

DEPARTMENT OF
MEDICINE

2018 ANNUAL
REPORT



A MISSION THAT MATTERS



Beth Israel Deaconess
Medical Center



HARVARD MEDICAL SCHOOL
TEACHING HOSPITAL



The Department of Medicine wishes to thank the many individuals who contributed to this report, including department leadership, division chiefs, administrators, and faculty members. We also thank Gigi Korzenowski and Jerry Clark of Korzenowski Design, and Jennie Greene and Meera Kanabar of the Department of Medicine. Most of the photography in this report was done by BIDMC's James Derek Dwyer and Danielle Duffey, who also helped with photo research. Jane Hayward, of BIDMC Media Services, provided expert copy editing and design consultation. We also thank the Communications Department and Bonnie Prescott of the CardioVascular Institute. Last but not least, we wish to thank all of the individuals featured in these pages for participating in this report—and for all they do to advance BIDMC's mission.

OUR MISSION:
TO PROVIDE
EXTRAORDINARY
CARE, WHERE
THE PATIENT
COMES FIRST,
SUPPORTED BY
WORLD-CLASS
EDUCATION AND
RESEARCH

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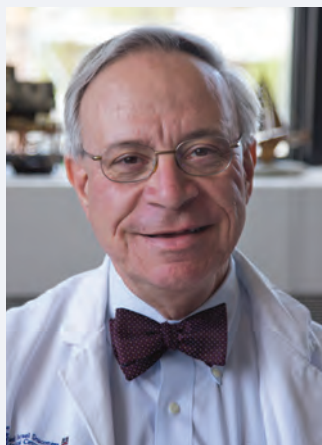
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Front cover:
John Tigges and Ionita Ghiran, MD (upper left)
Joseph Li, MD, and patient (lower right)
Kelly Graham, MD, with residents (lower left)

Left:
Vasileios Kyttaris, MD, and Kristie Smith, DO, with a patient

Back cover:
Dawn Lei, MD, and Gila Hoffman, MD



FROM THE CHAIR

In this year's Annual Report—entitled “A Mission that Matters”—we reflect on BIDMC’s mission: “To provide extraordinary care, where the patient comes first, supported by world-class education and research.” Indeed, our foremost goal is to deliver superb patient care or, as I often say, to provide to every patient, at all times, the kind of care that we would want for our

own family members. We support the goal of outstanding patient care with innovative and effective education, and with research that is both cutting-edge and likely to improve lives.

In the clinical arena, we continue to enhance the care we provide to our patients, improving their health outcomes and experience, and to share our best practices nationally and internationally. This year, we are pleased to celebrate the 20th anniversary of our Hospital Medicine Program and its co-founder Joseph Li, MD. One of the first hospital medicine programs in the country, ours has become a national model for hospital-based care. In the research realm, investigators like Rebecca Zash, MD, MPH, who is studying the safety of antiretrovirals in pregnant women and infants, are influencing global health policy. In medical education, we are proud to celebrate innovators like Anjala Tess, MD, who has launched a new and first-of-its-kind Quality and Safety Master’s degree program at Harvard Medical School.

In addition to highlighting people and programs that have reached milestones or contributed significantly to our mission this year, this report includes data on our clinical volume, academic publications, honors and awards, and research funding. This year, for the first time, we are also pleased to deliver updates from each of the Department’s Vice Chairs—leaders in the areas of education, mentorship, research, quality improvement, and network development. We also pause to remember the inspiring lives and the extraordinary, mission-driven contributions of two longtime BIDMC faculty members who died this year, Warner Slack, MD, and Terry Strom, MD.

Thank you for taking the time to read this report. Please be in touch should you have any questions or wish to connect on any of the work you read about in these pages. As health care professionals, we all share an overarching mission, and it’s through collaboration that we stand to make the most progress and do the most good.

Warm Regards,

Mark L. Zeidel, MD
Chair, Department of Medicine

DEPARTMENTAL ORGANIZATION

This list reflects our administration and leadership as of November 2018.

Administration

Mark Zeidel, MD
Department Chair

Kevin Maguire, MS
Chief Administrative Officer

Mark Aronson, MD
Vice Chair, Quality

Donald Cutlip, MD
Vice Chair, Clinical Care in the Community

Grace Huang, MD
Vice Chair, Career Development and Mentoring

Barbara Kahn, MD
Vice Chair, Research Strategy

Eileen Reynolds, MD
Vice Chair, Education

C. Christopher Smith, MD
Associate Vice Chair, Education

Anjala Tess, MD
Associate Vice Chair, Education

Peter Weller, MD
Vice Chair, Research

Jennie Greene, MS
Director, Communications

Tim McDermott, MHA
Executive Director, Finance and Business Operations

Paul Hart Miller
Director, Business and Network Development

Scot Sternberg, MS
Director, Quality Improvement

Clinical Divisions

Allergy and Inflammation

Peter Weller, MD
Division Chief

Nicholas Lord, MHA
Division Administrator

Cardiovascular Medicine

Robert Gerszten, MD
Division Chief

John DiGiorgio, MPS-HHSA
Division Administrator

Endocrinology, Diabetes, and Metabolism

Evan Rosen, MD, PhD
Division Chief

Nicholas Lord, MHA
Division Administrator

Gastroenterology

J. Thomas Lamont, MD
Division Chief (interim)

Sara Montanari
Division Administrator

General Medicine

Eileen Reynolds, MD
Division Chief

Blair Bisher, MHA
Division Administrator

Patrick Curley, MS
Division Administrator

Gerontology

Lewis Lipsitz, MD
Division Chief

Kerry Falvey
Division Administrator

Hematology/Oncology

Manuel Hidalgo, MD, PhD
Division Chief

Christine VanDeWege, MA
Division Administrator

Infectious Diseases

Peter Weller, MD
Division Chief

Nicholas Lord, MHA
Division Administrator

Nephrology

Martin Pollak, MD
Division Chief

Kerry Falvey
Division Administrator

Pulmonary, Critical Care, and Sleep Medicine

J. Woodrow Weiss, MD
Division Chief

Brian Duckman, MHA/MBA
Division Administrator

Rheumatology and Clinical Immunology

George Tsokos, MD
Division Chief

Patricia Harris
Division Administrator

Research Divisions

Clinical Informatics

Charles Safran, MD
Division Chief

Clinical Nutrition

Bruce Bistrian, MD, PhD, MPH
Division Chief

Experimental Medicine

Jerome Groopman, MD
Division Chief

Genetics

Pier Paolo Pandolfi, MD, PhD
Division Chief

Hemostasis and Thrombosis

Robert Flaumenhaft, MD, PhD
Division Chief

Immunology

Cox Terhorst, PhD
Division Chief

Interdisciplinary Medicine and Biotechnology

Ary Goldberger, MD
Division Chief

Signal Transduction

Alex Toker, PhD
Division Chief

Translational Research and Technology Innovation

Steven Freedman, MD, PhD
Division Chief

Center for Virology and Vaccine Research

Dan Barouch, MD, PhD
Division Chief

FROM THE CAO

Over the last year, the Department of Medicine has made great strides toward our goal of making care more readily available to our patients. Although Boston's Longwood Medical Area is a medical mecca like no other in the world, it's not always easy for our patients and their loved ones to come here for care. For many people, the time and resources it takes to get to our main BIDMC campus are prohibitive if they're coming from across the city, surrounding suburbs, rural areas, or even other states. This is why I'm so pleased that our network has continued to grow this year to include even more—and even stronger—partnerships with community health centers, hospitals, and practices across our region. Increasingly, BIDMC doctors are providing care to patients in their home communities. We're also making it easier for people to stay with their local physicians for most of their medical care, knowing they will have timely, direct access to our specialists if and when they need it. Many of this year's network highlights are described in greater detail on page 9. I am particularly excited about our plans to be part of a combined system with Lahey Health, New England Baptist Hospital, Mount Auburn Hospital, and Anna Jaques Hospital. In the coming months, we will come together as Beth Israel Lahey Health, with the goal of providing our patients with high-quality, affordable care close to where they live and work. BIDMC will be the academic flagship of the new system, positioning us even better to live up to our mission of providing extraordinary care where the patient comes first.

Best Wishes,



Kevin Maguire, MS
*Chief Administrative Officer,
Department of Medicine*



NEW LEADERS

During the 2017-2018 Academic Year, several talented members of the Department of Medicine assumed important leadership roles. Each of these individuals is nationally recognized and brings to his/her new position valuable experience and extraordinary commitment.



