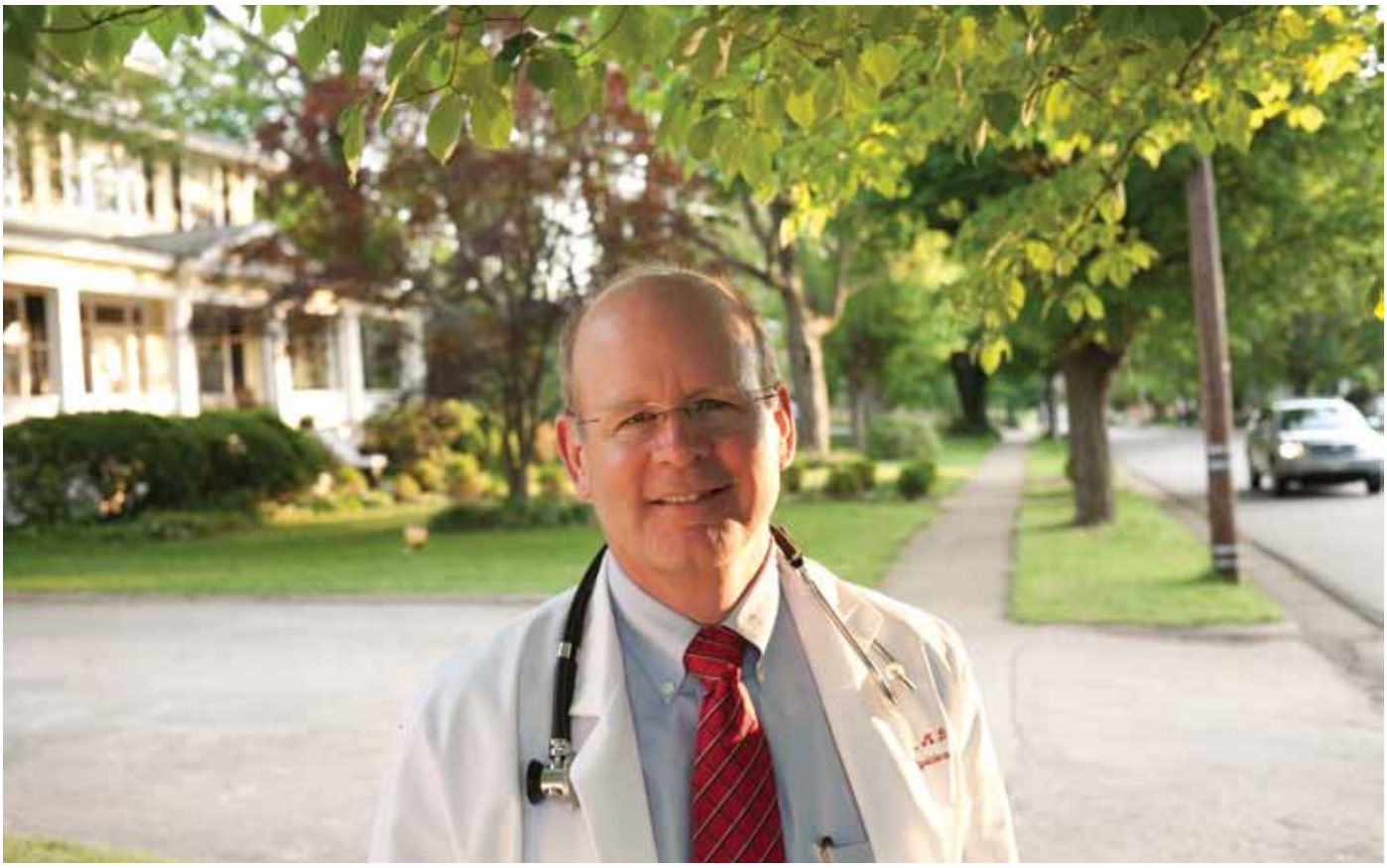
Duke's highly ranked School of Nursing and physician assistant (PA) program are also making changes with an eye toward future needs in primary care. Last fall, the nursing school received a nearly $1.3-million federal grant to help alleviate caregiver shortages by increasing enrollment and accelerating graduation rates of students in its adult primary care nurse practitioner and family nurse practitioner programs. Similarly, Duke's PA program won federal support this year to develop an extended primary-care rotation track that will expand the number of PAs practicing in rural, underserved areas in North Carolina.

And to better prepare students for the new world of primary care, in which health professionals work as teams to coordinate patient care, Duke's medical, nursing, PA, and physical therapy programs now offer regular team-based training sessions that bring students of various disciplines together for joint learning and problem-solving—unmatched preparation for the future of clinical practice.

"It's increasingly apparent that primary care will be the epicenter of medicine in the future," says John Anderson, MD, chief medical officer of Duke Primary Care. "It's being redefined as the career where all the action is happening."

Read more about the new Primary Care Leadership Track in the Summer 2011 issue of DukeMed Alumni News*, available at medalum.mc.duke.edu.*

Oxford, NC



"We want to create continuous, long-term, healing relationships between patients and providers, rather than episodic ones." —JOHN ANDERSON, MD, *Oxford Family Physicians*

the program has saved the state more than $1.2 billion to date.

For demonstrating that coordinated care can improve the health of communities while reducing overall health care costs, CCNC is looked to as a national model for care redesign—as are other medical-homes-based models initiated at Duke. In 2009, the Marshall I. Pickens Clinic, part of Duke's Division of Family Medicine, became one of the first practices in the Southeast to be officially recognized as a patient-centered medical home by the NCQA. Today, Duke Primary Care is adopting the medical home model throughout its 24-practice network, and official NCQA certification is expected soon.

Ultimately, says Duke Primary Care's chief medical officer John Anderson, MD, "We want to create continuous, long-term, healing relationships between patients and providers, rather than episodic ones."

Primary care 2.0

Transforming a primary care practice into a medical home takes some rejiggering of systems and processes, of course. Patients need ready access to their care team, and the care team has to communicate and coordinate vast amounts of information not only to their patients, but among the team and with external care providers.

In the Duke Primary Care (DPC) network, for example, moving toward a more patient-centered model of care has entailed major changes to make it easier for patients to get appointments when they need them. DPC practices were the first in Duke's health system to switch to so-called "open access scheduling" to offer patients same-day appointments, the first to extend hours to provide more urgent care and after-hours access, and the first to allow patients to book appointments online, using Duke's Web-based patient portal (HealthView.dukehealth.org).

These changes have increased practice efficiency as well as patient and staff satisfaction, says Anderson. "By leaving substantial blocks of the primary care provider's schedule open, we're able to respond to patient needs when they arise—and typically we can assign those patients to their usual provider, which improves continuity of care and enables us to take care of things like preventive screenings the patient may be due for at the same time."

downtown Durham, NC

"The relationship with the patient is very important, because if you don't connect with them, they may not come back. Many patients come to us with the mentality that we're just here to push pills, but they're learning that we're giving them the tools to be more responsible. They're coming back to us for follow-up care, and not just when they run out of pills—they consider us their medical home." —SHEKITTA ACKER, PA, *Holton Wellness Center*

Information technology is also critical to the job of coordinating patients' care across a complex array of providers and locations, says Anderson. Next year, Duke Primary Care will be the first group to assist in a multi-year rollout of an approximately $50-million transformation of the Duke ambulatory electronic medical records system. The Health System has also initiated an evaluation of an inpatient electronic medical record system that will standardize inpatient systems and also provide a seamless flow of information between inpatient and outpatient records.

Already, DPC providers are employing IT tools to improve their ability to manage care for some patient populations. For example, DPC has launched an electronic diabetes registry to better track care for those patients. The registry supports efforts such as the diabetes management program at Family Medical Associates by enabling the entire care team to input and view each patient's interventions and test results. Early data gleaned from the registry are also proving the success of the pilot program—according to O'Donnell, more than half of enrolled patients saw improvements in their hemoglobin A1C levels, a measure of blood sugar. "That's almost certainly due in part to our improved ability to track their progress and adjust care as needed," he says.

Care teams are also using electronic registries to streamline patient visits. Nurses can update a patient's medication list, perform a rapid-result A1C test, and enter the new information into the patient record before the doctor even enters the exam room.

