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Department of Medicine 2014 Annual Report

SCIENCE IN SERVICE
RESEARCH IN TRANSLATION
Cover Photo: Kavitha Prakash, MD, with patient Bridget Miola.
FROM THE CHAIR

Dear Colleagues and Friends,

The field of biomedical research is constantly evolving. With each day, an unexpected lab finding or an unforeseen clinical complication requires investigators to explore new territory and grapple with new research questions. This is happening across medical specialties in labs and clinics alike. Consider, for example, the following developments from just the past year:

- A new institute was launched, dedicated to researching part of the human genome once considered “junk”
- A paper was published on a new way to prevent one of the root causes of hospital-related morbidity and mortality among the elderly
- A clinical trial was developed aimed at curing HIV/AIDS worldwide
- Cutting-edge metabolism and nutrition research laid the groundwork for new personalized medicine programs

I’m proud to report that each of these is an accomplishment of the BIDMC Department of Medicine from 2014, and each reflects the robust research underway in the department.

I’m even prouder to note that each of these developments is an example of “Science in Service,” the title of this year’s report. Whether at the bench or the bedside—the lab or the clinic—the research efforts described in the following pages have a common goal: to help improve medicine and health care.

Furthermore, this research reflects the investigators behind it: members of the Medicine faculty who are inquisitive, analytic, thoughtful and, most importantly, committed—committed to applying their often highly specialized scientific expertise to the shared goal of improving people’s health and lives.

Our faculty also continues to lead the way in clinical care and medical education, which along with research, make up our tripartite mission. Although it focuses on biomedical advances, this report also highlights a year of record clinical growth for the department as well as continued innovations in teaching.

We in the Department of Medicine are fortunate to be part of local and global biomedical communities dedicated to advancing the type of translational research, clinical care and medical education celebrated in this report. We thank you for your collaboration and look forward to your continued partnership.

Sincerely,

Mark L. Zeidel, MD
Chair, Department of Medicine
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Acknowledgments

The Department of Medicine wishes to thank the division chiefs, administrators, partners and affiliates who contributed to this report. We also thank Gigi Korzenowski and Jerry Clark of Korzenowski Design, and Jennie Greene, Jacqueline St. Onge and Buck Strewler of the Department of Medicine. The photos in this report were taken by Mark Wilson and BIDMC’s Danielle Duffy and James Doyet, who also helped with photo research. Jane Hayward, of BIDMC Media Services, provided expert copy editing and design consultation. Last but not least, we thank the exceptional individuals featured in these pages for their contributions to this report.
BY THE NUMBERS

2014

HUMAN SUBJECT RESEARCH

In 2014, BIDMC’s Institutional Review Board reviewed a total of 336 human subjects research studies. These included clinical trials as well as educational and health services research.

Of the 336 studies reviewed, 121 were from the Department of Medicine: 51 (Full review), 49 (expedited) and 21 (exempt).

RESEARCH CORE REVENUE

- Revenue for all BIDMC institutional research cores: $2,533,956
- Revenue for the 9 institutional research cores led by Medicine faculty: $2,109,799
- Medicine revenue: 59.7% of BIDMC-wide revenue

NATIONAL INSTITUTES OF HEALTH AWARDS AND FUNDING

K Awards
- BIDMC-wide: 56
- Department of Medicine: 31

NIH Funding
- Top 3% of all institutions internationally
- #6 of 91 independent hospitals
- Department of Medicine received over $66,000,000

PUBLICATIONS

- Number of new publications by Medicine faculty and trainees in PubMed in 2014: 680

FACULTY DEGREES

- 556 MD
- 94 PhD
- 53 MD, PhD

CLINICAL VOLUME

- Inpatient discharges: 14,198
- Observation discharges: 4,862

2014

365

DAYS

CLINICAL REVENUE

$62,112,581

BIDMC AFFILIATED/LICENSED COMMUNITY HEALTH CENTERS

- Over 100 members of the Department of Medicine practice at six BIDMC affiliated/licensed community health centers.
- These six community health centers accounted for nearly 180,000 ambulatory visits and 3,000 admissions to BIDMC last year.

CARE POINTS

- Patient days in hospital: 86,004
- Individuals with a primary care provider in Medicine (“covered lives”): 41,000
- Work relative value units (RVUs): 867,527
- Endoscopic procedures: 26,227
- Cardiac catheterizations: 4,318

SAMUEL SNIDER, MD, WITH PATIENT JIM GAUDER

2014 BIDMC-WIDE RESEARCH FACILITIES

255,000
square feet

MEDICINE RESEARCH FACILITIES

150,000 square feet

INPATIENT DISCHARGES: 14,198

OBSERVATION DISCHARGES: 4,862

PATIENT DAYS IN HOSPITAL: 86,004

INDIVIDUALS WITH A PRIMARY CARE PROVIDER IN MEDICINE (“COVERED LIVES”): 41,000

WORK RELATIVE VALUE UNITS (RVUS): 867,527

ENDOSCOPIC PROCEDURES: 26,227

CARDIAC CATHETERIZATIONS: 4,318

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OF THE 336 STUDIES REVIEWED, 121 WERE FROM THE DEPARTMENT OF MEDICINE: 51 (FULL REVIEW), 49 (EXPEDITED) AND 21 (EXEMPT).

RESEARCH CORE REVENUE

- REVENUE FOR ALL BIDMC INSTITUTIONAL RESEARCH CORES: $2,533,956
- REVENUE FOR THE 9 INSTITUTIONAL RESEARCH CORES LED BY MEDICINE FACULTY: $2,109,799
- MEDICINE REVENUE: 59.7% OF BIDMC-WIDE REVENUE

NATIONAL INSTITUTES OF HEALTH AWARDS AND FUNDING

K AWARDS

- BIDMC-WIDE: 56
- DEPARTMENT OF MEDICINE: 31

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- TOP 3% OF ALL INSTITUTIONS INTERNATIONALLY
- #6 OF 91 INDEPENDENT HOSPITALS
- DEPARTMENT OF MEDICINE RECEIVED OVER $66,000,000

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- OVER 100 MEMBERS OF THE DEPARTMENT OF MEDICINE PRACTICE AT SIX BIDMC AFFILIATED/LICENSED COMMUNITY HEALTH CENTERS.
- THESE SIX COMMUNITY HEALTH CENTERS ACCOUNTED FOR NEARLY 180,000 AMBULATORY VISITS AND 3,000 ADMISSIONS TO BIDMC LAST YEAR.

CARE POINTS

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SAMUEL SNIDER, MD, WITH PATIENT JIM GAUDER
On February 24, 2014, Robert C. Moellering, Jr., MD, died at the age of 77. He left behind his beloved wife Mary Jane Ferraro and his children Anne, Catherine and Robert, as well as scores of admiring and devoted colleagues, friends and former trainees.

After graduating from Harvard Medical School (HMS) in 1962, Bob completed his residency in internal medicine and a fellowship in infectious disease at Massachusetts General Hospital (MGH). He was then hired as faculty in the MGH Infectious Disease Unit, where he was quickly recognized as a stellar clinician with encyclopedic knowledge and impeccable clinical judgment as well as a remarkably productive researcher—a reputation he maintained throughout his career.