Robert Flaumenhaft, MD, PhD, was named Chief of the Division of Hemostasis and Thrombosis, taking over from Bruce Furie, MD, who ran the Division since he and Barbara Furie, PhD, founded it in 2000. Flaumenhaft is an internationally recognized expert in platelet biology and thrombosis research. His laboratory has unraveled the molecular mechanisms that control platelet granule exocytosis and identified new antithrombotic therapies. He has been continuously funded by the National Institutes of Health and has been the recipient of several awards throughout his career, including an Established Investigator Award from the American Heart Association and an Outstanding Investigator Award from the National Heart, Lung, and Blood Institute. A Professor of Medicine at Harvard Medical School, he was elected to the American Society for Clinical Investigation and serves on the editorial boards of several leading journals. Flaumenhaft shares the Furies' commitment to training the next generation and will continue to lead what has become a top-tier clinical and research program.



Ary Goldberger, MD, was appointed Chief of the Division of Interdisciplinary Medicine and Biotechnology (IMBIO), succeeding Vikas Sukhatme, MD, PhD, who recently took on the role of Dean of Medicine at Emory University. A Professor of Medicine at Harvard Medical School and a member of the Cardiovascular Institute, Goldberger is an exceptional physician-scientist. He has pioneered the quantitative analysis of complex systems science to basic and translational medicine. His laboratory is at the frontier of nonlinear dynamics, bioengineering, statistical physics, and physiology. His appointment represents a timely new phase in the leadership of the Division of IMBIO, whose members are known for their collaborative research across a broad range of fields, including genomics and proteomics; cellular metabolism in cancer and immunology; sleep-disordered breathing syndromes; and novel biomarkers of cardiovascular disease, diabetes, and neuroautonomics.



Grace Huang, MD, was selected as the Vice Chair for Career Development and Mentoring. A hospitalist in the Division of General Medicine, she will lead faculty mentorship efforts, support divisions in their annual performance review processes, and prepare faculty for the Harvard Medical School promotion process. Huang will also work with the Director of BIDMC Epstein Society to promote the careers of recipients of K awards from the National Institutes of Health. As an Associate Program Director in our Internal Medicine Program, she oversees resident evaluation and remediation. Huang serves as Co-Director of the BIDMC Academy of Medical Educators, which holds professional development seminars for faculty. She is also Director of the Rabkin Fellowship in Medical Education, a nationally recognized program that trains education leaders at Harvard Medical School. She was recently appointed the medical school's Interim Director for Academic Careers and Faculty Development.



Daniele Ölveczky, MD, MS, a hospitalist in the Division of General Medicine, was chosen as the Diversity and Inclusion Officer for the Department of Medicine. In this newly-created leadership role, she will promote diversity and inclusion in the Department of Medicine. She will also collaborate closely with BIDMC's Office for Diversity, Inclusion and Career Advancement, of which she has been an active member for several years. One of the aims of this position is to increase recruitment and retention of underrepresented minority faculty members, residents, and fellows in the Department. Ölveczky was selected as a Harvard Medical School Academy Medical Education Fellow in 2017 as well as an HMS Miles Shore Fellow. She also served as Co-Chair of the Cross Cultural Interest Group of the HMS Academy. An exceptional physician and mentor, Ölveczky will also work to enhance the patient-provider experience and foster skills in cultural competency.



Evan Rosen, MD, PhD, assumed the role of Chief of the Division of Endocrinology, Diabetes, and Metabolism this year, following the departure of Anthony Hollenberg, MD, who went on to become the Chair of Medicine at Weill Cornell Medicine. Rosen is a Professor of Medicine at Harvard Medical School and an Institute Member at the Broad Institute of MIT and Harvard. He leads a laboratory at BIDMC that focuses on the transcriptional pathways that underlie metabolic diseases like obesity and Type 2 diabetes. In particular, his laboratory has used genomic and epigenomic approaches to identify novel transcription factors and pathways that regulate adipogenesis, lipid handling, insulin resistance and metabolic memory. Previously Program Director for the joint BIDMC and Joslin Diabetes Center Fellowship in Endocrinology and Metabolism, Rosen has built a strong foundation in research and education over more than a decade at BIDMC.

UPDATES FROM OUR VICE CHAIRS



EDUCATION

Eileen Reynolds, MD

Vice Chair, Education

C. Christopher Smith, MD

Associate Vice Chair, Education

Anjala Tess, MD

Associate Vice Chair, Education

This year, the Department continued to build on our tradition of exceptional and innovative educational programming. We welcomed 195 Harvard Medical School (HMS) students into our clerkships, 64 new interns into residency, and 56 new clinical fellows.

Our annual education retreat focused on the learning environment, developing wellness programs at all levels of learners, and a quality-improvement (QI) tracking system for episodes of professional mistreatment for all trainees. We are excited to expand and assess the use of this QI approach to wellness and professionalism.

Our student programs teach one third of all HMS students. The Medical School has now fully operationalized the new Pathways clinical training program whereby students

are assigned to a single site for the first two years. Our residency continues to flourish with clinician-educator, global health, and QI tracks. Our recently redesigned research track has attracted outstanding scientists to the residency this past year. We also welcomed the first fellow into our new Hospice and Palliative Care Medicine Fellowship. In addition, building upon our successful clinician-educator track for residents, this year we launched a similar track for fellows.

The Department of Medicine and BIDMC continue to expand work on diversity and inclusion. The Department named Daniele Ölveczky, MD, MS, as our first Diversity and Inclusion Officer. (Read more on page 5.) Our Advancement of Women Committee hosted a photography exhibit honoring notable women physicians in the Department's history. And all Division Chiefs and clinical leaders in the Department attended an educational program on unconscious bias. In this report, you will see that education runs through all we do in the Department.



RESEARCH

Barbara Kahn, MD, MS

Vice Chair, Research Strategy

Peter Weller, MD

Vice Chair, Research

A central mission of the Department of Medicine is the discovery of new information that can lead to the prevention, cure, and improved treatment of human diseases. Research in the Department is also aimed at enhancing the quality of life for those living with chronic diseases. As Vice Chairs of Research and Research Strategy, we consider it a high priority to foster a vibrant, diverse, and collaborative research program with the aim of making discoveries that can eventually be translated into improved medical care. Most of the Department's divisions carry out research ranging from basic science investigation to clinical trials and outcomes research. The research is led by approximately 290 Medicine faculty members with active grants, overseeing nearly 700 trainees and laboratory staff. Research training and mentoring is a high priority, and many of our divisions with active research programs have long-standing National Institutes of Health-funded training grants.

Department of Medicine research funding in the 2017-2018 Fiscal Year was over \$200 million, consisting of government, foundation, corporate, and donor sources. (See funding details on page 38.)

This makes the Department one of the best-funded medical school departments of medicine in the country. BIDMC consistently ranks as a national leader among independent hospitals in National Institutes of Health funding, and the Department of Medicine is responsible for over 68% of that funding.

Research in the Department is supported by over 20 technically sophisticated BIDMC research core facilities, many of which are directed by Medicine faculty. This year the Flow Cytometry Core expanded its capabilities with the introduction of new instrumentation focused on microvesicle research. (Read more about this facility on page 28.) In addition, the Transgenic Mouse Core has mastered new technologies that facilitate the alteration of gene expression in mice to investigate their role in disease. A new Functional Genomics and Bioinformatics Core was established to assist with analysis of transcriptomics and epigenomics data bases including single cell analysis. This is in addition to an existing Bioinformatics and Systems Biology Core thereby demonstrating the ability of BIDMC to respond to the growing needs for analysis of large and complex data bases.

Our faculty's work is widely published and, again this year, we were well represented in the world's leading scientific and medical journals, including *Nature*, *Science*, *Cell*,

and the *New England Journal of Medicine*. Investigators in the Department are recognized nationally for the excellence of their research as evidenced by their election to the National Academy of Sciences and the National Academy of Medicine, the American Society for Clinical Investigation, and the Association of American Physicians.

We have started to highlight Medicine research labs at designated Medical Grand Rounds, with the goal of fostering collaboration between clinicians and researchers, and of making students, residents, and fellows more aware of research opportunities within the Department. We will continue these research-focused Medical Grand Rounds next year. In addition, we aim to facilitate the recruitment of exceptional new research faculty members in several of our divisions. We also plan to foster the involvement of more Medicine faculty and trainees with the Broad Institute of MIT and Harvard, which has cutting-edge platforms and approaches for advancing biomedical science.