"We have so much more information at our fingertips now," says Jane Satter, MD, practice medical director at Hillsborough Family Practice. "In a prior era, we would have said, 'Let's wait and see what the lab work shows.' Now, the lab work can often be done before I see my patient. I can pull up the results right then and adjust her medication on the spot."

Satter says these and similar exam-related efficiencies can enhance the quality of the time she spends with her patients. "It gives us time to talk about how they can modify their lifestyle in a way we couldn't do before."

Living laboratories

Since 1996, Duke Primary Care practices have participated in more than 70 clinical studies involving more than 6,000 patients—generating evidence that improves primary care nationwide.

When the American Heart Association released new guidelines for preventing cardiovascular disease in women earlier this year, it relied, in part, on research conducted at Duke Primary Care practices.

Those studies, which investigated ways to control high blood pressure and promote physical activity and lifestyle changes, are part of a vibrant culture of clinical research within Duke's primary care clinics.

Although patients may think of their primary care office as a place to get checkups and flu shots rather than a hotbed of cutting-edge research, primary care is actually a critical hub in the process of translating advances in medicine into "real world" practice, says Rowena Dolor, MD, director of Duke's Primary Care Research Consortium.

"To really find out how a drug works, or if a preventive care intervention is effective, you have to test it in a busy clinical practice where the care is delivered on a daily basis," she explains.

It is more difficult for that to take place within the walls of an academic medical center like Duke because of the highly selective population it's designed to serve. "Less than 5 percent of community care is delivered at the hospital," Dolor says. "Ninety percent is done in the outpatient setting by community physicians."

DPC clinics, such as Duke Primary Care Butner-Creedmoor, which has been participating in research since the network's inception, see patients ages one to 101. "That helps researchers collect a wide range of useful data," says Tamra Stall, MD.

There are benefits for patients, too. Those who choose to participate in the research gain access to new vaccines, medications, diagnostic procedures, and behavioral interventions. They are among the first to pioneer new ways to conquer obesity, lower blood pressure, manage their weight, or quit smoking.

"We look for ways to help patients to make behavioral changes and sustain that change," says Hayden Bosworth, PhD, a Duke researcher who is a principal investigator of many studies conducted in DPC clinics. "For example, when we studied African-Americans with diabetes and heart disease, we wanted to make sure patients understood what medicines they were taking, and we wanted to know if they were following their doctors' orders, or what prevented them from doing so. Armed with that knowledge, we can come up with ways to effect change."

Doctors at Duke Primary Care Pickett Road are conducting a study looking at whether knowing one's genetic risk for diabetes will motivate patients to change their lifestyle behaviors.

"The patients want to participate," says Scott Joy, MD, Pickett Road's medical director. "Their interest is very high."

The information gathered in these and other studies often leads to advances in patient care, as well as new evidence-based treatment guidelines, like those recently announced by the American Heart Association. "The research we conduct in DPC results in publications that expert panels review for these type of guidelines," Dolor says.

Find out about Duke clinical trials currently seeking volunteers at dukehealth.org/clinical trials.

Reimbursing value

Ironically enough, the decline of the fee-for-service payment structure may be what finally lends traction to widespread adoption of these collaborative, prevention-oriented models of care.

Already, Fulkerson says, insurers are showing interest in negotiating fixed prices for physicians and hospitals for bundled patient care. "If we can deliver high-quality care for less cost, we'll share the reimbursement savings. If we can't, we will have to share the risk of the extended costs," he says.

Those pressures are driving a national trend toward integrated health systems, which allow pooling of resources and also control costs by improving negotiating strength with vendors and insurers. As a result, more community physicians, specialists, and hospitals are looking to affiliate with larger health systems.

While Duke's health system has been in existence for more than a decade, it continues to grow—particularly in primary care. Already one of the state's largest primary care networks, Duke Primary Care has doubled in size the last five years alone. Currently, it comprises 140 providers at 24 practices in seven counties, who see a combined 470,000 patients annually. Plans are in place to build more practices and acquire practices with highly accomplished doctors who will deliver care that is consistent with Duke standards.

The health system also plans to hire additional providers, including nurse practitioners and physician assistants, whose skill sets will enable Duke to expand opportunities for patients seeking access to high-quality care—whether it's provided in minute clinics, urgent care and other ambulatory sites, or primary care offices.

"It's our responsibility as a health care system to pioneer ways to provide the right level of care at the right venue, at the right time, by the right providers," says Cuffe.

From Duke's perspective, having a strong primary care network is the cornerstone of its ability to provide an optimal continuum of high-quality

The Granville Milling Co., Creedmoor, NC

"Our practice joined Duke Primary Care back in 1995. One of the attractions was that our patients would have the opportunity to participate in clinical trials, and that has turned out to be a benefit not only for them but for us as providers as well. Every trial has been educational for me—I get to see what's cutting-edge, what people are considering as possible interventions to improve patient care and to improve our own systems of record-keeping and data-collecting." —TAMRA STALL, MD, *Duke Primary Care Butner-Creedmoor*

care across the health system. "Only a fraction of patients require specialty care," says Ted Pappas, MD, vice chair for administration in the Department of Surgery. "But when they do, it's essential for our system to make that care safe and seamless from start to finish."

Integrated systems are the backbone of a new model of reimbursement called the Accountable Care Organization (ACO)—a sort of macro version of the medical home. The concept of an ACO is to bring together providers, clinics, and hospitals into an integrated health system that works as a unit to share resources, trim costs, and boost quality care.

Although the theory has yet to be put into practice, ACOs are gaining widespread interest for what they may be able to achieve. The model "emphasizes value rather than volume," says Anderson. "It emphasizes strengthened clinic integration across a delivery system. It requires primary care, specialty care, and hospital-based delivery models to communicate and integrate so that you limit testing and transitions of care to those that are necessary and essential." Ideally it would cover some internal infrastructure and IT costs, he notes. Systems would be held accountable for the quality and affordability of patients' care, and would receive financial bonuses and share some of the savings if performance goals were met.

As the employer, provider, and insurer for nearly 59,000 employees and dependents, Duke is in the unique position to take a lead in partnering with its delivery system by integrating many components of an ACO-like model into the plan design for Duke employees. "The concepts of integrated physician networks, disease management, and aligned incentives for employees and providers are all part of our overall strategy to manage our costs," says Kyle Cavanaugh, Duke's vice president for human resources.

The future may be uncertain, but it's innovations like these that will ultimately help it unfold. "Duke continues to be at the forefront of care redesign," says Cuffe. "That will prepare us for whatever road health care reform takes."

Lung cancer

Is "the blame game" hurting our progress?

BY THOMAS A. D'AMICO, MD

As a thoracic surgeon, I operate on lung cancer patients every day. We discuss life-and-death issues regarding their surgeries, but we don't usually talk about how they feel about their disease.

At a recent lung cancer advocacy event, I had the opportunity to hear one of my patients tell her story. A former Division I soccer player for East Carolina University, 24-year-old Taylor Bell was diagnosed with lung cancer two weeks after her 21st birthday. She puts a very different face on lung cancer than most people expect. She's very grateful for her survival, but she says that, even when she's talking to survivors of other types of cancer—to anyone, really—when she tells people she has had lung cancer, inevitably everyone asks the same thing: "Did you smoke?"

Her point of view is, "Why is that the most important thing you want to know about me?" It's offensive to her because, number one, she didn't smoke, and number two, what if she did? Would that mean that she deserved the disease? That is the underlying assumption when many people think about lung cancer: In an international survey commissioned in 2010 by the Global Lung Cancer Coalition, 22 percent of US respondents admitted they feel less sympathy for lung cancer patients than for patients with other types of cancer, because of the link to smoking.

The reality is that 15 to 20 percent of folks who get lung cancer have no personal firsthand experience with tobacco. Some, like Taylor Bell, are complete non-smokers. Some have been exposed to secondhand smoke, which certainly is not their fault. If you counted just deaths from lung cancer among nonsmokers, lung cancer would still be the sixth leading cause of cancer-related deaths in the United States.