In 1981, Bob was named Physician-in-Chief and Chair of the Department of Medicine at New England Deaconess Hospital and the Shelbly Warren-Mallinckrodt Professor at Harvard Medical School. Starting with a department of only 20 full-time faculty primarily in cardiology, hematology/oncology, rheumatology and pulmonology, he recruited nationally- and internationally-recognized faculty in all of the subspecialties of a modern department of medicine. Under his 15-year chairmanship, the Department was also granted full academic appointing privileges at HMS—a formidable accomplishment.

After the merger of New England Deaconess Hospital and Beth Israel Hospital in 1996, Bob served several leadership roles at the new Beth Israel Deaconess Medical Center, including Chair of the Department of Medicine and Herman L. Blumgart Professor of Medicine from 1998 through 2005. Providing wisdom, judgment and integrity, Bob helped lead the medical center through difficult post-merger times to its current position as a preeminent academic medical center and pillar of strength at HMS.

An extraordinary academic, Bob was an internationally-recognized leader in infectious diseases with particular interests in mechanisms of antibiotic action and antibiotic resistance, and the development of new antimicrobials. He published more than 430 original articles; and he served as Editor-in-Chief of Antimicrobial Agents and Chemotherapy for a decade, as Editor-in-Chief of Infectious Disease Clinics of North America, and as Editor of the Sanford Guides to Antimicrobial Therapy and HIV/AIDS Therapy.

Throughout his career, Bob maintained a particular research interest in the Enterococcus spp. He defined the mechanism whereby cell wall-active penicillins and aminoglycosides interact to achieve bactericidal synergism against the enterococcus—a phenomenon that has been the cornerstone of therapy for enterococcal endocarditis. He contributed extensively to the understanding of vancomycin resistance in enterococci and to the development of resistance to linezolid in Staphylococcus aureus. Bob received numerous prestigious awards, including the Garrod Medal from the British Society of Antimicrobial Chemotherapy, the Feldman and Maxwell Finland Awards from the Infectious Disease Society of America (IDSA), the Hoefft-Rousell Award from the American Academy of Microbiology and the Alexander Fleming Award for Lifetime Achievement from the IDSA. Bob was a Fellow of the American Academy of Microbiology, a Master of the American College of Physicians and a Fellow of the IDSA, where he was also President in 1991.

Bob was a spectacular clinician with an uncanny ability to solve the most complex clinical conundrums. He was also committed to medical resident education and mentored countless trainees. Throughout his remarkable career, Bob maintained a fundamental decency, gentleness, integrity, humility and generosity.

REMEmBERING

ROBERT C. MOELLERING, JR., MD

Adolf W. Karchmer, MD | George M. Eliopoulos, MD | Peter F. Weller, MD

He had a genuine interest in the well-being and success of those around him. In his own words at the time of his retirement as Chair of the Department of Medicine, Bob offered thanks to his colleagues and trainees: “The ability to work with you as a teacher, as a mentor, has provided my greatest professional satisfaction. You are my legacy. Your success is my success and will be forever.” Bob’s enduring legacy was on display at this fall’s Celebration of Life Symposium, where over 200 friends, colleagues and trainees acknowledged his enormous impact on their lives and careers. (Watch video from the Celebration of Life Symposium.)

New England Deaconess Hospital, Division of Infectious Diseases, c. 1984.

Top Row: Scott Hammer, MD, Robert C. Moellering, Jr, MD, Adolf W. Karchmer, MD, and George Eliopoulos, MD (left to right).

Bottom Row: Davis Allan, MD, Susan Davidson, MD, Jennifer Daly, MD, Claude Thouvenot, MD, and Francis Label, MD (left to right).
Charles Safran, MD, Chief of the Division of Clinical Informatics, recalls the founding of the Division at Beth Israel Hospital over 40 years ago. “Back then, it was called ‘Computer Medicine,’” he says. “We were one of the first academic divisions focused on the use of computers in health care.”

Since then, the field has become essential, integrating technology into clinical practice. Decision support, clinical protocols and patient education are all part of the clinical informatics toolkit. But perhaps the most important innovation to come out of the field is the electronic health record (EHR). Here at BIDMC, the Online Medical Record (WebOMR)—which Safran and his team originally developed in 1989—has become the standard for storing and sharing patient information across BIDMC’s ever-growing provider network.

Just as BIDMC has WebOMR, most other health care networks have their own EHRs. But these systems rarely “talk” to each other, meaning information doesn’t travel with patients, who may receive care in various places. So when Safran and his team began to envision a next-generation EHR that could help ensure continuity of care and information-sharing across care providers, they looked beyond the US to an environment where there were fewer systems in place. In fact, they looked well beyond: to Kuwait, a small country at the top of the Persian Gulf. There they partnered with the Dasman Diabetes Institute to create the Knowledge-Based Health Record (KBHR), a clinically intuitive and patient-centric EHR that is on its way to becoming, in the words of Safran, “the central nervous system of health care efforts throughout Kuwait.”

In addition to being a clean slate for EHRs, Kuwait has one of the highest rates of diabetes in the world. Because managing the disease requires close coordination of primary care physicians and specialists, a unified and accessible health record is especially important in diabetes care. “Treatment and research are strongly impacted by KBHR in that it forms a single source of truth for both research and clinical data,” says Henry Feldman, MD, Chief Information Architect of the KBHR team at BIDMC. “You don’t have to combine data from many systems to come up with an answer about the patient.”

This, as Feldman notes, is useful not only from a clinical standpoint but from a research perspective as well. The KBHR team is working on an exciting addendum to KBHR’s information repository: a system called I2B2, developed as part of Harvard’s Catalyst program. “I2B2 is a research database for integrating technology and informatics at the bedside,” explains Safran. “It not only allows administrators and scientists to access records for performance evaluation or basic research, but it allows physicians to ask, ‘Have we seen a patient like this before?’ And if so, what happened? What were the diagnoses, the complications, the best medical regimens?”

Antoine Kaldany, MD, of Joslin Diabetes Center and BIDMC’s Division of Nephrology, spearheaded the BIDMC-Dasman partnership and agrees that Kuwait and Dasman, in particular, have been ideal for this project. “Kuwait’s citizens are open-minded and eager to improve their health,” says Kaldany. “And Dasman’s Director-General, Dr. Kazem Behbehani, and his team have been exceptional partners.” In fact, the collaboration has been so successful that Kaldany is leading efforts to broaden the international partnership to include Malaysia and Indonesia. Behbehani, who launched global eHealth as a World Health Organization executive in the early 1990s, believes that KBHR has the potential to revolutionize health care in Kuwait and beyond. He says, “KBHR will help providers be more efficient and to make better clinical decisions for their patients. We hope to serve as a global model for the best technology that clinical informatics has to offer.”