UPDATES FROM OUR VICE CHAIRS



QUALITY

Mark Aronson, MD

Vice Chair, Quality

As Vice Chair for Quality, I have the pleasure of working with teams across Medicine to improve the quality of care we provide in ambulatory and inpatient settings. One such team, the Medical Peer Review Committee (MPRC), is a multidisciplinary group made up of clinical leaders from the Departments of Nursing, Medicine, Emergency Medicine, and Pharmacy. Its role is to review adverse events, near misses, and patient complaints. It functions as a pivotal foundation to the Department of Medicine Quality and Patient Safety Program. The Committee, chaired by Alex Carbo, MD, analyzes root causes, identifies any lapse in standards of care, system barriers or gaps, and importantly, opportunities for improvements in care. Many of the root cause analyses and presentations are conducted by residents as part of their Stoneman Quality Improvement Rotation. The committee refers cases to hospital groups and committees for further review or action, as appropriate.

Over the past year, 103 cases were reviewed by MPRC. An important recurrent theme in many of these cases has been poor communication and coordination of patients transferring into BIDMC from outside institutions, often leading to patients being admitted to an inappropriate service. This subsequently led to the combined efforts of multiple services in the development of a Transfer Center with the aim of mitigating the risks associated with the care of these very ill patients.

Another area of focus for this year has been improving the quality of medicine consults. A central tenet of this initiative has been the development and roll out of an electronic ordering and tracking system. Building upon a model first used for Infectious Diseases, we have developed an order entry and tracking system for 16 Medicine Consult Services. This effort was led by Drs. Lauren Doctoroff, David Feinbloom, Mary LaSalvia, and Jennifer Stevens. This system facilitates timely response to requests and provides needed data on consults including volume, reason, urgency, and timeliness.



CAREER DEVELOPMENT AND MENTORING

Grace Huang, MD

*Vice Chair, Career Development
and Mentoring*

The lifeblood of the BIDMC mission resides in its faculty, and the Department of Medicine honors this through the unique position of Vice Chair for Career Development and Mentoring. Responsible for supporting the career development of over 500 faculty in the Department of Medicine, I'm proud to have succeeded Tony Hollenberg, MD, in this position this past year. I am committed to ensuring a system of mentoring for all Medicine faculty members, supporting divisions in their annual performance review mechanisms, and preparing faculty for the promotion process. I'm pleased to work in tandem with Steve Freedman, MD, PhD, the newly-appointed Director of the Epstein Society, to promote the careers of researchers in the Department. Goals for the upcoming year include: launching a communication strategy to provide faculty access to resources across BIDMC and Harvard Medical School (HMS); conducting a department-wide mentoring needs assessment; implementing division-based efforts to collect clinical feedback; expanding the Epstein Society to support grant-writing efforts across the spectrum of training from residents to junior faculty; and continuing one-on-one HMS CV and career development consultation.



CLINICAL CARE IN THE COMMUNITY

Donald Cutlip, MD

Vice Chair, Clinical Care in the Community

This year, I have worked with colleagues in the Department of Medicine and across BIDMC to focus on building and strengthening relationships with our network affiliates. I have the pleasure of working with Paul Hart Miller, Administrative Director for Business and Network Development in the Department of Medicine. Our work has centered on the objectives of building a collaborative approach to care across the network, expanding appropriate levels of care to the community, and safeguarding the quality of this care.

A few key network successes within the Department this year include: developing a CME series with community partners across primary care and most medical subspecialties that drew some 500 participants; expanding cardiology care at BID-Plymouth to provide elective percutaneous coronary intervention; and partnering with our affiliates to establish and maintain community cancer care centers in Brockton, Needham, and Newburyport. We are now working with our physician group, Harvard Medical Faculty Physicians, and other BIDMC departments to develop a strategic plan for the coming year to coordinate all of our network efforts. We are pleased to support the BIDMC mission of "extraordinary care, where the patient comes first," at BIDMC and for all of our community partners.

"We are fortunate to have mission-driven leaders in the Department of Medicine—individuals who have excelled in their own careers and are committed to innovation and excellence in all that we do."

—Mark Zeidel, MD

MOMENTS THAT MATTER

A Year In Medicine

The Department of Medicine is engaged in pursuing our mission every day, but certain special events punctuated the 2017-2018 Academic Year. Here is a sampling of moments that particularly mattered this year.



Honoring Women Pioneers

The Department gathered to celebrate Women in Medicine Month with a photography exhibit entitled, "Honoring Women in the Department of Medicine," showcasing women pioneers in the Department.



A Moment of Silence

Led by internal medicine residents, members of the Department of Medicine and our colleagues across BIDMC distributed hundreds of orange ribbons and observed a moment of silence to mark the one-month anniversary of the school shooting in Parkland, Florida and to draw attention to gun violence as an important public health issue.



Cancer Immunotherapy and Cell Manipulation Facility Opened

The BIDMC Cancer Center announced the opening of the Randi and Brian Schwartz Family Center Immunotherapy and Cell Manipulation Facility. This state-of-the-art laboratory expands BIDMC's research capacity with the ultimate goal of accelerating the delivery of new immunotherapies to patients with cancer.



A Reason to Ride

Mark Zeidel, MD, Chair of the Department of Medicine, participated in a A Reason to Ride, an annual bike-a-thon to raise money for cancer research at BIDMC. Started by grateful patient Tom DesFosses, the ride began in 2004. This year, Zeidel and members of the Department participated under their new team name "Medical Miracles."

Launch of Opioid Use Disorder Clinic

Healthcare Associates, BIDMC's primary care practice, launched an opioid use disorder clinic to help address the worsening public health crisis. BIDMC also formed the Division of Addiction Psychiatry in response to the opioid epidemic.





Looking Beyond the Guidelines

A part of the unique collaboration between the Department of Medicine and the *Annals of Internal Medicine*, six Medical Grand Rounds discussions were held this past year. They featured physicians and patients who had to go “Beyond the Guidelines” to make decisions for which there were no clear guidelines.



The BIDMC Experience

The medical center launched the BIDMC Experience initiative to enhance the experience of those who work and receive care here. Members of the Department of Medicine have been actively involved in leading workgroups and engagement activities.



Expanding Palliative Care Training

The Department launched a new Hospice and Palliative Care Medicine Fellowship at BIDMC and Boston VA. Led by Mary Buss, MD, Chief of the Division of Palliative Medicine in the Division of General Medicine, the new program aims to train fellows to become educational and clinical leaders in the field of palliative care.



Mother's Day Walk for Peace

Team BIDMC joined 225 other teams from across Boston for the Louis D. Brown Peace Institute's annual Mother's Day Walk for Peace, co-chaired by BIDMC CEO Kevin Tabb, MD. Members of the Department walked alongside families affected by homicide as well as neighbors, clergy, business owners, and elected officials.



Reflecting on Health Care in America

The “Symposium on Health Care in America,” part of the George Altman Endowed Annual Lectureship at Medical Grand Rounds, addressed the challenges of achieving access to care, delivery of quality care, and cost containment. Drew Altman, PhD, President and CEO of the Kaiser Family Foundation, offered the keynote address, which was followed by a panel discussion.

Addressing Unconscious Bias

Over 30 Department of Medicine leaders — division chiefs, clinical chiefs, and administrative directors — participated in a three-hour unconscious bias training session. This training was a recommendation of the Department's Advancement of Women Committee, which made progress on many fronts this year.

HONORS AND ACCOLADES

Every year, BIDMC and members of the Department of Medicine earn many local, national, and international awards for their exceptional, mission-driven work. This is a sampling of honors received during the 2017-2018 Academic Year.

Named LGBTQ Healthcare Equality Leader by the Human Rights Campaign Foundation for the eighth consecutive year.

Recognized as National Nonprofit Organization Partner of the Year by the U.S. Environmental Protection Agency as part of its WasteWise Program.

Earned HOPE Award from the Medically Induced Trauma Support Services organization. The award went to BIDMC's Patient Safety team in the Silverman Institute for Health Care Quality and Safety.

Recognized by *Boston Magazine*, which named 177 physicians and surgeons from 42 medical specialties affiliated with BIDMC in its "Top Doctors" guide.

Mark Andermann, PhD

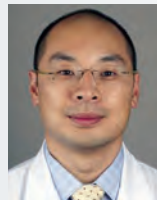
Received the Armen H Tashjian, Jr. Award for Excellence in Endocrine Research from the Harvard T.H. Chan School of Public Health.