But no one should be blamed for getting cancer, regardless of their smoking history. Most smokers first start the habit as teenagers, and by adulthood it becomes entrenched; nicotine addiction is among the hardest to overcome. The real issue is not the smoker who develops cancer; it's how we as a society assign blame for disease. If we are to measure our sympathies for the ill by the behaviors that may have contributed to their illness, what about the patients with debilitating heart disease who have led high-stress, low-exercise lifestyles, or people with type 2 diabetes who had poor eating habits? What about the smokers who didn't develop lung cancer but developed breast cancer, heart disease, or stroke? Would you have more sympathy for a smoker with lung cancer if you knew he had grown up with little education about the dangers of smoking? What about if the individual had a strong genetic predisposition to nicotine addiction? The truth is, it's rare that we can draw a straight line from a person's disease to their lifestyle choices, and applying moral judgments to the ill is not only a waste of energy, but also a slippery moral slope.

I believe the public-health campaign against smoking and tobacco use has had unintended consequences: not only stigma for the victims of diseases associated with smoking, but actually slowing our progress in the fight against those diseases. And that is something we need to pay attention to.

The fact is that lung cancer is the most important cancer disease in our country, and indeed among all developed countries, in terms of its impact. In 2010, lung cancer caused 157,300 deaths in the United States, more than breast, prostate, and colon cancer combined, according to estimates from the American Cancer Society. In 2006, the most recent year for which we have estimates, we spent $10.3 billion in care for lung cancer patients, and the estimated loss of economic productivity due to lung cancer is $36.1 billion—far higher than the next-highest figure (which is breast cancer, at a $12.1-billion loss). The burden of this disease to us as a society should be, in itself, enough to compel us to do everything we can to improve diagnosis and treatment.

Yet lung cancer receives much less research funding than other types of cancer that cause fewer deaths. The stigma associated with lung cancer definitely takes its toll on survivors personally, and it's possible that it also affects research funding for the disease. Using the most recent available data on National Cancer Institute research funding, lung cancer received only $1,875 per death, compared to $17,028 per breast cancer death, $10,638 per prostate cancer death, and $6,008 per colorectal cancer death.

It's impossible to read the minds of people who make decisions regarding funding for lung cancer research, but I think funding disparities can be attributed partly to a combination of the smoking stigma and ageism. If a 73-year-old person has a life-threatening disease, that's not perceived as being as important to society as a disease that affects younger people. And an older patient population also means less patient advocacy. The fight against breast cancer, for example, has been promoted successfully

because many young women who are survivors have their life to give to raising awareness. The cure rate for lung cancer is much lower than for breast cancer. So there are fewer advocates.

There is a need for greater research funding to advance two priorities that could make a significant difference for patients with lung cancer—perfection of screening methods to catch more cases in the early stages, and stepped-up evaluation of biologic therapies, which can be equally as effective or more effective than chemotherapy without the overall toxicity.

Improved screening is an urgent need. Today, only about 20 percent of lung-cancer cases are caught at stage 1. If we could increase that to 40 percent, we would improve survival dramatically. Spiral computed tomography (CT) scan screening is a promising technique that's being tested for patients known to be at high risk [see sidebar], but as a widespread tool, even CT has a drawback: the high chance of false positives. Your CT scan might show a little nodule, but that does not necessarily mean you have lung cancer, and follow-up testing for lung cancer is invasive: if you have a positive screening for a mammography, you get a needle biopsy, but a positive screen from a CT scan might lead to a surgery. We would like to be able to determine your true cancer status without having to do additional CT screens on you for the next five years or subjecting you to an unnecessary lung biopsy. A line of research that holds much promise is perfecting a method for combining CT scans with a serum or urine test that detects a protein or other biomarker.

Even if we improve diagnosis, we'll always have people who present with advanced disease, and the cure rate for those people is frankly dismal. One way to improve that rate is with better targeting of biologic therapies. Industry is producing these agents faster than we can test them. We need to put more effort into testing and enhancing these agents—which could improve treatment for others cancers as well. For instance, Avastin (bevacizumab) is now known to be successful against lung cancer, but it wasn't originally conceived as a lung cancer agent.

To carry out these research priorities, we must erase the stigma that accompanies lung cancer and give the disease the full research support that its sufferers and their families deserve. In the meantime, we will count on survivors such as Taylor Bell, who handles the smoking question with grace. After she tells people that no, she never smoked, the second question usually is: "Well, how did you get it?" Her response: "Why does anyone get cancer?"

CT screening for lung cancer

For the first time, people at high risk for lung cancer will have access to screening that uses computed tomography (CT) scans.

Preliminary results from the National Lung Screening Trial, released in November 2010, showed that among people at high risk for lung cancer, those who were screened with low-dose spiral CT scans showed a 20 percent reduction in lung-cancer-related mortality compared to those who were screened with standard chest X-rays. The trial, which Duke did not participate in, included 53,000 participants ages 55 to 74 who were current and former heavy smokers.

"Once those results are published, it will be the first US trial to show in a randomized fashion a benefit from screening people at high risk for lung cancer with low-dose CT scans," says thoracic surgeon Thomas D'Amico, MD. "Before, CT screening was not thought to be effective. This is an important advance." Published results will likely result in third-party payers such as insurance companies and Medicare covering CT scan-based screening for patients at high risk. Right now, such screening is not covered.

Duke is currently developing a lung cancer screening program using CT scans for patients at high risk, to be launched later in 2011.

Thomas A. D'Amico, MD, is a professor of surgery and director of the Duke Cancer Institute's lung cancer program. He was elected chair of the National Comprehensive Cancer Network board of directors in 2010.

SAYING THANK YOU

Gifts from individuals and organizations are the largest source of non-government support for Duke Medicine's research, education, patient care, and service missions—and we are grateful to all who help us make a difference. To learn more about how you can partner with Duke Medicine, please call **919-667-2500** or visit **dukemedicine.org/giving**.

More than 400 friends and supporters, faculty, and staff of Duke Medicine attended the Chancellor's Gala in May. Duke men's basketball coach Michael Krzyzewski was the keynote speaker. Three new Duke Medicine videos were shown—on transforming care through education, driving discovery and redesigning care for cancer, and accelerating progress in translating basic science into patient care. The evening ended with an *a capella* performance by the Duke medical student group, Major Groove.


01


02


03


04


05


06


08


09


07

01 Chancellor Victor Dzau, MD; Joseph and Lisa Quattrocchi

02 Chancellor Victor Dzau, MD; Mary Duke Biddle Trent Semans; Ruth Dzau

03 Cathy and Bill Hudson, Coach Mike Krzyzewski

04 Earle and Rose Finley, Coach Mike Krzyzewski

05 Neil Spector, MD; Tamara and Kirk Nuckols

06 Mike Pearson, E'81; former School of Nursing Dean Ruby Wilson, EdD'69, RN, FAAN; Christine Pearson, BSN'84

07 Lee and Thad Wester, T'46, MD'51, HS'51-'54

08 Chikoti Mibenge, MSIII, and Christopher O. Wheat, PhD

09 Major Groove, Duke School of Medicine *a capella* group


10


11


13


12


14


15


17


16

10 Chancellor Victor Dzau, MD; Coach Mike Krzyzewski

11 Eric and Rebecca Hinshaw, Coach Mike Krzyzewski

12 Mary Silver, Mitch Silver, Sepi Asefnia, Durham Mayor Bill Bell, Judith Bell, John Idler, Martha Idler, Kim Saunders, Barry Saunders, and Scott Cutler

13 Coach Mike Krzyzewski; Daneen and Charles Stiefel

14 Sky Vanderburg, MSI, and Art Palumbo, T'49

15 Jodi and Tony Tata, Sepi Asefnia, Scott Cutler

16 Fran Mauney, Carol Hooker, Charlie McIlvaine, and School of Nursing Dean Catherine Gilliss, BSN'71, DNSc, RN, FAAN

17 Henry Friedman, MD; George Grody, T'81

SAYING THANK YOU

01 Christine Siegler Pearson, BSN'84, and Dean Catherine Gilliss, BSN'71, DNSc, FAAN

02 Learning Center (architect's rendering)

Historic gift will name School of Nursing building for Pearson, BSN '84

Christine Siegler Pearson, BSN'84, will have the Duke University School of Nursing building named in her honor thanks to a historic $15 million gift from her husband, J. Michael Pearson, MBA, E'81.

The gift, the largest ever to the School of Nursing, was informally announced at the Chancellor's Gala on May 5, to a standing ovation. The official public announcement followed the next day.