EBKaldany, Charles Safran, MD, Henry Feldman, MD, PhD, Adeeba Kamarulzaman, MD, Antoine Kaldany, MD, and Kazem Behbehani, PhD (left to right).
TRAILBLAZING RESEARCH IN HIV

Since its launch two years ago, the Center for Virology and Vaccine Research (CVVR) has advanced the field of HIV research. The Center’s Director, Dan Barouch, MD, PhD, and his team have made strides in the areas of both vaccines and therapy for HIV.

The CVVR has had breakthroughs in both areas in the last year: a new HIV vaccine entered clinical trials with industry partner Johnson & Johnson at the end of 2014, and Barouch served as senior author on a paper exploring the use of monoclonal antibodies—cloned proteins that encourage a subject’s immune system to attack diseased cells—to treat HIV.

The new vaccine, Barouch says, is the sixth clinical vaccine trial that the Center has initiated in recent years. This one in particular has potential to become a “global” vaccine—meaning it would be useful worldwide rather than just for a specific region. The proof-of-concept preclinical studies showed for the first time that “mosaic” HIV antigens—a blend of three major HIV proteins—gave rhesus monkeys partial protection against simian-human immunodeficiency virus (SHIV, a virus similar to HIV that infects monkeys). Barouch says, “The results suggest a path forward for the development of a global HIV vaccine and give us hope that such a vaccine might indeed be possible. A global vaccine would offer major biomedical and practical advantages.”

In the area of HIV treatment, Barouch and his team received a $20 million grant from the Bill & Melinda Gates Foundation to develop potent virus-specific monoclonal antibodies as a novel HIV therapy and potential cure strategy. The team studied the effects of PGT121, an antibody that has been observed to neutralize most strains of HIV-1 worldwide, in treating SHIV infection in rhesus monkeys. SHIV-infected monkeys responded remarkably well to this treatment: following a single antibody infusion, levels of the virus dropped to undetectable levels in under a week. Additionally, in monkeys with lower initial levels of the virus, undetectable levels of the virus were maintained even after antibody infusions stopped. “The data strongly encourage the development of monoclonal antibodies as a novel therapy for HIV in humans,” says Barouch. The Gates grant will support the continuation of this research into proof-of-concept studies in monkeys and phase I and II clinical trials in HIV-infected humans.

The CVVR team continues to work toward both preventing and eradicating HIV. Looking to the future, Barouch says, “We’re still in exploratory phases, but we’re actively working on strategies for HIV vaccines and cures.” Now that HIV/AIDS is largely a manageable but chronic condition, Barouch says, “Our focus is shifting. The goal is to eliminate it.”
TARGETED RESEARCH AND PERSONALIZED CARE IN METABOLIC DISEASE

For many of the nearly 79 million US adults who suffer from obesity, blanket recommendations like “lower your carbohydrate intake” or “get more exercise” have proven ineffective. So researchers and clinicians at BIDMC are looking more closely at obesity’s neurobiological, hormonal and metabolic roots in the hopes of developing new, more targeted and personalized treatments—treatments that work.

This is the goal of BIDMC’s new Center for Nutrition and Metabolism. The Center, spearheaded by Chief of the Division of Endocrinology, Anthony Hollenberg, MD, and endocrinologist Terry Maratos-Flier, MD, is an interdisciplinary, BIDMC-wide initiative to combine obesity research and clinical care and to encourage the collaboration of basic researchers, translational researchers and clinicians. The Center will have four components: a Personalized Care Center led by Jody Dushay, MD, MMSc; a Center for Translational Medicine led by Dushay, Maratos-Flier and Chris Mantzoros, MD, PhD; community outreach programs; and a Discovery Laboratory consisting of 15 existing BIDMC research laboratories.

Among the investigators contributing to the Discovery Laboratory is Mark Herman, MD, whose work focuses on the relationship between nutrient intake and metabolic disease. Herman and fellow researchers such as Evan Rosen, MD, PhD, Young-Bum Kim, PhD, and Pavlos Pissios, MD, are working closely with Dushay in the Center for Translational Medicine to move their basic research from the bench to the bedside. Herman and Dushay’s work is aimed at weight loss efforts, specifically through personalized nutrition consultation.

One recent study led by Herman, Dushay and Maratos-Flier is particularly exciting in its potential to improve nutrition-based care. Earlier studies have linked high levels of fibroblast growth factor 21 (FGF21, a metabolic hormone that is made predominantly in the liver) with metabolic syndrome, a common constellation of risk factors that can lead to obesity, diabetes and heart disease. The BIDMC team was curious about regulation of FGF21 given that interventions known to regulate it in animal models have not been effective in humans. They gave identical doses of fructose and glucose—simple sugars found in table sugar, high-fructose corn syrup and fruit—to lean individuals and to individuals with metabolic syndrome. Their findings were groundbreaking: FGF21 responds acutely and robustly to fructose ingestion, but not glucose ingestion. Moreover, this response was increased in people with metabolic disease, an important distinction as fructose ingestion and elevated levels of FGF21 have previously been associated with cardiometabolic disease.

This finding is a key step toward developing personalized, nutrition-based treatment. The relationship between fructose and FGF21 is the first example, Herman says, of a nutrient having a direct, measurable effect on the level of a specific hormone, aside from the well-known ability of glucose to stimulate insulin. This is also among the first studies to show that fructose ingestion has variable effects in humans. “We’re very interested in how different people react to different diets and regimens,” says Herman. “For the first time, we can begin to understand susceptibility [to nutrient-induced disorders] in a focused way.” The eventual goal is to find a genetic basis for individuals’ responses to different nutrients, which will allow for personalized risk assessments and targeted prevention and treatment.

As Dushay notes, the purpose of the Personalized Care Center will be to use this type of research and “apply it to people directly.” Indeed, patients at the Center will have the option of participating in cutting-edge clinical trials of new, personalized therapies—to treat disease but also to prevent it to begin with. “We want to be forward-thinking about this,” says Dushay. “We want to be preventative by developing novel ways to evaluate and reduce, or ideally eliminate, risk for our patients. That’s the ultimate goal.”
UNDERSTANDING THE PATIENT EXPERIENCE:
BEYOND THE PRESCRIPTION

Ted Kaptchuk started research on alternative medicine at BIDMC in 1990. As he administered acupuncture and other treatments he had learned while training in China, he noticed that his patients’ responses to treatments differed from those of his teachers’ Chinese patients.

Given that the therapies were the same, he wondered what else might be impacting patients’ outcomes. He became fascinated by the question of what factors—other than clinical therapies themselves—influence patients’ responses.

Kaptchuk, now a professor at Harvard Medical School (HMS) and Director of the Program in Placebo Studies and the Therapeutic Encounter at BIDMC and HMS, investigates elements of health care that, he says, are “often ignored in the pharmacocentric world.” In particular, Kaptchuk has become one of the world’s leading experts on the “placebo effect”—a phenomenon in which patients or research subjects report improvement in their health when treated with inactive substances. (Kaptchuk chuckles at this: “The effect of an inert substance is an oxymoron, of course.”) The pharmacology of a drug explains only part of the patient’s experience, he says, and his ultimate goal is to “illuminate what’s in the dark.”