Dan Barouch, MD, PhD

Barouch was featured this year in *Boston Magazine* for his groundbreaking HIV research. He also earned the "Investigator of the Year" award from the Massachusetts

Society for Medical Research, the Drexel Prize in Immunology from Drexel University College of Medicine, and the Highly Cited Researchers Award from Clarivate Analytics.



Alex Chee, MD

Chee received the Heinrich Becker Young Investigator Award for Research and Clinical Innovation from the World Association of Bronchology and

Interventional Pulmonology.

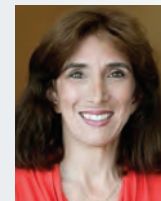
Robert Cohen, MD

Named Gold Humanism Scholar at the Harvard Macy Institute Program for Educators of the Gold Foundation.



Reed Drews, MD

Drews earned the Mentor Award from the American Society of Hematology.



Sara Fazio, MD

Fazio was awarded the Ruth-Marie E. Fincher, MD, Award from the Clerkship Directors in Internal Medicine.



Lachlan Forrow, MD

One of the people who helped launch the International Campaign to Abolish Nuclear Weapons (ICAN) in 2007, Forrow joined celebrations in Oslo

when the organization received the 2017 Nobel Peace Prize.



Ary Goldberger, MD, and CK Peng, PhD

Their publication "Mosaic organization of DNA nucleotides" was selected by *Physical Review E* as one of the 25 milestone papers of the past 25 years.

**Molly Hayes, MD**

Hayes was honored with the Emerging Educator Award from the Association of Pulmonary and Critical Care Medicine Program.

Grace Huang, MD

Named Editor-in-Chief of the Association of American Medical Colleges' *MedEd Portal*.

Douglas Kiel, MD, MPH, and Elizabeth Samelson, PhD

Selected as Fellows of the American Society for Bone and Mineral Research for being long-term members who have made outstanding contributions to the field. Kiel also received a leadership award from the Cohorts for Heart and Aging Research in Genomic Epidemiology Consortium.

Brad Lowell, MD, PhD

Received the Naomi Berrie Award for Outstanding Achievement in Diabetes Research, Columbia University in 2017.

Christos Mantzoros, MD, DSc

Received the Outstanding Investigator Award from the Endocrine Society.

**Susan Mitchell, MD, MPH**

Mitchell earned the National Institutes of Health Method to Extend Research in Time (MERIT) Award from the National Advisory Council on Aging.

**Pier Paolo Pandolfi, MD, PhD**

Pandolfi was named 2017 Fellow of the American Association for the Advancement of Science.

Yury Popov, MD, PhD

Earned the Irving W. and Charlotte F. Rabb Award for Excellence in GI Research from the Irving W. and Charlotte F. Rabb Foundation.

Yuri Quintana, PhD

Named Senior Member for the Institute of Electric and Electronic Engineers of the Engineering Society.

**Eileen Reynolds, MD**

Reynolds was named Master of the American College of Physicians.

**Adam Rodman, MD**

Rodman's podcast, *Bedside Rounds*, was named one of best medical podcasts by *Internal Medicine News*. This year the American College of Physicians

also partnered with *Bedside Rounds*, which focuses on the history of medicine and how it affects our society and culture, to offer Continuing Medical Education credits and Maintenance of Certification points.

**Sunil Sheth, MD**

Sheth was honored with the Nobility in Science Award from the National Pancreas Foundation.

Ronald Silvestri, MD

Named President-Elect of the Directors of Clinical Skills Courses (DOCS).

Robert J. Thomas, MD

Honored with the Lifetime Achievement Award for Extraordinary Contribution and Academic Excellence in Sleep Medicine from the Association of American Physicians of Indian Origin Sleep.

George C. Tsokos, MD

Named Master of the American College of Rheumatology; and received the Marian Ropes Physician Achievement Award from the Arthritis Foundation.

Griffin Weber, MD, PhD

Won the Patient Matching Algorithm Challenge from the U.S. Department of Health and Human Services' Office of the National Coordinator for Health Information Technology.

Peter F. Weller, MD

Received the Distinguished Service Award from the International Eosinophil Society.

**Gloria Yeh, MD, MPH**

Yeh was awarded the A. Clifford Barger Excellence in Mentoring Award from Harvard Medical School.

PIONEERING HOSPITALIST AND HOSPITAL MEDICINE PROGRAM CELEBRATE 20 YEARS



**"I see the role of
the hospitalist as
part primary care
doctor, part ER
doctor, and part
social worker."**

—Joseph Li, MD

"When you take a history, the patient is always telling you a story. The question is whether you are hearing it or not," explains Joseph Li, MD, Chief of BIDMC's Hospital Medicine Program. And the story is often complex. "People come into the hospital with complicated medical issues and often other related issues," Li notes. "I see the role of the hospitalist as part primary care doctor, part ER doctor, and part social worker."

Li's health care training uniquely prepared him for the demands of being a hospitalist, including his first job as a nurse's aide at a nursing home in Tulsa, Oklahoma. He then attended pharmacy school, and eventually, medical school at the University of Oklahoma. He arrived in Boston in 1994 for residency at New England Deaconess Hospital, becoming Chief Medical Resident in 1998. It was a transitional time in the field of internal medicine, especially hospital-based care. "Back then, when a person was admitted to the hospital, their primary care doctor was contacted to come and care for them. This didn't always work well because primary care doctors couldn't easily leave other patients at their outpatient practice to care for a hospitalized patient," he explains. Also, some patients—referred to

as "unassigned"—did not have primary care doctors to come care for them in the hospital, Li recalls.

Mark Aronson, MD, then Associate Chief of General Medicine and Primary Care, believed that BIDMC could provide higher quality care to hospitalized patients by having internists specifically assigned to inpatient care. "It was becoming clear that office-based internists were caring for increasingly complex patients and that those demands made it often untenable for them to also care for inpatients in a timely, effective, and safe manner," he explains. "Because we thought that sick patients and distraught families deserved to have doctors available in the hospital at all times, we decided to embrace the hospitalist model." Aronson approached Li and a fellow residency graduate, Preetha Basaviah, MD, about heading up the new hospitalist program. They agreed, and it became one of the first in the country. "We were incredibly fortunate to have hired two brilliant, devoted and spirited young doctors to start our program," notes Aronson.

Since then, the field has grown exponentially with upwards of 60,000 hospitalists in the country today. As one of



60,000+

The field of hospital medicine has grown exponentially with upwards of 60,000 hospitalists in the country today.

the founding members of the Society for Hospital Medicine and a past president, Li has been a leader and innovator. (Basaviah went on to University of California, San Francisco, and then Stanford.) Li's also been highly involved in the American College of Physicians' Hospitalists Publications and has expanded BIDMC's program substantially. BIDMC now boasts over 125 hospitalists, who provide care at four hospitals throughout our growing system.

Reflecting on the last two decades of hospital medicine, Li notes that a lot has changed: "We have so many new medications, electronic medical records, and the internet as a constant source of clinical information, like *UptoDate*." But much has also stayed the same, he adds:

"Our program has always been innovative and physician-led." And, in his view, BIDMC hospitalists have always been "the fiber of the institution in many ways": they are instrumental in the residency training program; they are some of the top quality improvement leaders at BIDMC (and arguably the country); and they are critical to the care of 400 inpatients throughout the BIDMC system at any given time. BIDMC hospitalists are also nationally recognized for their contributions to patients and to the field. Li proudly points out that more BIDMC hospitalists have been recognized as Top Hospitalists by *ACP Hospitalist* magazine than from any other program in the country.

This year's celebration of the Hospital Medicine Program's two decades is in many ways a celebration of Li, as his colleagues are quick to point out. "Joe leads by example and keeps the focus on the patients first, as the top priority in every decision," explains Caleb P. Hale, MD, Associate Chief of Hospital Medicine. "As we celebrate the 20th year of our program, we're celebrating the good it has done for our patients, our doctors, and BIDMC. But we're also celebrating Li, who continues to expand and improve the program daily."