"This generous gift recognizes the school's recent growth and progress in leading nursing education and research," said Victor J. Dzau, MD, chancellor for health affairs.

Currently the school has more than 700 students enrolled, the largest number in its 80-year history, and the faculty has nearly doubled under the leadership of Dean Catherine Gilliss, BSN'71, DNSc, RN, FAAN. This spring, *U.S.News & World Report* ranked Duke seventh among nursing schools nationally, a significant jump from 29th in 2004 and 15th in 2007.

Christine Pearson is a member of the last class to complete the traditional BSN program at Duke before the program closed.

"My recent involvement with the Nursing Alumni Council has made me aware of the wonderful advances that have occurred in the school," said Pearson. "I have renewed respect and appreciation for Duke University School of Nursing and all of its activities that result in improved health care."

Dean Gilliss noted the emotional and historical significance of having the building named to honor an alumna. "I am deeply moved by Mike Pearson's generous gift in honor of his wife, Christine," she said. "This is a transformative gift, and we are grateful beyond words."

Michael Pearson is the chairman and CEO of Valeant Pharmaceuticals International, Inc., headquartered in Mississauga, Ontario, Canada. The Pearsons have four children: Andrew, a freshman at Duke, Morgan, who will enter Duke's freshman class in Fall 2011, and 14-year-old twins, Trevor and John.

Bequest from alumnus provides $9 million for School of Medicine

Duke University School of Medicine received a tremendous boost for the Learning Center building fund and scholarships from the estate of Robert A. Hare, MD'35.

Hare, who died in 2002, was a successful ophthalmologist based in Los Angeles, California. After the death of his last surviving beneficiary, his entire estate was designated for the School of Medicine. One million dollars will be used to establish a scholarship fund in Hare's name, as he requested. The remaining $8 million of unrestricted funds will go toward the new Learning Center, currently under construction and slated for completion in 2013.

"We are extremely grateful to Dr. Hare for his generosity," said Dean Nancy C. Andrews, MD, PhD. "Obviously, he didn't know it when he designated this gift to us, but he is helping to change the face of medical education at Duke."

Hare's gift is the largest to the Learning Center other than the initial $35 million from The Duke Endowment. Together with gifts from other alumni, it brings the total funds raised for the Learning Center to $45.6 million.

The 83,000-square-foot Learning Center is designed to educate adults in the ways they learn best—through individual preparation, team-based learning, and hands-on practice. It will provide collaborative education with students from nursing and other health professions, and include an entire floor for the most state-of-the-art medical simulation equipment.

03 Charles, Daneen, Todd, and Diana Stiefel

04 Pat Johnson and Richard Johnson, with Joseph St. Geme III, MD

05 Duke women's basketball coach Joanne P. "Coach P" McCallie with patient Rebecca Woodard at MIX 101.5 Radiothon

Stiefel family funds immunodeficiency disease research

The Stiefel family of Raleigh, North Carolina, has given a total of more than $700,000 to fund research on common variable immunodeficiency disease (CVID) at Duke. CVID, which is caused by low levels of infection-fighting antibodies, not only increases the risk of serious infections, but is also associated with a ten-fold higher risk of developing lymphomas. Charles and Daneen Stiefel gave $632,500 for research being conducted by Patricia Lugar, MD, an assistant professor in the Division of Pulmonary, Allergy, and Critical Care Medicine, and Sandeep Dave, MD, an assistant professor in the Division of Medical Oncology. Todd Stiefel, T'97, and his wife, Diana, gave $100,000 to endow the Stiefel Family Immunology Fund. These funds support research to better understand the genetic causes of CVID and its link to lymphomas.

Cardiac crib room named for Pat Johnson

Richard S. "Dick" Johnson, T'52, has given $100,000 to name the crib room in the Pediatric Cardiac Intensive Care Unit of Duke University Hospital in honor of the birthday of his wife, Patsy S. "Pat" Johnson, in March. Celebrating with the Johnsons is Joseph St. Geme III, MD, chair of the Department of Pediatrics. Dick Johnson is a member of the Duke Medicine Board of Visitors, and Pat Johnson is a member of the Duke Children's National Board of Advisors Executive Committee.

Radiothon raises $1.2M

Dozens of volunteers, including patients and their families and members of the Duke Children's National Board of Advisors, participated in the 17th annual MIX 101.5 WRAL-FM Radiothon for Duke Children's Hospital & Health Center in February. When it was over, pediatrics Chairman Joseph St. Geme III, MD, announced a total raised of $1,224,053.

The annual Radiothon raises more dollars per capita than any other Children's Miracle Network Radiothon in the US or Canada, for a total of $13 million in its history.

APPOINTMENTS

Pioneering cancer researcher to lead the new Duke Cancer Institute

Michael B. Kastan, MD, PhD, a renowned cancer scientist and director of the Comprehensive Cancer Center at St. Jude Children's Research Hospital, has been named executive director of the Duke Cancer Institute (DCI).

"Dr. Kastan's achievements as the director and driving force behind one of the world's preeminent cancer centers, as well as his widely recognized accomplishments in basic and clinical research, make him the ideal person to lead our newly launched Duke Cancer Institute and to implement a novel model of integrated cancer care and research," says Victor J. Dzau, MD, Duke University chancellor for health affairs.

A pioneer in describing molecular and cellular events that cause cancer and its progression, Kastan has directed St. Jude's cancer center since 2004. He led efforts that resulted in it becoming the only pediatric hospital designated by the National Cancer Institute as a Comprehensive Cancer Center.

"Mike Kastan stands out as one of the most thoughtful and important leaders of his generation of cancer physician-researchers," says Richard D. Klausner, MD, a former director of the National Cancer Institute, past executive director for global health at the Bill & Melinda Gates Foundation, and current member of the Duke University Health System board of directors. "The Duke Cancer Institute is an innovative and groundbreaking commitment to the future of cancer research and cancer care. Its success is not only important for Duke but for cancer patients and their families everywhere. Dr. Kastan's appointment as its first director represents a key event in fulfilling Duke's ambitious vision of the future of cancer care and progress against all cancer."

Kastan is eager to help shape the new Duke Cancer Institute, which he believes will become a national model for the way cancer programs should be structured. The institute, launched in November 2010, brings together education, cancer research, and patient care into a unified venture. "It is exactly what cancer medicine should be about," Kastan says. "It's the merging and strategic oversight of a seamless structure, including everything from basic research to patient care, all coordinated as part of a continuum."

Read more about Kastan and the DCI at cancer.duke.edu.

New leader for development and alumni affairs

Ellen Medearis, formerly the associate vice president for development at Duke University, became Duke Medicine's vice president for Development & Alumni Affairs in April.

"Following a national search in which we evaluated top candidates from peer institutions, it became clear to me, as well as to the search committee, that the ideal candidate was right here at Duke," said Victor J. Dzau, MD, chancellor for health affairs, in announcing the appointment. "I was impressed by Ellen's proven record of success, the strategic thought process that she has demonstrated, and her experience and reputation as an effective and highly respected leader."

Medearis has served in positions of leadership within the Duke University Development office since joining that team in 1996. Previously, she worked in development for Duke Medicine, Columbia-Presbyterian Medical Center, and the University of California-San Francisco.

In her new role, Medearis will lead a team dedicated to securing the private support that is critical to advancing Duke Medicine's missions in research, education, and patient care.

Executive IT leader on board

After a nationwide search, **Art Glasgow** was selected as the chief information officer for Duke Medicine, effective May 1.

Glasgow was previously the chief technology officer for Ingenix, an informatics company that supports UnitedHealthcare and various other clients. At Ingenix, he led the company's provision of informatics, consulting, and software solutions to nearly 6,000 hospitals, as well as to clients in the payer and pharmaceutical markets. "Art is recognized as one of the country's leading experts in health care information technology strategies and solutions," says Victor J. Dzau, MD, chancellor for health affairs. "He will bring an important perspective to our executive leadership team as he has a unique, direct, and current understanding of the directions in which the health care delivery market is headed."

In his new role, Glasgow is responsible for leading technology strategy, innovation, initiatives, and operations across Duke Medicine, including the Duke University Health System, School of Medicine, School of Nursing, and Private Diagnostic Clinic. In addition, he works in collaboration with Duke-NUS Graduate Medical School in Singapore and Duke Medicine's other global partners to develop an IT strategy to meet mutual goals.