A study published this year in Science Translational Medicine helps to do just that by quantifying how much pain relief is attributed to a drug’s pharmacological effect versus the placebo effect. Working with Rami Burstein, PhD, Director of Pain Research in BIDMC’s Department of Anesthesia, Critical Care and Pain Medicine, Kaptchuk studied over 450 migraine headaches in 66 people. After an initial headache episode, where patients received no treatment and documented their symptoms 30 minutes after the attack and again two hours later, participants were each given six envelopes with pills to take during each of their six subsequent migraine attacks. Two envelopes were labeled “Maxalt” (the migraine drug rizatriptan), intended to elicit a positive expectation from the participant; two were labeled “placebo” to elicit a negative expectation; and two were labeled “Maxalt or placebo” to elicit a neutral expectation. Despite the labels, in each pair of envelopes, one envelope actually contained a Maxalt tablet and one contained a placebo pill. During subsequent attacks, patients again reported on their symptoms 30 minutes after and then two hours later.

The team’s striking results added significantly to the existing body of research pointing to the power of the placebo. “Though Maxalt was superior to the placebo in alleviating pain, under each of the three messages the placebo effect accounted for at least 50% of the subjects’ overall pain relief,” says Kaptchuk. For example, when the Maxalt tablet was labeled “Maxalt,” participants reported almost double the relief than when the Maxalt was labeled “placebo.” And there was no difference between placebo labeled “Maxalt” and Maxalt labeled “placebo.” The effectiveness of the drug without positive expectation was similar to the placebo with a positive expectation.

There was another surprising finding as well: even when participants received a placebo labeled “placebo,” they reported more pain relief than with no treatment. As Kaptchuk explains, the idea of an “honest” placebo runs contrary to the idea that patients respond to placebos because they think they’re getting active drugs and suggests that even known placebos could be used to boost pharmaceutical effects. This is particularly exciting to Kaptchuk, who seeks to “improve clinical outcomes of effective and marginally effective drugs.”

More broadly, Kaptchuk’s goal is to understand the ways in which care provided to patients—including the labels on medications and other forms of communication—has powerful impacts on patient responses. He believes that medicine today downplays verbal and nonverbal communication, which he suspects has powerful effects on patients’ responses to treatment. “Ultimately, it’s what the provider does that isn’t the drugs that I’m trying to quantify,” he says.
According to medical historians, the earliest reference to delirium was in the first century AD by the Roman writer Celsus, who described it as a mental disorder that occurred during fever or head trauma.

Today, delirium is more precisely defined as the sudden onset of confusion or change in mental status that can be induced by physical illness, surgery or hospitalization—often confused with but clinically distinct from dementia. Affecting up to 42% of medical inpatients, delirium is associated with long-term complications for 20% of people and with as much as a 33% rate of hospital mortality among those 65 and older.

Despite the toll it takes, delirium among hospital patients—particularly elderly ones—has historically been considered “somewhat inevitable and unavoidable,” explains Sharon Inouye, MD, MPH, a BIDMC geriatrician in the Division of Gerontology and Director of the Aging Brain Center at the Institute for Aging Research, Hebrew SeniorLife (HSL). This changed in 1999, however, when Inouye and colleagues published findings on a new intervention called the Hospital Elder Life Program (HELP). Using the program, delirium was shown to be preventable and treatable through fairly basic steps like better hydration and mobilization.

These findings have informed national delirium guidelines and have laid the foundation for several delirium prevention and treatment programs. One such program is the Global Risk Assessment and Careplan for the Elderly (GRACE) program, developed at BIDMC and championed by Melissa Mattison, MD, a hospitalist in the Division of General Medicine and Primary Care. Using the HELP protocol as a starting point, GRACE standardized a “bundle,” giving health care providers the necessary tools to prevent and treat delirium in a “very pragmatic way,” says Mattison. A study of the bundle published in 2014 showed that elderly patients were less likely to be prescribed high-risk drugs like haloperidol or morphine, and more likely to be discharged home than to extended care facilities.

To better understand the underlying causes of delirium, Inouye and Marcantonio have partnered on the Successful Aging after Elective Surgery (SAGES) study funded by the National Institute of Aging, which is examining novel risk markers for delirium, including plasma biomarkers, advanced neuroimaging markers and cognitive reserve markers. Marcantonio says, “There are so many possible causes of delirium that we’re often making an educated guess when we try to treat people. This research—developing an evidence base—is critical to making rational treatments to help our patients.”

This year, Marcantonio and Inouye developed and validated the 3D-CAM, a three-minute assessment tool for diagnosing delirium. The 3D-CAM is part of a broader CAM (Confusion Assessment Method) toolkit that is widely used to identify delirium and rate its severity. “This measure holds great promise to improve understanding of the effects of delirium on clinical care, prognosis, pathophysiology and response to treatment,” Inouye says.

A SHIFTING MINDSET IN DELIRIUM PREVENTION AND TREATMENT

Despite these successful prevention and treatment programs, there’s still much to be understood about why and how delirium so profoundly affects the human body and brain. As BIDMC’s Edward Marcantonio, MD, SM, a geriatrician and Section Chief for Research in the Division of General Medicine and Primary Care, explains, “Our current understanding of delirium is comparable to knowing that cholera could be stopped by sterilizing water without understanding that there was a bacteria involved or how it caused disease.”

Here at BIDMC this body of research is already benefiting older patients in real time, every day. In fact, by preventing and treating delirium, the Medical Center is also addressing falls, which as Mattison explains, are one of the other primary causes of morbidity in hospitalized older people. She notes, “Delirium impacts people’s health and quality of life in so many ways. This is one more reason to take it seriously.”
At BIDMC, there is a select group of people who find themselves both running dynamic business enterprises and conducting cutting-edge biomedical research. They are the research faculty who lead BIDMC’s 20 institutional core facilities. These “cores” are small businesses that serve BIDMC as well as the broader biomedical community—both nationally and internationally. They operate as fee-for-service establishments and their directors are responsible for running the front and back ends of these small companies.

The Department of Medicine has particularly close ties to these enterprises: of BIDMC’s 20 cores, 9 are led by Medicine research faculty. Towia Libermann, PhD, and Manoj Bhasin, PhD, both faculty in the Division of Interdisciplinary Medicine and Biotechnology (IMBIO), are among them. They direct the Genomics, Proteomics, Bioinformatics and Systems Biology Center, with Libermann administrating Genomics and Proteomics and Bhasin running Bioinformatics and Systems Biology. Genomics and Proteomics provides the “hardware”—high-end equipment and methodologies for procedures like gene mutational analysis and genome-wide quantitative protein and gene profiling. Bioinformatics and Systems Biology, on the other hand, is the “software,” offering services like experimental design assistance, analysis of omics data in disease pathophysiology, and identification of diagnostic, prognostic and predictive biomarkers.