Top left: Joseph Li, MD, with a patient

Top right: Original Hospital Medicine team circa 1998

Bottom right: Today's Hospital Medicine team

NATIONAL HEALTH CARE LEADER APPLAUDS BIDMC CARE

Donald Berwick, MD, the founder of the Institute for Healthcare Improvement (IHI) and a national leader in health care quality and safety, has a unique perspective on BIDMC. In addition to four decades as a health care industry trailblazer, Berwick spent a harrowing 11 days at his brother's bedside in BIDMC's Finard Medical Intensive Care Unit (ICU). In March 2017, his younger brother, David, developed sepsis from Legionnaires' disease and, suffering from multiple organ failure, was brought to BIDMC and put on life support. "We were sure we were going to lose him," Berwick recalls.

"The team was partnering perfectly; and the nurses were angels. Some people would look back on this experience with regret and fear, but I look back with gratitude because I felt so loved and well taken care of."

—David Berwick

Antibiotics, feeding tubes, ventilators, hemodialysis machines, and multiple monitors were employed to keep him alive. But what struck Berwick more than the impressive modern technology was the human interaction and teamwork he witnessed among the 20-30 people on the care team. "This was a ballet more complex than any dancer ever danced," he recalls. "Amazingly, movingly, they included David's family in all of that. They included me. They asked 'Do you have any questions? Do you have any ideas?' We, the people who loved David, were not watching the team, we were on the team."

"He beat the odds," Berwick says, crediting this exemplary communication, cooperation, and inclusion with helping to save his brother's life. "I noticed that everyone had a voice. Sure, the ICU director had a voice, but so did the student nurse." He recalls a respiratory therapist questioning one of the physicians on the team about his assessment. Rather than bristle at being challenged, the doctor thanked the respiratory therapist for the correction. "I have worked in health care for four decades now," Berwick reflects, "and what I saw at BIDMC was care that I had only dreamed of." David Berwick was

similarly impressed by the care he received once he was well enough to be transferred from the ICU to another medicine floor. "The team was partnering perfectly; and the nurses were angels," he recalls. "Some people would look back on this experience with regret and fear, but I look back with gratitude because I felt so loved and well taken care of."

Berwick has been vocal in his praise for the care his brother received at BIDMC, dedicating much of his keynote address at IHI's annual conference this year to the subject. Upon hearing of David's experience, Chair of the Department of Medicine Mark Zeidel, MD, invited Berwick to debrief—not simply to hear about what had gone well, but to learn about areas of potential improvement. The subsequent meeting included several Department of Medicine quality improvement leaders. "Dr. Berwick applied his keen understanding of care processes to identify a number of things that we can do better," Zeidel explains. This includes improved communication and sign-out between the ICU and the floor teams, better and more reliable communication with rehabilitation facilities, and improved design of the waiting and patient support areas in the Finard ICU.



Members of the Department, along with partners across the medical center, are currently working on several of these areas. For instance, a new ICU Transition Guide Program aims to mitigate the fear and confusion that patients and families sometimes feel upon transferring from the ICU to a regular medical/surgical floor. To help improve the process, a multidisciplinary team developed a system whereby pre-medical school volunteers are trained to provide individualized assistance to patients and families being transferred out of the ICU. In 2018, the Institute for Patient- and Family-Centered Care

recognized the program with a Partnership Award honorable mention.

Department of Medicine teams are also studying communication in the ICU with the goal of continuous improvement. A paper published this year in *BMJ Quality and Safety* by Department of Medicine faculty member Sigall Bell, MD, found that about 50% of ICU patients and family members surveyed nationally say they are hesitant to speak up about some concerns, such as possible mistakes in care. As Bell explains, "Our goal is to have every patient and family member at any ICU in the country feel like Dr. Berwick did: that they are an integral member of the team and always able to communicate openly and honestly with the care team."

As Zeidel notes, "The culture of the Department and BIDMC has never been to rest on our laurels." Referring to Berwick's praise, he says, "This kind of recognition from someone who really understands quality of care is enormously gratifying, but I am extremely proud of the fact that we always focus on what we can do to improve, so that our patients continue to benefit from better and better care."



Top left: Intensive Care Unit team members

Top right: Donald Berwick, MD

Bottom right: David Berwick

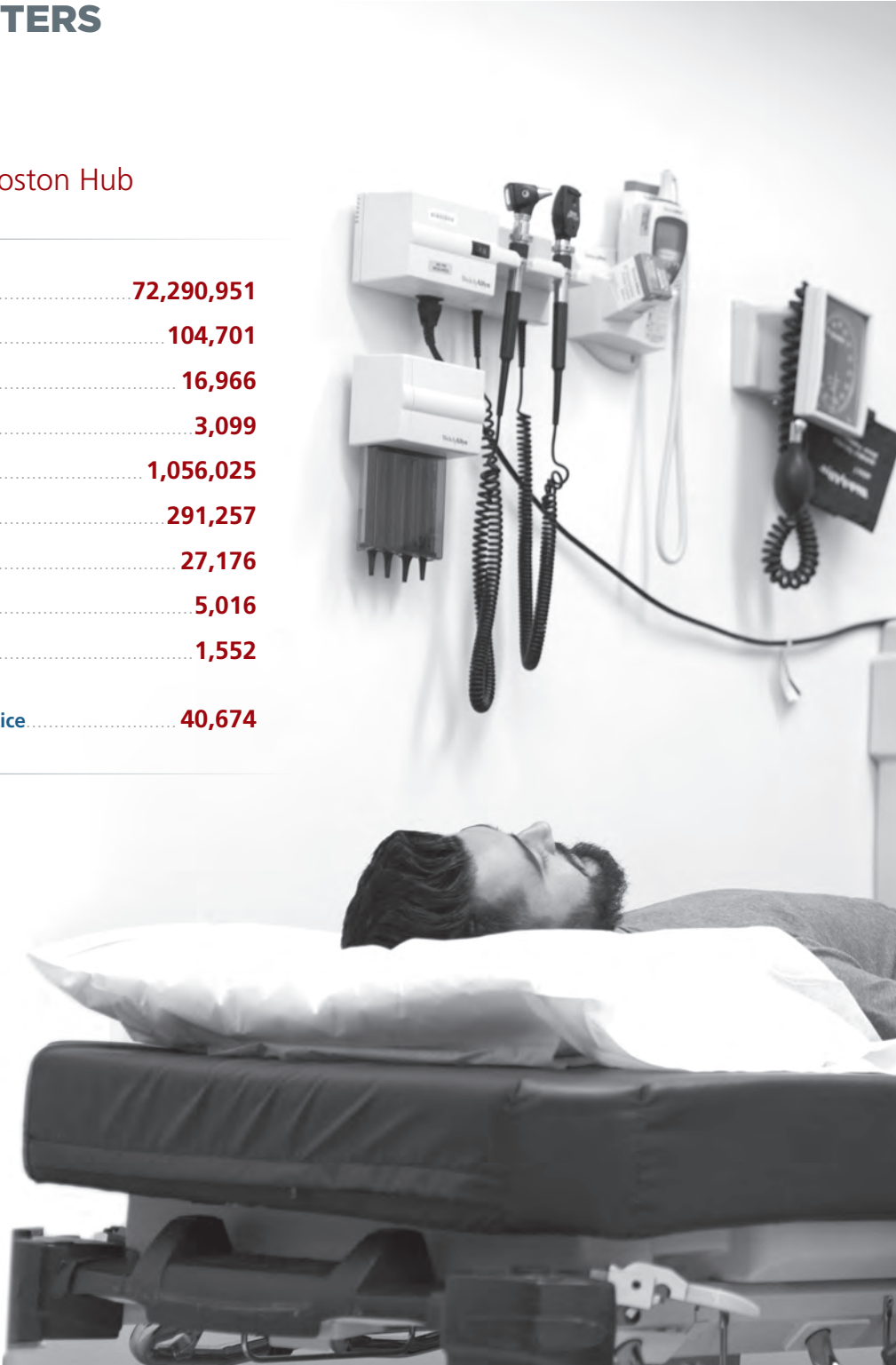
50%

Effective communication in the ICU is a BIDMC priority given that about 50% of ICU patients and family members surveyed nationally say they are hesitant to speak up about concerns.