DUKE MEDICINE HONORS AND AWARDS

In April, **Duke University Hospital** successfully achieved Magnet recognition for the second time from the American Nurses Credentialing Center (ANCC). This voluntary credentialing program for hospitals recognizes excellence in nursing. In 2006, Duke University Hospital achieved Magnet status; ANCC requires hospitals to apply for redesignation every four years. Only about 3 percent of US hospitals that attempt redesignation are successful in reaching the goal.

Duke University Medical Center was named the top hospital in the Raleigh-Durham area in *U.S.News & World Report*'s first-ever Best Hospitals by Metro Area list.

In the new metro rankings released in March, Duke was nationally ranked in 15 of the specialties measured. Duke is the only hospital in the Triangle to have five or more specialties ranked among the best in the nation.

Duke University Health System's other two hospitals were also recognized—**Durham Regional Hospital** was ranked #4 and **Duke Raleigh Hospital** tied for fifth place.

Duke Medicine's academic programs were also nationally ranked by *U.S.News & World Report* this year. For details, see page 2.

Duke Children's Hospital & Health Center was ranked among the top 50 children's hospitals in the nation, according to *U.S. News & World Report* rankings released in May. Duke was listed among the top 50 hospitals in all 10 areas of specialty measured by the rankings: cancer, cardiology and heart surgery, diabetes and endocrinology, gastroenterology, neonatology, nephrology, neurology and neurosurgery, orthopaedics, pulmonology, and urology.

Nancy C. Andrews, MD, PhD, vice chancellor for academic affairs and dean of the School of Medicine, accepted the 2010 Vanderbilt Prize in Biomedical Science in March. The prize, awarded by the Vanderbilt University School of Medicine, honors prominent women in science who have "a stellar record of research accomplishments" and who have contributed significantly to the mentorship of other women in science. Andrews received $25,000 as part of the award and will serve as mentor to the Vanderbilt Prize Scholar.

Rebecca H. Buckley, MD, James Buren Sidbury Professor of Pediatrics, was elected into the National Academy of Sciences in April for her lifesaving research in pediatric immunological diseases. Her research focus has been on the fundamental causes and optimal treatments of genetically determined immunodeficiency diseases. She pioneered the use of one kind of stem cell transplant as a successful treatment for severe combined immunodeficiency disease ("bubble boy disease").

David L. Epstein, MD, Joseph A. C. Wadsworth Clinical Professor of Ophthalmology and chair of the Department of Ophthalmology, was elected president of the Association of University Professors of Ophthalmology (AUPO). AUPO serves as the national organization for chairs of ophthalmology programs as well as residency and research directors of ophthalmology departments in the United States and Canada. His office began on April 1.

Vance Fowler, MD, MHS, associate professor of medicine (Infectious Diseases), has been selected as the 2011 winner of the American Federation for Medical Research Outstanding Investigator Award. He presented his work at the Henry Christian Awards Reception and Dinner on April 26 and at the 2011 Clinical and Translational Research and Education meeting on April 28 in Washington, DC.

Anthony Galanos, MD, associate professor of medicine, received the 2011 Cunniff-Dixon Physician Award in March. The awards, which recognize excellence in the practice of palliative medicine, are distributed by the Hastings Center, a nonpartisan group for bioethics and public interest. Galanos received $25,000 as winner of the midcareer physician category.

Cristina Hendrix, DNS, FNP, associate professor in the School of Nursing, was named president-elect of the Philippine Nurses Association of North Carolina for 2011–2013.

Mary Klotman, MD, chair of the Department of Medicine, served as physician-in-chief pro tempore at the Brigham & Women's Hospital April 13–15. Her visit to BWH included a presentation, "HIV-Associated Nephropathy: From Mice to Men" to the BWH Medical Grand Rounds, as well as the keynote address at a gala dinner. BWH annually bestows its physician-in-chief pro tempore honor on a visiting physician.

Seok-Yong Lee, PhD, assistant professor of biochemistry, received two honors for his work in ion channel science. In February, Lee was selected for the 2011 Alfred P. Sloan Research Fellowship, which provides $50,000 and recognition to early-career scientists and scholars. Lee also received the 2011 Basil O'Connor Award grant from the March of Dimes. The O'Connor Award is designed to support young scientists embarking on their independent research careers, is limited to those holding recent faculty appointments, and provides up to $75,000 per year for a duration of two years.

Robert J. Lefkowitz, MD, James B. Duke Professor of Medicine and Howard Hughes Medical Institute investigator, was awarded the highest honor of the Association of American Physicians, the George M. Kober Medal, in April. Lefkowitz was honored for his research into understanding the largest, most important, and most therapeutically accessible receptor system that controls the body's response to drugs and hormones. Since 1925, the association has bestowed the award "for research in scientific medicine" that rises to the highest level of achievement.

Marva Price, DrPH, FNP, associate clinical professor in the School of Nursing, has been re-elected to the board of directors of the National Organization of Nurse Practitioner Faculties.

William Michael Scott, MSN, FNP-BC, clinics director and clinical associate at the Duke University School of Nursing, was appointed interim treasurer of the Commission on Collegiate Nursing Education

HONORS & AWARDS

(CCNE) in January. He completed a one-year term as vice chair elect of the CCNE board in December 2010.

Linda Sutton, MD, associate professor in medical oncology and medical director of the Duke Oncology Network, has been selected to be the next president-elect for the North Carolina Oncology Association.

J. Brice Weinberg, MD, professor of medicine and staff physician in hematology–oncology at the Durham VA Medical Center, was awarded the William S. Middleton Award by the US Department of Veterans Affairs in May. The award, recognizing outstanding achievement in biomedical or behavioral research, is the highest honor for scientific achievement given by the Veterans Health Administration's Biomedical Laboratory Research and Development program.

Christopher Willett, MD, Leonard Prosnitz Professor of Radiation Oncology, was presented with the 2011 ASCO Statesman Award in June. The award recognizes members of the American Society of Clinical Oncology for their voluntary efforts to benefit patients, the organization, and the field of oncology.

Eight Duke scientists were elected as fellows into the American Association for the Advancement of Science in February:

Blanche Capel, PhD, James B. Duke Professor of Cell Biology, for distinguished contributions to understanding the genetics and molecular biology of sex determination and gonadal development

Maria E. Cardenas-Corona, PhD, research professor of molecular genetics & microbiology, for distinguished contributions to the field of cell signaling, elucidating how the rapamycin-sensitive Tor kinase pathway enables cells to sense nutrients and respond physiologically

Mark W. Dewhirst, DVM, PhD, Gustavo S. Montana Professor of Radiation Oncology, for his work on the role of hyperthermia in cancer therapy, particularly its synergistic use with other treatment regimens

Jack D. Keene, PhD, James B. Duke Professor of Molecular Genetics & Microbiology, for leadership in microbiology and distinguished contributions to elucidating the essential roles of RNA and RNA-binding proteins in coordinating multiple cellular processes

Sally Kornbluth, PhD, James B. Duke Professor of Pharmacology & Cancer Biology, for distinguished contributions in elucidating mechanisms of cell proliferation and cell death, and for contributions as vice dean for research at the School of Medicine

Stephen Nowicki, PhD, dean and vice provost for undergraduate education and professor of biology, psychology and neuroscience, and neurobiology, for distinguished contributions to the fields of animal behavior and behavioral ecology, particularly for studies of animal signaling mechanisms and the evolution of animal communication

Ann Marie Pendergast, PhD, James B. Duke Professor of Pharmacology & Cancer Biology, for distinguished contributions to the field of cellular signaling, with groundbreaking work on the function of Abl tyrosine kinases in cancer development and infectious disease

John D. York, PhD, Cancer Biology Professor of Pharmacology & Cancer Biology and Howard Hughes Medical Institute investigator, for distinguished contributions to the field of signal transduction, particularly with regards to the biology of phosphoinositides and inositol lipids

---

In March, seven Duke physicians and nurses were among the 22 recipients of the *Triangle Business Journal* 2011 Health Care Heroes awards:

Peter Grossi, MD, assistant professor of surgery

Joanne Kurtzberg, MD, Jerome S. Harris Professor of Pediatrics

Joseph Moore, MD, professor of medicine

Marjorie "Lee" Ruckert, RN, Duke HomeCare & Hospice

Beth Stewart, RN, Duke University Hospital

Marie Szalanski, RN, Durham Regional Hospital

Kim Thacker, RN, Duke University Hospital

In a joint meeting held in April, the American Society for Clinical Investigation and the Association of American Physicians inducted the following Duke faculty members:

American Society for Clinical Investigation
J. Andrew Alspaugh, MD, associate professor of medicine

Jen-Tsan Ashley Chi, MD, PhD, associate professor in molecular genetics and microbiology

Paul Rosenberg, MD, assistant professor of medicine

Michelle Winn, MD, associate professor of medicine

Association of American Physicians
Mariano Garcia-Blanco, MD, PhD, professor of molecular genetics and microbiology

Robert Harrington, MD, Richard Sean Stack, MD/Guidant Foundation Professor of Cardiology

Laura Svetkey, MD, professor of medicine

Thirteen members from the School of Medicine and School of Nursing faculty were named to endowed professorships on April 26:

School of Medicine
David Brizel, MD, Leonard Prosnitz Professor of Radiation Oncology

S. David Hsu, MD, PhD, William Dalton Family Assistant Professor of Medical Oncology

Priya Kishnani, MD, Chen Family Professor of Pediatrics

Mary Klotman, MD, R. J. Reynolds Professor of Medicine

Michael Krangel, PhD, Mary Bernheim Professor of Immunology

Daniel Lew, PhD, James B. Duke Professor of Pharmacology & Cancer Biology

Joseph Mathew, MD, Jerry Reves, MD, Professor of Cardiac Anesthesiology

Kathleen McGann, MD, Dr. Glen A. Kiser and Muriel C. Kiser Professor of Pediatrics

Richard Mooney, PhD, George Barth Geller Professor for Research in Neurobiology

Manesh Patel, MD, John Bush Simpson Assistant Professor of Interventional Cardiology

Glenn Preminger, MD, James F. Glenn, MD, Professor of Urology

Geoffrey Rubin, MD, George Barth Geller Professor for Research in Cardiovascular Diseases

School of Nursing
Barbara Turner, DNSc, RN, Elizabeth P. Hanes Professor of Nursing

In addition, **Joanne Kurtzberg, MD**, formerly Susan Dees Professor of Pediatrics, was named Jerome S. Harris Professor of Pediatrics.

DUKE WELCOMES NEW PHYSICIANS

DUKE PRIMARY CARE

Monica D. Barnes-Durity, MD
Duke Primary Care Morrisville
Particular Clinical Interests and Skills: Whole life-cycle family medicine, helping patients develop and maintain healthy lifestyles
MD Degree: The University of the West Indies School of Medicine (Jamaica), 1995
Residency: Family Practice, State University of New York–Downstate Hospital, 2001

Jamila R. Battle, MD
Wake Forest Family Physicians
Particular Clinical Interests and Skills: Prevention and wellness, chronic disease, behavior medicine, integrative medicine
MD Degree: University of North Carolina at Chapel Hill School of Medicine, 2004
Residency: Family Medicine, Cabarrus Family Medicine (North Carolina), 2004-2006
Family Medicine, University of Michigan–Ann Arbor, 2006-2008

John K. Campbell, MD
Duke Urgent Care
Particular Clinical Interests and Skills: Urgent care, family medicine, family practice residency teaching, sports medicine, orthopaedic care, travel medicine, employee health care, hospice and palliative care
MD Degree: University of Mississippi School of Medicine, 1991
Residency: Family Medicine, Halifax Medical Center (Florida), 1991-1994

Ranee Chatterjee, MD
Sutton Station Internal Medicine
Particular Clinical Interests and Skills: Preventive medicine, general internal medicine
MD Degree: Duke University School of Medicine, 1997
Residency: Internal Medicine, Johns Hopkins Hospital (Maryland), 1997-2000
Fellowship: General Internal Medicine Clinical Research, Johns Hopkins School of Medicine (Maryland), 2008-2010
Other Degree: MPH, Emory University Rollins School of Public Health (Georgia), 2008

Scott C. Elston, MD
Duke Urgent Care Morrisville
Particular Clinical Interests and Skills: Urgent care, internal medicine, critical care, emergency medicine
MD Degree: Jefferson Medical College of Thomas Jefferson University (Pennsylvania), 1988
Residency: Transitional Internship, Mercy Catholic Medical Center (Pennsylvania), 1988-1989
Internal Medicine, Mercy Catholic Medical Center (Pennsylvania), 1989-1991

Yvonne Luyando, MD
Duke Primary Care Timberlyne
Particular Clinical Interests and Skills: Family medicine
MD Degree: Columbia University College of Physicians and Surgeons (New York), 1984
Residency: Internal Medicine, City Hospital at Elmhurst, Mount Sinai School of Medicine (New York), 1985-1986
Family Medicine, University Hospital, State University of New York at Stony Brook, 1986-1988

Sabine M. Maas, MD
Duke Urgent Care Knightdale
Particular Clinical Interests and Skills: Broad-spectrum family medicine focusing on urgent care, international medicine/travel medicine
MD Degree: Brody School of Medicine at East Carolina University (North Carolina), 1996
Residency: Family Medicine, East Carolina University, Brody School of Medicine (North Carolina), 1998

Christopher Z. Rayala, MD
Duke Primary Care Morrisville
Particular Clinical Interests and Skills: Family practice including pediatrics, internal medicine, geriatrics, sports medicine, women's health
MD Degree: University of the Philippines College of Medicine, 2000
Residency: Family Medicine, University of Pittsburgh Medical Center (Pennsylvania), 2005

Kristine M. Schmit, MD
Henderson Family Medicine Clinic
Particular Clinical Interests and Skills: Treatment and prevention of chronic diseases such as obesity, diabetes mellitus, hypertension, and hyperlipidemia; women's health issues; preventive health services; patient care for all ages
MD Degree: Duke University School of Medicine, 2004
Residency: Family Medicine, University of California, San Diego, 2004-2005
Family Medicine, University of California, San Diego, 2005-2007
Preventive Medicine, UNC Hospitals, 2010-2011
Other Degree: MPH, UNC School of Public Health

Anita Shivadas, MD
Sutton Station Internal Medicine
Particular Clinical Interests and Skills: General internal medicine, women's health, preventive medicine
MD Degree: Kilpauk Medical College (India), 1996
Residency: Internship, Kilpauk Medical College Hospital (India), 1997-1998
OB–GYN, Walsgrave Teaching Hospitals, (UK), 1999
OB–GYN, Basildon General Hospital (UK), 1999-2000
OB–GYN, Cambridge University Hospitals (UK), 2000-2001
Internal Medicine, Cleveland Clinic Foundation (Ohio), 2003-2006

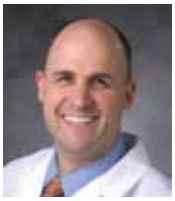
HOSPITAL MEDICINE

Pamela K. Smith, MD
Duke Raleigh Hospital Medicine
Particular Clinical Interests and Skills: Hospital medicine, cardiovascular disease prevention
MD Degree: University of North Carolina at Chapel Hill School of Medicine, 1982
Residency: Internal Medicine, University of Texas Health Sciences Center at Houston, 1982-1985

MEDICINE

William S. Abernathy, MD
Cardiology
Particular Clinical Interests and Skills: Comprehensive cardiology, including noninvasive cardiac testing
MD Degree: Columbia University College of Physicians and Surgeons (New York), 1969
Residency: Internal Medicine, University of Kansas Medical Center, 1969-1970
Internal Medicine, Presbyterian Hospital (New York), 1970-1971
Fellowship: Cardiology, University of Michigan Hospital, 1972-1974

Robert A. Buchanan Jr., MD
Cardiology
Particular Clinical Interests and Skills: Clinical cardiology, general interest in all cardiovascular disease and echocardiography, noninvasive testing, neurocardiogenic syncope
MD Degree: Wake Forest University School of Medicine (North Carolina), 1969
Residency: Internal Medicine, Vanderbilt University Hospitals (Tennessee), 1969-1972
Fellowship: Cardiovascular Diseases, University of Alabama at Birmingham Hospitals, 1972-1974