Through their core, Bhasin and Libermann have collaborated with several top medical research institutions, including Dana-Farber Cancer Institute, Tufts Medical Center, Massachusetts General Hospital, Boston Children’s Hospital, Brigham and Women’s Hospital and Boston University. One of their longest-running partnerships is with Massachusetts General Hospital’s Benson-Henry Institute for Mind Body Medicine. Libermann and Bhasin have co-published multiple papers with Benson-Henry’s Herbert Benson, MD, Gregory Fricchione, MD, and John Denninger, MD, PhD, over the last decade. “Our partnership with the Institute began when they came to us looking for genomics information,” Libermann says, “but it turned into an ongoing collaboration.” Their work focuses on the “relaxation response”—a phenomenon in which practices like meditation or prayer stimulate brain signals resulting in organs slowing down and increased blood flow to the brain.

Last year, Libermann and Bhasin’s work with the Institute helped record, for the first time, rapid and quantifiable changes in gene expression induced by the relaxation response. Using bioinformatics techniques and equipment available through their core facility, Bhasin and Libermann assisted in collecting and analyzing subjects’ blood samples before, immediately after and 15 minutes after listening to a relaxation response-eliciting CD. The blood samples provided information showing selective changes in gene expression, and these data were used to narrow down which biological pathways had been affected the most. “We wanted to find out which genes had more push or pull compared to others, so we focused on the systematic nature of gene interaction,” notes Bhasin, referring to their analysis of targeted networks of genes rather than individual instances of enhanced or repressed gene expression.

The team found that regularly partaking in relaxation response activities further increases the body’s immediate gene expression response. They also pinpointed some of the major biological pathways involved: energy metabolism, insulin secretion, inflammatory responses and stress pathways.

While conducting sophisticated research, Libermann and Bhasin—like other BIDMC core leaders—are also responsible for gauging competitive pricing and finding innovative ways to attract customers. When asked if they practice the relaxation techniques their research has shown to be beneficial, the two investigators smile. “We know it’s helpful,” says Bhasin. “It’s just finding the time.”
Rhodesian trypanosomiasis, also called acute African sleeping sickness, takes a heavy toll when left untreated. Transmitted by the tsetse fly, the disease is most common in eastern Africa and can cause fever, anemia and death from cardiac failure. In response, evolution has favored genetic variations that are protective against the disease: namely, two common coding sequence variants of a gene called apolipoprotein L1 (APOL1).

In the United States today, these protective gene variants are common among people of African descent. However, the same mutations that have been protective against acute African sleeping sickness have been shown to increase risk for a different, though also potentially fatal, condition: kidney disease.

The BIDMC research team that made this discovery is headed by Martin Pollak, MD, Chief of the Division of Nephrology. He and fellow investigators found that APOL1 increased risk of several forms of non-diabetes-related kidney disease, including hypertension-attributed end-stage renal disease (ESRD), idiopathic focal segmental glomerulosclerosis (FSGS) and HIV-associated nephropathy. They originally published these findings in 2010. Since then, Pollak's team—along with David Friedman, MD, Seth Alper, MD, PhD, and members of their labs—has continued to investigate the mechanism by which APOL1 impacts the kidney. “We’re attacking the problem in a lot of different ways,” Pollak says. “We’re doing anything we can think of that might be informative.” This includes developing human, mouse and fish models to better understand the genetics, cell biology and biochemistry of APOL1’s interaction with the kidney.

The APOL1 gene variants are associated with more than a ten-fold increase in risk for FSGS and more than a seven-fold increase in risk for hypertension-attributed ESRD. And the variants are responsible for up to 40% of kidney disease in African Americans who receive renal replacement therapy with either dialysis or kidney transplantation. This genetic association is one of the strongest ever reported for a common disease and provides an explanation for the higher rates of kidney disease in African-Americans relative to Caucasians. “Nearly a third of the half million people in the US with kidney disease are African American,” says Friedman. “We hope to help eliminate this disparity by further understanding how the APOL1 gene confers this risk.”

The importance of this work has been reinforced by the National Academy of Sciences, who elected Pollak as a new member this year—one of only two elected from BIDMC and 84 nationally. While the award is given to individuals for their “distinguished and continuing achievements in original research” and not for specific findings, BIDMC’s Chief Academic Officer Vikas Sukhatme, MD, PhD, notes, “Dr. Pollak’s election to the National Academy of Sciences is a reflection of this critically important work.”

According to Pollak, his ultimate goal is to save lives by better preventing, screening and treating individuals who carry this genetic mutation and are therefore at increased risk of kidney disease. Currently, Pollak explains, “There are no good treatments for these kidney diseases. We want to learn more about the mechanism so that we can interfere with the pathway.” Sukhatme adds, “This innovative research is a tremendous example of how laboratory discoveries reach our patients and could help clinicians to better tailor treatments to specific forms of kidney disease.”
Robert Banzett, PhD, and Robert Lansing, PhD, have been research collaborators for 30 years despite two apparent barriers. First, they work some 2,600 miles apart: Banzett has worked at Harvard since 1976 and at BIDMC since 2006, while Lansing’s primary post is at the University of Arizona in Tucson. Second, they have very different areas of expertise: Banzett is a physiologist whereas Lansing is a psychologist. In other words, one focuses on the body, and the other, the mind.

However, through the years, the pair has overcome and even benefited from these differences. Undaunted by distance, Lansing Skypes in to weekly faculty meetings with Banzett and the team at BIDMC, which includes Richard Schwartzstein, MD, and Carl O’Donnell, ScD, MPH, also longtime collaborators. As for their areas of expertise, it’s actually their differences that make possible Lansing and Banzett’s collaboration, which they call “psychophysiology.” More specifically, their research focuses on dyspnea, or shortness of breath, and the physiological mechanisms behind it as well as the psychological factors involved in measuring it.

Banzett compares dyspnea to pain, a symptom that health care providers have been monitoring for years, using the now-familiar 1-10 scale. But health care protocols rarely include questions about dyspnea, despite research indicating that it’s often an equal or better indicator of morbidity and mortality than pain. Also, while pain is more common than dyspnea, some of Banzett and Lansing’s research suggests that shortness of breath causes more anxiety than peripheral pain. (Visceral pain and dyspnea, they’ve found, can induce similar psychological responses.)

“Not only have we been leaving our patients to suffer from shortness of breath—and the related anxiety—in silence and without treatment, but we’ve been ignoring a valuable clinical indicator that should be used to inform prognosis and treatment plans,” says Banzett. But this is starting to change. Now, thanks to Banzett and Lansing’s research—funded mostly by the Nursing Institute at the National Institutes of Health—on every Medical-Surgical floor at BIDMC, the initial patient intake process includes two questions about dyspnea, and patients are asked about shortness of breath during every shift. Kathy Baker, RN, MSN, another key member of the team, has been instrumental in implementing this process among the nursing staff.

Banzett and Lansing are also working to expand the treatments available to patients suffering from dyspnea. One of the theapeutics they’re investigating is particularly innovative in that it’s non-narcotic. It relies on an aerosol drug that sensitizes the stretch receptors in the lungs and creates the illusion of larger breaths, which has the potential to give patients some relief from the feeling of being short of breath—a terrible sensation with which Banzett is all too familiar, having had asthma since childhood.