PATIENT CARE MATTERS

Department of Medicine's
Clinical Volume at BIDMC's Boston Hub

Clinical revenue	72,290,951
Patient days in bed	104,701
Inpatient discharges	16,966
Observation discharges	3,099
Work RVUs	1,056,025
Outpatient visits	291,257
Endoscopic procedures	27,176
Cardiac catheterizations	5,016
Electrophysiology procedures	1,552
Patients in BIDMC's Boston-based Healthcare Associates primary care practice	40,674





Left: Adam Cheifetz, MD, with a trainee and patient

Top right: Suzanne Salamon, MD, with a patient

Bottom right: Resident Nathan Raines, MD, with a patient

PRIMARY CARE ON TRACK

When Kelly Graham, MD, was finishing medical school at Georgetown in 2007 with an interest in primary care, her mentors encouraged her to apply to BIDMC. The medical center's Internal Medicine Residency Program had a reputation for its innovative approach to primary care education. Building on a strong foundation, in 2014 the program underwent a transformative shift under the leadership of Howard Libman, MD, and Eileen Reynolds, MD, becoming one of only two programs in the country to offer residents an immersive longitudinal experience in primary care.

"Immersion training is more effective. It's more intense. Residents get a sense of what it's like to be a primary care doctor—with large panels of about 200 patients each."

—Kelly Graham, MD

Despite the fact that 80% of all internal medicine residency graduates go on to practice in the ambulatory environment (many in the medical specialties), most internal medicine residency programs focus on inpatient training, explains Graham, now faculty in the Department of Medicine and Director of Ambulatory Training and the Primary Care Track. "The typical inpatient training model impacts all internists, but most vulnerable are those going into primary care who rely on their residency training to prepare them for their careers without any subsequent time in fellowship," she says. "That's how primary care training has been for decades—kind of an afterthought."

In order to provide residents with a rigorous and comprehensive primary care training experience, the BIDMC Residency Program's Primary Care Track is uniquely designed: after a standard internship year, those residents who opt to join the track spend their junior and senior years participating in a training method known as the "long block," a key feature of BIDMC's program.

During the "long block," each academic year is cut into two six-month periods. During one of those, primary care track residents do typical rotations with the other residents; during the other half year, they are immersed in providing primary care at BIDMC's Healthcare Associates (HCA) and a second primary care clinic. Whereas many primary care tracks offer short periods of exposure to primary care, BIDMC's program is longer and immersive. "Immersion training is more effective. It's more intense. Residents get a sense of what it's like to be a primary care doctor—with large panels of about 200 patients each," Graham explains. During their training, primary care residents gain experience that helps them decide on a career path; and for those who go into primary care, the skills they've developed help them significantly once they graduate. "Ordinarily it takes residents several years post-residency to acclimate to full-time primary care work," Graham says. "But graduates of the BIDMC Primary Care Track are more confident, skilled, and poised to succeed straight out of the gate."

With its "long block" design, the Primary Care Track also emphasizes the importance



of relationship building and time. Graham believes that establishing longer-term relationships with patients makes the residents' diagnostics and treatment strategies more sophisticated and precise. She also believes that the time spent on long block allows residents to watch disease processes evolve over the weeks to months it often takes to develop the right diagnostic and treatment plan. "Rather than conduct a battery of tests on a patient you've never seen before, you're able to consider their illness in the broader context of their health and their lives, and evaluate it over time and space." And she believes that these two tools—relationship building and time—are essential to being an exceptional primary care physician and can only be taught in this immersive environment.

Another important feature of the Primary Care Track is its focus on research and quality improvement training. This year, one of the projects that residents are working on is an extension of research Graham recently published in *Annals*

of Internal Medicine, exploring ways to implement innovative post-discharge care for our most vulnerable patients—including home visits—and empowering residents to take the lead in delivering this care. By working on real-world quality improvement projects, residents gain a deeper understanding of primary care in various settings and they learn research skills valuable throughout their careers. Graham has seen the effects first hand: "Residents graduate from the track with so many great skills, and are ready to take on leadership roles throughout the country," she notes. "And it's really wonderful to work with them."





MASTERING HEALTH CARE QUALITY AND SAFETY

“It’s like starting to hear in stereo instead of mono,” explains Anjala Tess, MD, referring to the added dimension that quality improvement and safety training offers physicians. As the Department of Medicine’s Director of Quality and Safety Education and Associate Chair for Education, she often sees the transformation take place among internal medicine residents: “They start to think differently in everything they do—they graduate with a new mindset.”

“Today quality and safety underlie everything we do in the Department of Medicine.”

—Anjala Tess, MD

This year, Tess is taking quality and safety training to a new level and a new audience, launching a Master in Healthcare Quality and Safety Program at Harvard Medical School (HMS). The program evolved out of an HMS fellowship—funded by Controlled-Risk Insurance Company, Ltd. (CRICO)—which Tess has led for five years. The fellowship, designed as a pilot program, proved to be an effective approach to teaching quality and safety. “Traditionally, quality and safety were taught on the job, but we found through the fellowship that a more foundational approach combined with an apprenticeship worked well. Fellowships are limited in number so we decided to design a master’s program to create more access for professionals who want the training,” Tess explains. The inaugural class began the first week of September 2018 with ten students from five different countries.

The new HMS master’s program is one of the first of its kind internationally. Unlike many quality and safety programs, which are primarily online, it is residential. Enrollees—all graduates from health professional programs—are based in Boston at HMS and have access to Harvard

institutions and faculty. The program also draws on the resources and expertise available at BIDMC as well as the other Harvard teaching hospitals. “Many medical schools have one or two affiliated hospitals, but we have such a network across Harvard,” Tess notes. She has designed 378 hours of instruction and will be leading several of the courses within the program. Other BIDMC Medicine faculty members include Lauge Sokol-Hessner, MD, Julius Yang, MD, PhD, Patricia Folcarelli, RN, PhD, and Shani Herzig, MD.

As the field of quality and safety has evolved over the last two decades, BIDMC and Harvard have consistently been at the forefront—and students will benefit from this exposure. Recently, for instance, the medical center has received international recognition for its groundbreaking initiative to identify, track, and prevent non-physical harms that patients often experience in medical settings. (Tracking physical harms has long been required at hospitals, but addressing non-physical harms is new and unique.)

Tess explains that when she came to BIDMC for residency in 1997, she found mentors like Mark Aronson, MD, and Ken Sands, MD,



who were committed to patient safety, but there was not yet a formal training program in place. “In the late 1990s, the concept of ‘do no harm’ was refined to include what we now refer to as quality and safety work,” she reflects. She and Yang, a fellow resident, were among a new cohort of physicians at BIDMC focusing in this area, many of whom have gone on to become national leaders in the field.

“Today quality and safety underlie everything we do in the Department of

Medicine,” says Tess, noting that residents, fellows, and faculty alike are expected to engage in quality improvement projects on an ongoing basis. In fact, she says, residents often graduate, leave BIDMC, and only then realize how much of a focus it is at the medical center. “It’s something that they often take for granted but that sets them apart in other institutions. They have the mindset and skills to improve patient outcomes and efficiencies in how we deliver care. BIDMC is years ahead in this

journey and in engaging our trainees from their first week here,” she says. With the new master’s program, Tess intends to further expand the number of physicians and other health professionals with high-level, foundational training and a commitment to healthcare quality and safety.

EDUCATION MATTERS

MEDICAL EDUCATION LEADERSHIP



Department of Medicine education leadership for the 2017-2018 Academic Year

Residency Leadership

Residency Program Director

C. Christopher Smith, MD

Primary Care Program Director

Kelly Graham, MD

Associate Program Directors

Alicia Clark, MD
Jonathan Crocker, MD
Jason Freed, MD
Molly Hayes, MD
Grace Huang, MD
Kenneth Mukamal, MD, MPH
Daniel Ricotta, MD
Anjala Tess, MD
Anita Vanka, MD
Christina Wee, MD, MPH
Julius Yang, MD, PhD

Education Manager

Ruth Colman

Chief Medical Residents

Andrew Locke, MD
Susan McGirr, MD
Robert Montgomery, MD
Lika Targan, MD
Alok Tewari, MD, PhD
Alexa Triot, MD