Benjamin J. Conway, MD
Cardiology
Particular Clinical Interests and Skills: Noninvasive general cardiology
MD Degree: University of Massachusetts Medical School, 2001
Residency: Internal Medicine, Rhode Island Hospital, 2004
Fellowship: Cardiology, Maine Medical Center, 2007

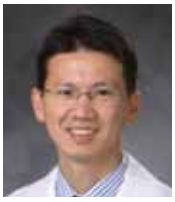
Timothy P. Donahue, MD
Cardiology
Particular Clinical Interests and Skills: Treatment and ablation of supraventricular tachycardias, including atrial fibrillation; pacemaker and defibrillator implantation and management
MD Degree: Louisiana State University School of Medicine in New Orleans, 1996
Residency: Internal Medicine, Emory University Medical Center (Georgia), 1999
Fellowship: Cardiology, University of Florida Medical Center, 2002
Electrophysiology, University of Florida Medical Center, 2003

Jeffrey T. Guptill, MD
Neurology
Particular Clinical Interests and Skills: Electromyography; neuromuscular disease, particularly myasthenia gravis and inflammatory muscle disease
MD Degree: Virginia Commonwealth University School of Medicine, 2005
Residency: Internal Medicine, Medical College of Virginia Hospitals, 2005-2006
Adult Neurology, Duke University Medical Center, 2006-2009
Fellowship: Neuromuscular Medicine and EMG, Duke University Medical Center, 2009-2010 Advanced Neuromuscular Medicine, Duke University Medical Center, 2010-2011
Other Degree: MA, Anatomy and Neurobiology, Boston University School of Medicine (Massachusetts), 2001

M. Alycia Hassett, MD
Cardiology
Particular Clinical Interests and Skills: Consultative cardiology to include acute and chronic coronary artery disease, valvular heart disease, heart failure, heart disease in women, prevention of heart disease, diagnostic catheterization
MD Degree: Duke University School of Medicine, 1978
Residency: Internal Medicine, Emory University Medical Center (Georgia), 1981
Fellowship: Cardiology, Duke University Medical Center, 1984

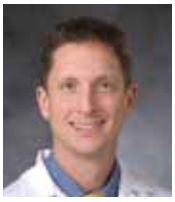
Elizabeth Henke, MD
Cardiology
Particular Clinical Interests and Skills: Clinical cardiology, consultative cardiology, echocardiography, transesophageal echocardiography, diagnostic cardiac catheterization
MD Degree: Welsh National School of Medicine (UK)
Residency: Internal Medicine, UNC Hospitals, 1981
Fellowship: Cardiology, Duke University Medical Center, 1986

Janet L. Hortin, MD
General Internal Medicine/
Student Health
Particular Clinical Interests and Skills: Student health care, headaches, women's health, health issues related to graduate school/professional school stresses, assisting students in coping with chronic illness during graduate and undergraduate school, non-traditional student and international student health care issues
MD Degree: University of Michigan Medical School, 1977
Residency: Internal Medicine, University of Wisconsin Hospital, 1977-1980



Jerry B. Hung, MD
Pulmonary, Allergy, and
Critical Care Medicine
Particular Clinical Interests and Skills: Diagnosis and treatment of lung cancer, management of lung nodules, atypical lung infection, critical care medicine
MD Degree: Stony Brook School of Medicine, State University of New York
Residency: Internal Medicine, Albert Einstein College of Medicine, Montefiore Medical Center (New York), 2000-2003
Fellowship: Pulmonary and Critical Care, NYU Medical Center, 2003-2007

J. Stewart Jones, DO
Cardiology
Particular Clinical Interests and Skills: All aspects of cardiovascular disease, including interventional cardiology, peripheral vascular disease, nuclear cardiology, coronary CT, cardiac rehabilitation, and risk factor modification/ preventative medicine
DO Degree: Michigan State University College of Osteopathic Medicine, 1987
Residency: Osteopathic Internship, Oakland General Hospital (Michigan), 1987-1988
Internal Medicine, Michigan State University, 1988-1991
Fellowship: Heart Failure/ Heart Transplant, University of Pittsburgh (Pennsylvania), 1991-1992
Cardiology, University of Missouri–Kansas City/Saint Luke's Mid-America Heart and Vascular Institute, 1992-1995
Interventional and Peripheral Vascular Cardiology, Iowa Heart Center and Mercy Hospital, 1995-1996



Michael R. Komada, MD
Cardiology
Particular Clinical Interests and Skills: All aspects of general and interventional cardiology including valvular heart disease and coronary artery disease
MD Degree: Wake Forest University School of Medicine (North Carolina), 1993
Residency: Internal Medicine, University of Virginia Medical Center, 1993-1996
Fellowship: Cardiovascular Medicine, Wake Forest University Baptist Medical Center (North Carolina), 2003
Interventional Cardiology, Wake Forest University Baptist Medical Center (North Carolina), 2004

ON THE SPOT

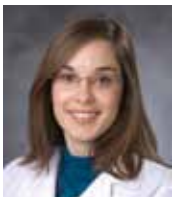
What is the most challenging part of your work in cardiac transplantation and mechanical circulatory support?

The most challenging aspect is choosing the best time to pursue these advanced therapies. Waiting too long can make the time around surgery very risky for the patient. On the other hand, both therapies require cardiac surgery, so we need to make sure the patient is at a point in his disease's progression where he'd truly benefit from an invasive procedure. Some of our research efforts here at Duke are focused on finding the right time to intervene.

—Chetan B. Patel, MD

Eric S. Moore, MD
Cardiology
Particular Clinical Interests and Skills: Noninvasive cardiovascular imaging, including transthoracic and transesophageal echocardiography, cardiac CT, nuclear cardiac imaging, and stress testing; diagnosis and management of coronary disease, congestive heart failure, and valvular disease
MD Degree: University of Alabama School of Medicine, 2001
Residency: Internal Medicine, St. Louis University (Missouri), 2001-2004
Fellowship: Cardiovascular Disease, Virginia Commonwealth University, 2005-2008
Other Degrees: MBA, University of Alabama at Birmingham, 1997
MPH, Health Care Organization and Policy, University of Alabama at Birmingham, 1997

Chetan B. Patel, MD
Cardiology
Particular Clinical Interests and Skills: General cardiology, heart failure, cardiac transplantation, mechanical circulatory support
MD Degree: University of Texas Southwestern Medical School, 2002
Residency: Internal Medicine, University of Texas Southwestern Medical Center, 2006
Fellowship: Cardiology, Duke University Medical Center, 2010
Heart Failure and Cardiac Transplantation, Duke University Medical Center, 2010



Jennifer V. Rowell, MD
Endocrinology, Metabolism, and Nutrition
Particular Clinical Interests and Skills: General endocrinology including thyroid disorders, pituitary and adrenal disease, polycystic ovary syndrome, hypercalcemia, diabetes
MD Degree: Medical University of South Carolina College of Medicine, 2004
Residency: Internal Medicine, University of Alabama at Birmingham Hospitals, 2004-2007
Fellowship: Endocrinology, Metabolism, and Nutrition, Duke University Medical Center, 2007-2010

Marvaretta M. Stevenson, MD
Medical Oncology
Particular Clinical Interests and Skills: Investigating ways to identify high-risk lung cancer populations and methods to guide therapeutic options
MD Degree: Medical University of South Carolina College of Medicine, 2004
Residency: Internal Medicine, Duke University Medical Center, 2007
Fellowship: Hematology–Oncology, Duke University Medical Center, 2010

ORTHOPAEDICS

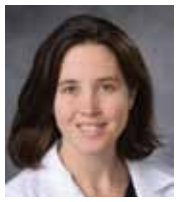
John Gregory Bentley, MD
Spine
Particular Clinical Interests and Skills: Evaluation and nonoperative treatment of neck pain, back pain, and musculoskeletal pain due to degenerative disc disease, arthritis, disc herniation, musculoskeletal injury; fluoroscopically guided spinal injections including epidural steroid injections, facet injections, sacroiliac joint injections, radiofrequency neurotomy, joint injections, lumbar discography
MD Degree: St. George's University School of Medicine (West Indies), 1998
Residency: Physical Medicine and Rehabilitation, Indiana University School of Medicine, 1999-2002
Fellowship: Interventional Spine and Musculoskeletal, Orthopaedic Specialists of the Carolinas (North Carolina), 2002-2003