Finding and improving ways to systematically address, measure and manage dyspnea has long been a personal passion of Banzett’s. He recalls being in the hospital with his elderly father, noticing that the pain scale card was reliably stored near the head of every patient’s bed. “My hope,” he says, “is that before I die, the nurse will turn that card over and on the other side will be a scale for shortness of breath.”

Banzett and Lewis Adams, PhD, took and published the first images of dyspnea in the brain in 2002.
THE NEXT GENERATION OF INVESTIGATORS:
SPOTLIGHTS IN RESIDENT RESEARCH

“The important thing is not to stop questioning,” said Albert Einstein. This is a valuable message for our internal medicine residents, who are given every opportunity to ask research questions—and often find answers.

Haider Warraich, MD

Patients with the type of heart rhythm disturbance known as atrial fibrillation are at risk of strokes. Blood pools due to the failure of the atrial chambers of the heart to contract, forming clots that float to the brain. Haider Warraich, MD, teamed up with Warren Manning, MD, to review echocardiograms of patients with episodic, paroxysmal atrial fibrillation. He found, surprisingly, that in some patients, the left atrial appendage was fibrillating in isolation even when the remainder of the atrium and the other chambers were contracting normally. This could explain why those who have only episodic atrial fibrillation are nonetheless at risk of stroke.

Sushrut Jangi, MD

What triggers exacerbations of multiple sclerosis (MS)? Sushrut Jangi, MD, brought a novel idea to Howard Weiner, MD, in the Partners Multiple Sclerosis Center: Perhaps relapses of multiple sclerosis could be due to changes in the gut microbiome. Thus was launched a major effort to collect samples and sequence the gut microbiome in MS patients, which is now bearing first fruit and demonstrating clear differences between the microbiome in MS patients and normal controls. Jangi continues work on the project post-residency.

Chris Richards, MD

Leaders of the Internal Medicine Residency Program have long wondered whether students who undertake a heavy clinical elective load in the fourth year of medical school are better prepared for internship. In a collaboration with Program Director Chris Smith, MD, resident Chris Richards, MD, compared the intensity of fourth-year course work with multi-source performance evaluations collected by the residency program, observing that each intensive fourth year course (e.g., subinternship) significantly reduced the odds of a low clinical evaluation score in a multivariate analysis. These findings suggest that perhaps subinternships should be emphasized more during the fourth year of medical school.

Kristin MacArthur, MD

Standardizing care is an important precept for health care quality. Kristin MacArthur, MD, evolved a standard protocol for the treatment of acute pancreatitis in the Emergency Department and ICU, centering on early fluid resuscitation, early nutrition and a pancreatology consult. With a multidisciplinary team led by Steven Freedman, MD, PhD, Chief of the Division of Translational Research, MacArthur showed that clinical outcomes were improved in patients treated per protocol, as compared with pancreatitis patients treated at the clinician’s discretion.

For the past nine years, three-quarters of our internal medicine residents have undertaken research projects like these. Helped by the program to find mentors, they learn the basics and develop their research projects in a two-week course in clinical study design and methods, taught by Ken Mukamal, MD, MPH. Though brief, the course is rigorous—with over 50 hours of faculty contact time—and effective. And the result of the course? Many novel projects like these, and 160 original papers published by residents since 2008.
For much of the history of genetics, researchers focused on parts of the genome that code for proteins. This is the familiar “genetics” from entry-level biology courses: DNA (deoxyribonucleic acid), which makes up genes, communicates via RNA (ribonucleic acid). The genetic code is copied to messenger RNA (mRNA), which delivers genetic information to ribosomes. Ribosomes read the code to produce proteins. These proteins ultimately define physical traits.

Alongside these portions of DNA and mRNA, though, are portions of RNA that do not code for proteins, thus called “non-coding RNA.” Scientists originally labelled these regions “junk.”

But in 2010, researchers based at BIDMC began to see these “junk” portions of the genome in a new way, hypothesizing that non-coding RNA could play a part in gene regulation in conjunction with another type of RNA called microRNA. MicroRNA binds to mRNA—unlike mRNA, it doesn’t transport genetic information from DNA to ribosomes. Rather, microRNA controls protein production by binding to and silencing mRNA, thus preventing genetic information from being translated into proteins. The team guessed that non-coding RNA could act as decoys, binding to microRNA before it binds to mRNA—meaning that “junk” RNA actually plays a critical role in controlling which proteins are produced and when. Subsequent research confirmed this, and even linked this regulatory function to genes associated with cancer and tumor formation. The team’s findings were published in Nature.

In July 2014, Pier Paolo Pandolfi, MD, PhD, who served as a senior author on that seminal paper, helped found the new Institute for RNA Medicine (iRM) at the BIDMC Cancer Center. The Institute is dedicated to investigating non-coding RNA—in particular, adapting its regulatory function for therapeutic purposes, especially in cancer. The iRM is headed by Frank Slack, PhD, who recently joined the BIDMC team from the Department of Molecular, Cellular & Developmental Biology at Yale. “Non-coding RNAs have revealed themselves to be great novel targets of anti-cancer therapies,” says Slack, whose research has led to major breakthroughs in understanding microRNA function. Non-coding RNA expert John Rinn, PhD, has also joined Slack and Pandolfi in launching the Institute.

“How many musketeers were there?” Pandolfi asks, comparing himself, Rinn and Slack to Dumas’ famed trio. Their D’Artagnan, he says, is BIDMC scientist Daniel Tenen, MD, whose expertise in gene regulation is central to the iRM’s research goals. Tenen’s work implicates non-coding RNAs in switching genes on or off by regulating DNA methylation. Pandolfi also credits Jeffrey Saffitz, MD, PhD, Chair of Pathology and a co-founder of the new Institute. With Slack at work alongside Pandolfi, Rinn, Tenen and the team’s newest addition, pathologist Andrew Beck, MD, PhD, BIDMC has consolidated a significant international presence in RNA medicine.

BIDMC’s CEO Kevin Tabb, MD, calls the Institute as the “first of its kind,” noting that BIDMC’s state-of-the-art facilities give the RNA a particular edge. The Cancer Center’s “mouse hospital” is an especially valuable asset. In fact, the I RM will use “co-clinical trials,” a model developed by Pandolfi in which human clinical trials and animal studies are conducted simultaneously to speed the testing of targeted cancer therapies. “The I RM will provide an interdisciplinary approach to expedite our scientific discoveries,” says Pandolfi. “By bringing together a variety of experts, we can identify new non-coding RNA pathways, determine targets for therapeutic intervention and test candidate drugs.”
Mark Zeidel, MD
Received the 2014 Robert H. Williams, MD, Distinguished Chair of Medicine Award from the Association of Professors in Medicine. The award is presented annually to a physician who has demonstrated outstanding leadership as the chair of a department of internal medicine.

Allergy and Inflammation
Peter Weller, MD
Awarded the 2013 Paul Ehrlich Lectureship at the International Eosinophil Society’s 8th Biennial Symposium in Oxford, UK.

Cardiovascular Medicine
Zoltan Arany, MD, PhD
Honored with the Dvorak Young Investigator Award in Translational Research from Beth Israel Deaconess Medical Center.