Undergraduate Education Leadership

Core I Clerkship

Amy Weinstein, MD, MPH
Course Director

Anita Vanka, MD
Course Co-Director

Core II Clerkship

Pamela Hartzband, MD
Course Director

Alexander Carbo, MD
Course Director

Practice of Medicine Clerkship

Ronald Silvestri, MD
Site Director

Anita Vanka, MD
Associate Site Director

Primary Care Clerkship

Susan Frankl, MD
Site Director

Fellowship Program Directors

Cardiovascular Medicine

Joseph Kannam, MD

Electrophysiology

Alfred Buxton, MD

Interventional Cardiology

Eric Osborne, MD, PhD

Non-Invasive Cardiology

Warren Manning, MD

Clinical Informatics

Charles Safran, MD

Endocrinology, Diabetes, and Metabolism

Alan Malabanan, MD

Gastroenterology

Ciaran Kelley, MD

Advanced Endoscopy

Tyler Berzin, MD

Celiac Disease

Daniel Leffler, MD

Hepatology

Michelle Lai, MD

Inflammatory Bowel Disease

Alan Moss, MD

Motility

Anthony Lembo, MD

Transplant Hepatology

Nezam Afdhal, MD

General Medicine and Primary Care

Christina Wee, MD, MPH
Gloria Yeh, MD, MPH

Gerontology

Sarah Berry, MD, MPH

Global Health

Jonathan Crocker, MD

Hematology/Oncology

Reed Drews, MD

Hospice and Palliative Medicine

Mary Buss, MD, MPH

Infectious Diseases

Wendy Stead, MD

Christopher Rowley, MD, MPH

Associate Director

Nephrology

Stewart Lecker, MD

Pulmonary and Critical Care

Jakob McSparron, MD
Associate Director

Asha Anandaiah, MD
BIDMC Site Director

Sleep Medicine

Robert Thomas, MD

Rheumatology

Vasileios Kyttaris, MD



Top left: Residents Joshua DuBow, MD, and Alex Goldowsky, MD

Top right: Internal Medicine Residency Program Director, C. Christopher Smith, MD, with residents

Bottom left: Chief Medical Residents

Bottom right: Jeff Zwicker, MD, with resident Ali Corley, MD



ANTIRETROVIRAL TREATMENT FOR PREGNANT WOMEN AND INFANTS: RESEARCH WITH A GLOBAL IMPACT

“Women of reproductive age make up nearly half of the global population of people living with HIV.”

—Rebecca Zash, MD

“Women of reproductive age make up nearly half of the global population of people living with HIV,” explains Rebecca Zash, MD, a member of the Division of Infectious Diseases, and Associate Director of the Internal Medicine Residency Global Health Program and the Global Health Fellowship in Medicine at BIDMC. “However, there’s been a lack of effort to understand the effects of HIV medications on pregnant women and their infants, except to determine whether the medications prevent mother-to-child transmission of HIV.” While preventing pediatric HIV infections is critical, she notes, “It’s only one of the bad things that can happen to a baby. We need to find out if any antiretroviral medications (ARVs) cause other adverse birth outcomes like stillbirth, preterm delivery or birth defects, in order to determine the best HIV treatment regimen. That’s the focus of my work.”

Zash’s research in Botswana—often in partnership with her longtime mentor Roger Shapiro, MD, and BIDMC’s Botswana Global Health Program—has established her as an internationally known expert on the safety of HIV medications for pregnant women and infants. Her work has informed

treatment recommendations and health policy internationally; and over the last 18 months, her landmark findings have resulted in a proverbial roller coaster ride for her and many in the global health world.

At the 2017 International AIDS conference, Zash presented results from the Tsepamo Birth Surveillance Study in Botswana on the safety of the drug Dolutegravir when started during pregnancy. At the time, Dolutegravir was becoming the HIV medication of choice in non-pregnant adults because it was more effective in controlling viral load and had fewer side effects than most other ARVs. So when Zash studied its safety during pregnancy and reported that it carried the same low risk of adverse birth outcomes as Efavirenz (a popular ARV, which had already been shown to be one of the safest during pregnancy), several countries welcomed her findings and changed their recommendations to Dolutegravir.

However, Zash had reported outcomes among women who started Dolutegravir *during* pregnancy, and the Tsepamo Birth Surveillance Study took longer to accrue data on women who started Dolutegravir



Left: Rebecca Zash, MD ©International AIDS Society/Rob Huibers
Below: Mother and son ©Getty Images



before pregnancy. In the spring of 2018, when she analyzed the new data on women who started ARVs prior to conception, she found that Dolutegravir carried an increased risk for neural tube defects of about 1 in 100 births compared to about 1 in 1000 births on other ARVs. Although the findings were preliminary and needed more data to confirm or refute, the stark difference in risk ratio was too large to ignore, prompting Zash to present her findings to the World Health Organization (WHO) HIV Guidelines Committee and at the 2018 AIDS Conference. “Our findings were disappointing to everyone—the public health world and women taking these drugs,” she reflects. “It was hard to be the bearer of bad news, as we knew it would likely impact health recommendations and cause concern and anxiety among HIV-infected pregnant women.”

Published in the *New England Journal of Medicine*, her results led to official safety warnings by the FDA and WHO, and to HIV treatment guideline modifications in the US and globally. While more data is being collected in Botswana and elsewhere, Zash explains that the decision to choose one ARV regimen over another one is complicated

with many factors to consider. Controlling the viral load is important to help prevent mother-to-child transmission after birth and to ensure the health of the mother, but using a drug that might cause a birth defect is also risky. Although “there are no easy answers,” as Zash reflects, her work is critical for the field, says Peter Weller, MD, Chief of Infectious Diseases. “Her research has drawn important attention to and helped elucidate the safety of HIV drugs for the two million HIV positive women who become pregnant each year around the world,” he explains.

“Historically, there hasn’t been enough research on the safety of medications in pregnancy, in general, not just with HIV,” Zash reflects. “I’m hoping that my research highlights why this is important—and ultimately we shift the conversation from the challenges of including pregnant women in research to the ethics of excluding them.”

THE CORE OF THE MATTER

While in Dublin, Ireland, in 2008 for a conference, BIDMC Flow Cytometry Project Manager John Tigges wound up talking with engineers from a biomedical instrument company. He described a challenge then facing BIDMC investigators at the Flow Cytometry Core: in order to study microvesicles present in stored blood, they needed a new instrument with higher resolution than their current machine provided.

“The greatest fulfillment comes when our insights have practical impacts on patient care and outcomes.”

—Ionita Ghiran, MD

The researchers were concerned that the formation of microvesicles—small membrane-bound sacs that are thought to be shed from a variety of cell types—were impacting the quality of stored blood. But their then-current instrument did not have adequate magnification to see the microvesicles. During a brainstorming session over a beer at a Dublin pub, Tigges and the engineers sketched a new instrument on a cocktail napkin. They believed it would help address the Boston-based investigators’ research dilemma.

And it did; this rudimentary sketch eventually led to the development of new instruments with higher resolution than was previously available. This new technology also helped establish BIDMC’s Flow Cytometry Core as a world-leader in microvesicle research. When it was first established in 1994, the Core—started by Peter Weller, MD—consisted of just one full-time staff member and a single instrument, which was funded by a \$113,000 grant from the National Institutes of Health. With the world’s latest technology to offer, the Core has since expanded into a successful enterprise with hundreds of clients. According to Core Director Peter Weller, MD, Vice Chair for Research, Department of Medicine, today

the research facility’s clients are 60% internal BIDMC investigators and 40% external. Its state-of-the-art flow cytometry instrumentation includes three different models that evolved from the early sketch: the Nanoview, the Moflo Astrios EQ,

7,400+

Total number of requests for Flow Cytometry Core services 2013-2018

and the CytoFLEX. These instruments are available to help researchers perform the important work of characterizing microvesicle size, distribution, count, surface protein composition, and RNA cargo.

During his 15 years at the Core, Tigges has worked closely with many investigators. Among them is long-time BIDMC researcher Ionita Ghiran, MD, a member of the Division of Allergy and Inflammation and Associate Professor at Harvard Medical School. Born in Romania, Ghiran’s international medical training gave him a strong theoretical background, which



From left: Researcher Ionita Ghiran, MD, with Flow Cytometry Specialist Eric Zigon and Core Project Manager John Tigges

proved advantageous to his later work with the Core. He explains, “In Romania, you didn’t have flow cytometers or kits. Knowing what one component does, you can make individualized solutions.” Given their technical skills and proclivities, over the years, Ghiran and Tigges have paired up to improve the Core’s instruments, often advising the instrument manufacturers on upgrades to the technology.

They’ve also teamed up to use the technology to perform groundbreaking research. As Ghiran notes, “A lot of the things you don’t consider when working with larger cells come into play when working with extracellular vesicles.” For instance, some of their recent research has looked at the best time of day and method for collecting blood samples

based on biological circadian rhythms and other variables. Collecting specimens at different times and in different ways introduces noise into the sample that can lead to misdiagnosis. “If you’re looking at different times of day, you may actually be misdiagnosing what is happening, or undermining the effectiveness of treatment,” Ghiran explains. “If you take the sample differently—for instance, the process varies nurse to nurse—you might think everything looks great, but the next day the patient isn’t doing well. So we are narrowing down the ‘when’ and the ‘how.’” While they have received continued funding to explore this further, their preliminary findings suggest that it is generally best to take blood samples early in the morning.