Anand B. Joshi, MD
General Orthopaedics
Particular Clinical Interests and Skills: Nonoperative interventional care of neck and back pain; functional outcome optimization through rehabilitation, electrodiagnostics, and minimally invasive percutaneous spine procedures
MD Degree: Northeastern Ohio Universities Colleges of Medicine and Pharmacy, 2003
Residency: Physical Medicine and Rehabilitation, East Carolina University (North Carolina), 2005-2007
Preventive Medicine (Occupational and Environmental Medicine), Duke University Medical Center, 2008-2009
Fellowship: Interventional Spine, Sports, and Musculoskeletal Medicine, Penn Spine Center, Hospital of the University of Pennsylvania, 2009-2010
Other Degree: MHA, UNC School of Public Health, 2008

Jon J. Wilson, DO
Spine
Particular Clinical Interests and Skills: Evaluation and nonoperative treatment of neck pain, back pain, and musculoskeletal pain due to degenerative disc disease, arthritis, disc herniation, musculoskeletal injury; fluoroscopically guided spinal injections including epidural steroid injections, facet injections, sacroiliac joint injections, radiofrequency neurotomy, joint injections, lumbar discography
DO Degree: Ohio University College of Osteopathic Medicine, 1994
Residency: Physical Medicine and Rehabilitation, University of Kentucky College of Medicine, 1998
Fellowship: Interventional Spine and Musculoskeletal, Orthopaedic Specialists of the Carolinas (North Carolina), 2004-2005

PEDIATRICS

Mikelle L. Key-Solle, MD
Hospital and Emergency Medicine
Particular Clinical Interests and Skills: Comprehensive family-centered care of hospitalized children
MD Degree: University of North Carolina at Chapel Hill School of Medicine, 2002
Residency: General Pediatrics and Adolescent Medicine, North Carolina Children's Hospital, 2005



Carolyn E. Pizoli, MD, PhD
Neurology
Particular Clinical Interests and Skills: Acquired brain injury such as concussion, traumatic brain injury, infection, and stroke; general pediatric neurology
MD Degree: Pennsylvania State University College of Medicine, 2003
Residency: Pediatrics, St. Louis Children's Hospital (Missouri), 2003-2005
Neurology, Barnes Jewish Hospital (Missouri), 2005-2006
Child Neurology, St. Louis Children's Hospital (Missouri), 2006-2008
Other Degree: PhD, Pennsylvania State University College of Medicine, 2003

SURGERY

Paul J. Mosca, MD, PhD
General Surgery
Particular Clinical Interests and Skills: General surgery and surgical oncology; melanoma, liver, and pancreatic tumors; upper and lower gastrointestinal tumors; breast tumors; soft tissue tumors
MD Degree: University of Virginia School of Medicine, 1995
Residency: General Surgery, Duke University Medical Center, 2002
Other Degrees: PhD, Biophysics, University of Virginia, 1994
MBA, Health Care Systems Management, DeSales University (Pennsylvania), 2011

A decade of *DukeMed Magazine*

With this issue, *DukeMed Magazine* celebrates 10 years of bringing readers the best of Duke Medicine—from the latest advances in research, education, and care to the perspectives of internationally renowned faculty leaders to the newest evolutions of this ever-changing enterprise. You're invited to take a look back at our archives at dukemedmag.duke.edu, and help us look forward by sharing your feedback, ideas, and suggestions at **dukemedmag@mc.duke.edu**.

2011 **Duke CME Calendar**

CONTINUING MEDICAL EDUCATION AT DUKE For more information on the courses listed below, please contact the Duke Office of Continuing Medical Education at 919-401-1200 or visit cme.mc.duke.edu.

On-site courses

	DATE	LOCATION	CREDITS
ANESTHESIOLOGY			
Ultrasound-Guided Regional Anesthesia Preceptorship	August 8-10, September 12-14, October 10-12, November 7-9	Durham, NC	20
Pre-ASA Conference: Ultrasound for Every Anesthesiologist	October 14	Chicago, IL	8
CARDIOLOGY			
Duke Clinical Medicine Series: Cardiology Conference	July 7-9	Asheville, NC	14
DIET & FITNESS			
The Missing Pieces: A Whole-Person Approach to Obesity Treatment	October 15	Durham, NC	8.75
ONCOLOGY			
ASCO Highlights 2011: Changing Landscape of Oncology Care	July 22	Cary, NC	6.75
PSYCHIATRY			
Visiting Fellowship in Transcranial Magnetic Stimulation	July 23-23, October 29-30	Durham, NC	13
RADIOLOGY			
21st Annual Duke Review Beach Course	July 25-29	Myrtle Beach, SC	17.5
Duke Advanced Course in Transradial Angiography and Intervention	October 20-21	Cary, NC	8.5
A Comprehensive Review of Musculoskeletal MRI	November 6-9	Maui, HI	18
SURGERY			
Innovations and Controversies in Female Pelvic Medicine and Reconstructive Surgery	July 8-9	Baltimore, MD	12.25
Masters of Minimally Invasive Surgery	September 22-24	TBA	14
INTERDISCIPLINARY			
Collaborative Anesthesia and Obstetric Care of the High-Risk Delivery: What's New in Patient Safety	November 12	Chapel Hill, NC	7.5

Online courses

	DATE	CREDITS
TeamSTEPPS e-Essentials	Through August 10	1
Acute Coronary Syndromes Management: Current State of Clinical Practice	Through October 12	0.5
Duke Clinical Medicine Series: Pulmonology Conference	Through November 4	0.5
Management of Patients with Acute Coronary Syndromes Following Percutaneous Coronary Intervention	Through December 13	1
Therapeutic Advances in the Management of Psychoses: Volume 2	Through February 24, 2012	1
Duke Virtual Overactive Bladder Clinic	Through March 8, 2012	0.75
Tumor Board: Clinical Updates on Glioblastoma	Through March 15, 2012	1
VISION Peer-to-Peer Podcast: Patient Adherence to Therapy	Through March 17, 2012	0.5
VISION Peer-to-Peer Podcast: Use of Test Results to Modify Antiretroviral Therapy	Through March 17, 2012	0.5
VISION Peer-to-Peer Podcast: Role of CD4+ and HIV Viral Load Tests in the Management of HIV	Through March 17, 2012	0.5
Update on High-Grade Gliomas	Through March 31, 2012	1
15th Annual Duke ACS Symposium Webcast	Through April 6, 2012	2
Duke Virtual Overactive Bladder Clinic: Activity 2	Through April 18, 2012	0.75
REDUCING COMPLICATIONS AND IMPROVING OUTCOMES IN ATRIAL FIBRILLATION CARE		
Mitigating Stroke Risk in AF	Through April 20, 2012	0.5
Addressing AF in Asymptomatic Patients	Through April 20, 2012	0.5
Addressing Suboptimal Anticoagulation in Patients with AF	Through April 20, 2012	0.5
Managing Burdensome AF-Related Symptoms	Through April 20, 2012	0.5
Prevention and Treatment of Venous and Arterial Thromboembolic Disease: Revisiting the Evidence-Based	Through April 20, 2012	2.5
CHAMBER Peer-to-Peer Podcast: Patient Management and Increasing Adherence	Through April 29, 2012	0.5
CHAMBER On-Demand Webinar: HER2 Signaling Network and Targeted Therapies	Through April 29, 2012	0.75

DukeMed Magazine
DUMC 3687
Duke University Medical Center
Durham, NC 27710

Non-profit Org.
U.S. Postage
PAID
Durham, NC
Permit #60

201013001

DukeMed MAGAZINE
VOLUME 11, ISSUE 1, SUMMER 2011

VALUE VERSUS VOLUME

Health care reform and the growing burden of chronic illnesses are driving big changes in how primary care works—from the community clinic to the academic medical center. Duke Primary Care's chief medical officer, John Anderson, MD, says Duke is rallying behind a new patient care philosophy—and real operational reforms—that promote value over volume, creating "a continuous, long-term, healing relationship between patients and providers, rather than an episodic one." Read more on page 36.

DukeMed Magazine is printed on Forest Stewardship Council-certified paper, manufactured from wood harvested from well-managed forests certified by Bureau Veritas Certification.