Endocrinology
Mark Andermann, PhD
Named a Pew Scholar in the biomedical sciences, and awarded a Smith Family Award for Excellence in Biomedical Research.

Center for Virology and Vaccine Research
Dan Barouch, MD, PhD
Inducted into the Association of American Physicians.

Raphael Dolin, MD
Selected to present the Robert M. Chasnoff Memorial Lecture for the National Institutes of Health.

Igor Korainik, MD
Instated as Chief of the Division of Neuro-Immunology in the Department of Neurology at BIDMC.

R. Keith Reeves, PhD
Earned the Early Career Faculty Grant from the American Association of Immunologists.

Clinical Informatics
Charles Safran, MD
Received the 2013 Don Eugenie Detmer Award for Health Policy Contributions in Informatics from the American Medical Informatics Association.

Clinical Nutrition
Bruce Bistrian, MD, PhD
Reappointed Chair of the 2014 NASA Human Research Program Standing Review Panels and named Chair of the Nutrition Curriculum Subcommittee of the Division of Nutrition at Harvard Medical School.

Suzanne Bertisch, MD, MPH
Received the 2014 Wayne Hening Young Investigator Award at the International Restless Legs Syndrome Study Group.

Honors and Awards

Robert Schmerling, MD
Served as the 2014 Thomas Neff Visiting Professor at the University of Colorado, Denver.

Rheumatology

Chung-Kang Peng, PhD
Leader of an international team of scientists and engineers selected as finalists in the $10 million Qualcomm Tricorder XPRIZE competition.

Pankaj Seth, PhD
Invited speaker at the Mouse Models of Human Cancers Consortium’s 3rd Annual Co-Clinical Trials Workshop.

Nephrology
Martin Pollak, MD
Elected to the National Academy of Sciences.

Theodore Steinman, MD
Received the Massachusetts 2013 Top Doctors Award and the 2014 President’s Award from the Renal Physicians Association.

Pulmonary, Critical Care and Sleep Medicine
David Roberts, MD
Named 2014 Best Doctor by Castle Connolly.

IMBIO

Madalena Costa, PhD
Appointed as a member of the advisory panel for the James S. McDonnell Foundation Postdoctoral Fellowship Awards.

Ary L. Goldberger, MD
Invited speaker at the American Thoracic Society’s annual national meeting.

Honors and awards continue on page 32
TEACHING HONORS AND AWARDS

Resident
Bracken Babula, MD
Presented the Steven E. Weinberger Award for contributions to the residency program and for exemplifying the collegial spirit of BIDMC through membership, advocacy and leadership.

Kristin Beaver, MD, Steven Chen, MD, Katie Germansky, MD, Andrew Hall, MD, Elana Rosenthal, MD, and Luke Stmad, MD
Received the Resident Teaching Award from the Harvard Medical School Class of 2014.

Jonah Cohen, MD
Earned the Katherine Swan Ginsburg Resident Award for embodying Dr. Ginsburg’s qualities of intelligence, courage, dignity and compassion.

Jake Decker, MD, and Christopher Whitcomb, MD
Received the Housestaff Award from the Nursing Department.

Jason Freed, MD
Received the Lowell McGee Award, which is given to the senior resident who contributed the most to educating his/her fellow house officers.

Elizabeth Targan, MD, and Vladimir Kaplinsky, MD
Earned the Elmer Hinton Award as intern and junior recipients, respectively, in recognition of outstanding physician-patient relationships.

Andrey Ahn, MD
Received the Hospitlist Medicine Teaching Award for exemplifying attributes of an outstanding clinician educator on the wards.

Robin Allister, MD, Mary Louise Ashur, MD, Steven Balk, MD, Gary Brisette, MD, Alexander Carbo, MD, Jason Freed, MD, Gyanprakash Ketwaroo, MD, Maria Kontrados, MD, Andrew Konson, MD, Barbara LeVarge, MD, Katherine Lynch, MD, Alan Malaban, MD, Diane McNally, MD, Eran Metzger, MD, Ari Moskowski, MD, James Rabb, MD, Robert Resnick, MD, Jeremy Richards, MD, Leon Sanchez, MD, Jules Schwalber, MD, Saurabh Sethi, MD, Ronald Silvestri, MD, Gordon Strewler, MD, Daniel Sullivan, MD, Lindsey Surace, MD, Byron Vaugh, MD, and Elena Volozhanina, MD
Awarded the Certificate for Excellence in Tutoring.

Mary Russ, MD
Received the Katherine Swan Ginsburg Faculty Award for Humanism in Medicine.

Alexandre Carbo, MD
Honored as Best Clinical Instructor at BIDMC by the HMS Class of 2014.

Alexandre Carbo, MD, Eran Metzger, MD, Jeremy Richards, MD, and Daniel Sullivan, MD
Recognized with the Award for Excellence in Tutoring, given to those who have received the Certificate for Excellence in Tutoring three years consecutively.

Michael Donnino, MD
Presented with the Outstanding Faculty Teaching Award from the Department of Emergency Medicine.

Richard Doyle, MD
Received the Department of Medicine Excellence in Ambulatory Student Teaching in Subspecialty Medicine Award.

Michael George, MD
Presented the Herman Blumgart Award, given to the faculty member who has contributed most to both housestaff education and professional development during the past academic year.

Andrey Hale, MD, and David Lucier, MD
Received the Medicine Quality Council Stoneman Award.

Andrew Hale, MD, Sharukh Lohandawala, MD, and Roy Siwattanakom, MD
Honored with the Principal Clinical Experience (PCE) Outstanding Resident-Fellow Teaching Award.

Glenn Hanna, MD
Presented the Resident as Teacher Award, which goes to the resident considered by medical students to be an outstanding teacher.

Gia Leddy, MD
Earned the Preceptor of the Year Award.

Daniel Leffler, MD
Earned the Mentorship Award for significantly contributing to the growth and development of the research skills and experiences of the housestaff.

Jakov McSparron, MD, and Laura Rock, MD
Named Rakbin Fellows in Medical Education for the 2013-2014 academic year.

Monica Oliveira, RN
Honored with the Nursing Excellence Award in recognition of a long tradition of exceptional nursing care and collegial nurse-house staff relationships.

Rod Rahimi, MD
Honored by the HMS Class of 2014 with the Fellow Teaching Award.

Michael K. Rees, MD
Honored by the HMS Class of 2014 with the Fellow Teaching Award.

Anjala Tess, MD
Earned the BIDMC Academy of Medical Educators award for distinguished participation, contribution and commitment to educational excellence and promotion of best teaching practice.

Katherine Troy, MD
Honored by the outgoing Chief Medical Residents with the Teaching Award for Non-medical Specialties.

Jeffrey William, MD
Received the Fellow Teaching Award from the 2014 class of residents.

Mark Zeidel, MD
Presented the Robert C. Moellering Teaching Award by the outgoing Chief Medical Residents, recognizing a faculty member who is an outstanding teacher, clinician and researcher.

Robert Schmerling, MD, and George Tsokos, MD
Named 2014 Top Doctors and Best Doctors by Castle Connolly.

George Tsokos, MD
Appointed to the Nominating Committee of the Kunkel Society.

Camilia Martin, MD, MS
Recognized on the Honor Roll of the Biomedical Sciences Careers Program for Underrepresented Minorities at Harvard Medical School.

Steven Freedman, MD, PhD, and Camilla Martin, MD, MS
Invited plenary speakers at the Maine Primary Care Association’s 2013 Annual Conference.

Camilla Martin, MD, MS
Recognized on the Honor Roll of the Biomedical Science Careers Program for Underrepresented Minorities at Harvard Medical School.

Transplant Immunology
Maria Koulmanda, MSc, PhD
Appointed President of the Cell Transplant Society.

Monica Fung, MD, and Randy Goldberg, MD
Earned the James Tullis Award respectively, in recognition of their achievements as intern and junior recipients.

Terry Strom, MD
Received the Starzl Prize in Immunology and Surgery.

Kristin Remus, DO
Earned the Department of Medicine Excellence in Ambulatory Student Teaching in Primary Care Award.

Jeremy Richards, MD
Earned the Charles McCabe Faculty Prize for Excellence in Teaching and the Junior Faculty Award for Excellence in Mentoring and Advising.

David Roberts, MD
Awarded the Teacher of the Year Award by the American Thoracic Society’s Clinical Problems Assembly, in recognition of outstanding clinical and educator expertise and significant contribution to clinical education in pulmonanycritical care medicine.

Richard Schwartzstein, MD
Honored as Best Preclinical Instructor at Harvard Medical School by the HMS Class of 2014.

Anjala Tess, MD
Earned the BIDMC Academy of Medical Educators award for distinguished participation, contribution and commitment to educational excellence and promotion of best teaching practice.

Katherine Roy, MD
Honored by the outgoing Chief Medical Residents with the Teaching Award for Non-medical Specialties.

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Received the Fellow Teaching Award from the 2014 class of residents.

Mark Zeidel, MD
Presented the Robert C. Moellering Teaching Award by the outgoing Chief Medical Residents, recognizing a faculty member who is an outstanding teacher, clinician and researcher.
Christopher Perrone, MD, with patient Carol Love.
Gerontology
Naresh Darsan, MD
Lauren Glavins, MD
Stephen Goldin, MD
Caroline Kim, MD
Peta Maza-Rodriguez, MD
Anika Orkaby, MD
Nabashita Rodgers, MD
Aaditya Singhal, MD
Naresh Dasari, MD
Lauren Gleason, MD
Stephen Gordon, MD
Caroline Kim, MD
Perla Macip Rodriguez, MD
Ariela Orkaby, MD
Nakeisha Rodgers, MD
Aaditya Singhal, MD
Rotem Tellem, MD
Anthony Zizza, MD
Hematology/Oncology
Allison Ackerman, MD
Alexandra Bailey, MD
Elizabeth Brem, MD
Anasuya Gunturi, MD
Rebecca Karp, MD
Xiuning Le, MD, PhD
Brittany Polhill, MD
Benjamin Schlechter, MD
Ashish Sharda, MBBS
Naharika Shankar, MD
Matthew Weinrock, MD
Jessica Zervos, MD
Infectious Diseases
Roger Araujo Castillo, MD
Abdullah Chahin, MD
Spyridon Chalkias, MD
Yehuda Cohen, MD
Aparna Dave, MD
Brian Hollenbeck, MD
Sachin Jain, MD, MPH
Sarah Housman, MD
Rebecca Zash, MD
Neurology
Christina Chen, MD
Peter Czarnecki, MD
Neetika Garg, MD
Arvind Goel, MD
Joseph Kupferman, MD
Katherine Lynch, MD
Matthew Niemi, MD
Ali Poyan Mehr, MD
Cristian Riella, MD
Rupam Ruchi, MD
Khuloud Shukha, MD
Joseph Tremaglio, MD
Jeffrey William, MD
Renal Transplant
Eliyahu Khankin, MD
Pulmonary, Critical Care
and Sleep Medicine
Neil Ahluwalia, MD
Lisa Belbel, MD
Jeremy Bistric, MD
Laura Brenner, MD
Robert Burch, MD
George Cheng, MD
Jessica Costley, MD
Joshua Dowin, MD
Paul Deffenbach, MD
Kathleen Dudley, MD
Adel El Bissair, MD
Adam Gaffney, MD
Brian Hobbs, MD
Douglas Hsu, MD
Puja Kohli, MD
Danielle Lamas, MD
Sean Long, MD
Sydney Moreau, MD
Crystal North, MD
Rachel Pouryay, MD
Farzad Rahighi, MD
Rud Kalani, MD, PhD
Krishna Reddy, MD
Elizabeth Rivelli, MD
Jennifer Stawik, MD
Allan Wilkin, MD
Jaycee Wolfe Outland, MD
Sleep Medicine Fellows
Mihira Hristova Bazalakova, MD, PhD
Pankaj Mehta, MD
Joel Reiter, MD
Rheumatology
Amy Davlin, MD
Eva Sadowski Stodolak, MD, PhD
Jonathan Hausmann, MD
Christine Koppa, MD
Zo Paz, MD, MPH
Naresh Dasari, MD, with patient Leila May Pascual at Fenway Health, a BIDMC-affiliated community health center.
Allergy and Inflammation


Cardiovascular Medicine


Center for Virology and Vaccine Research


Endocrinology, Diabetes and Metabolism


Experimental Medicine


Gastroenterology


Germatology


Experimental Medicine


Gender Research


Germatology


Allergic and Inflammatory Diseases


Endocrinology, Diabetes and Metabolism


IMIBIO


Nephropathy

Highly active antiretroviral therapy (HAART) has been shown to alleviate the symptoms of HIV/AIDS. This study in Botswana endeavored to show the efficacy of HAART in prevention of mother-to-child HIV transmission (MTCT) and its impact on the long-term survival of both the mothers and children. Methods: In a longitudinal clinical trial in which HIV-infected pregnant women received different HAART cocktails, investigators were able to maintain low rates of MTCT across the board. A decreasing number of maternal and child deaths occurred after HAART was discontinued, however, pointing to the need for further investigations into improving long-term maternal and child survival.

Sleep

Molecular and Vascular Medicine

The infiltration of inflammatory cells into the intimal-medial wall causes the inflammatory-based diseases of the intima and adventitia respectively. Infiltrated monocytes and macrophages play an important role in the progression of atherosclerosis. J Am Coll Cardiol. 2014; 63:1256-67.
## RESEARCH FUNDING 2013-2014

<table>
<thead>
<tr>
<th>Division</th>
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**TOTAL RESEARCH FUNDING**

182,892,233
Chris Riella, MD, nephrology fellow.
Beth Israel Deaconess Medical Center (BIDMC) is a patient care, teaching and research affiliate of Harvard Medical School and consistently ranks as a national leader among independent hospitals in National Institutes of Health funding. The medical center is clinically affiliated with the Joslin Diabetes Center and is a founding member of the Dana-Farber/Harvard Cancer Center. BIDMC is the official hospital of the Boston Red Sox.