The vision of the Core, Tigges notes, has always been “to stay at the forefront of cytometry, and be here to provide everything we can in an instrument capacity as well as in a scientific capacity. We’ve tried to be forward thinking.” While they’re both inspired by innovation and are constantly looking at new ways to improve and apply existing technology, Tigges and Ghiran agree that they’re most fulfilled by the impact the Core has on patient care and outcomes. Ghiran reflects, “We both love high-tech ‘toys’ and using technology to advance science, but the greatest fulfillment comes when our insights have practical impacts on patient care and outcomes.”

MEDICINE WITH A MISSION

In recent years, the number of cancer survivors has rapidly increased as a result of both an aging population and the development of highly effective cancer treatments. Cardiologist Aarti Asnani, MD, wants survivors and their caregivers to be aware of an often overlooked side effect of these highly effective cancer treatments.

“With all the recent successes of cancer treatment, there is a need to minimize the impact of cardiotoxicity as much as possible.”

—Aarti Asnani, MD

“Therapies such as chemotherapy and radiation that effectively battle cancer can be toxic to the cardiovascular system,” explains Asnani, who joined the Division of Cardiovascular Medicine in 2017. Prior to treatment, it can be difficult to identify which cancer patients are at risk of developing these dangerous and sometimes fatal complications and, in some cases, heart damage doesn’t become apparent until many years after cancer treatment has ended.

During her medical residency, Asnani cared for a woman in her early 40s who had received high doses of Adriamycin chemotherapy as a teenager. Several decades later, the patient was cancer-free but had developed symptoms of heart failure. By the time Asnani saw the patient, she was in cardiogenic shock and passed away within 48 hours of arriving at the hospital.

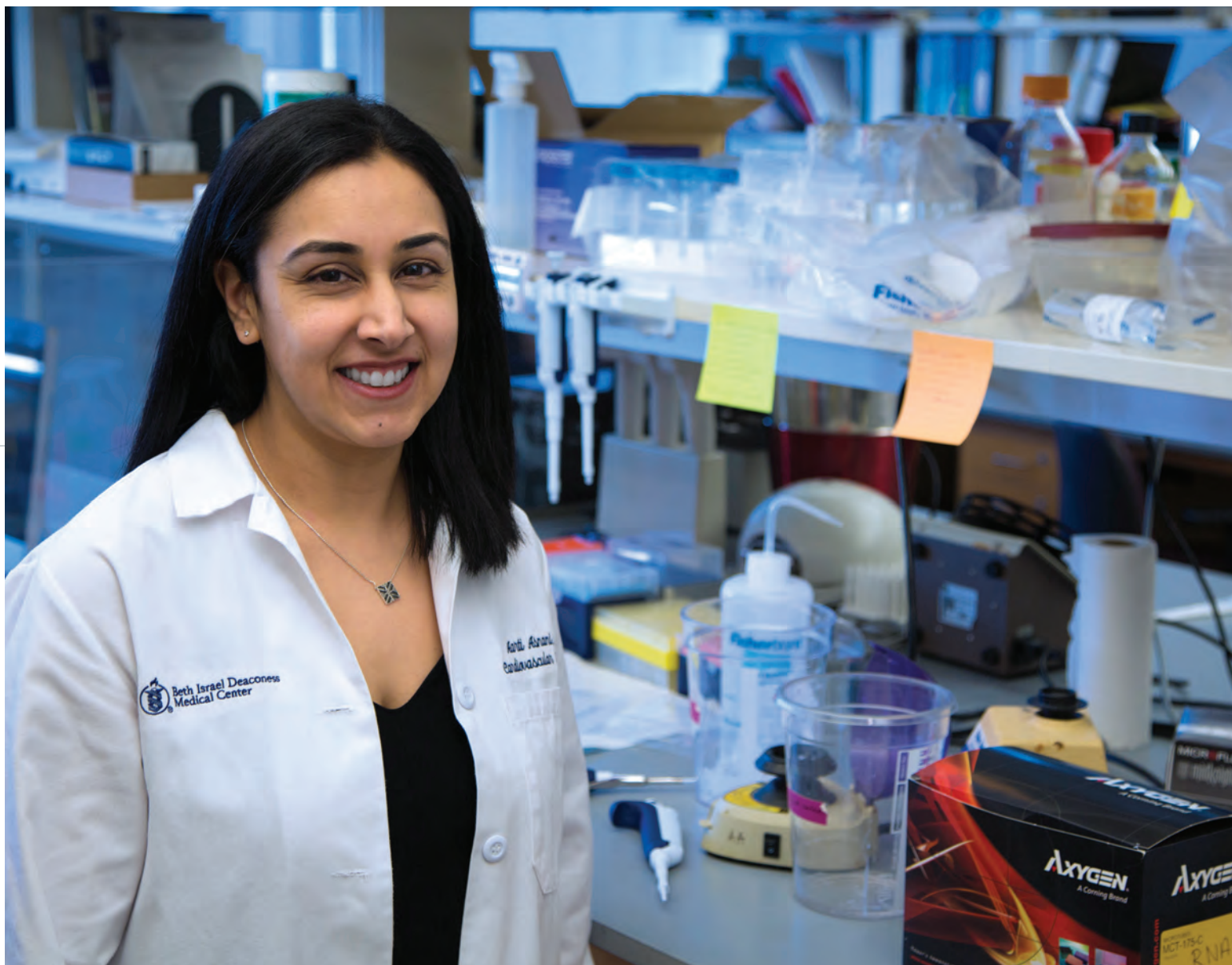
“She and her doctors thought she was cured of cancer and in good health. When she developed decreased energy levels and fatigue, it took a while to diagnose her with congestive heart failure and treat her with the appropriate medications.” This particular experience, says Asnani, led her to pursue the field of cardio-oncology.

“Discussing this case with my mentors made me realize that we need to raise awareness of both the short- and long-term cardiovascular complications that can develop from cancer therapies.”

A physician-scientist, Asnani oversees a team of basic researchers who are working to identify risk factors and markers that could signal the development of cardiac problems following cancer treatments. Using both zebrafish and mouse models, the Asnani lab is focused on understanding the molecular pathways that underlie chemotherapy-induced cardiac toxicity in patients who receive anthracyclines including Adriamycin, which is still commonly used in the

9%

The percentage of all cancer patients who were treated with anthracyclines demonstrated signs of heart toxicity within the first year after chemotherapy



treatment of leukemia, lymphoma, breast cancer, and sarcoma.

At the same time, Asnani is working to identify cardio-protective therapies that one day could be administered in tandem with chemotherapy to prevent the development of heart damage.

A recent estimate finds that as many as 9% of all cancer patients who were treated with anthracyclines demonstrated signs of heart toxicity within the first year after chemotherapy. Asnani reflects, "With all the recent successes of cancer treatment, there is a need to minimize the impact

of cardiotoxicity as much as possible. From a public health standpoint, it will be important to develop new risk stratification and treatment strategies to protect the heart during cancer therapy."

RESEARCH MATTERS: PUBLICATIONS

The following publications from the 2017-2018 Academic Year highlight just some of the scholarly work conducted in the Department of Medicine.

Allergy and Inflammation

Babatunde KA, Mbagwu S, Hernández-Castañeda MA, Adapa SR, Walch M, Filgueira L, Falquet L, Jiang RHY, Ghiran I, Mantel PY. Malaria infected red blood cells release small regulatory RNAs through extracellular vesicles. *Sci Rep* 2018; 8:884.

Bandeira-Melo C, Paiva LA, Amorim NRT, Weller PF, Bozza PT. Eicosacell: an imaging-based assay to identify spatiotemporal eicosanoid synthesis. *Methods Mol Biol* 2017; 1554:127-41.

Tucker JD, Hughes MA, Durvasula RV, Vinetz JM, McGovern VP, Schultz R, Dunavan CP, Wilson ME, Milner DA, LaRocque RC, Calderwood SB, Guerrant RL, Weller PF, Taylor TE. Measuring success in global health training: data from 14 years of a postdoctoral fellowship in infectious diseases and tropical medicine. *Clin Infect Dis* 2017; 12:1768-72.

Weller PF, Spencer LA. Functions of tissue-resident eosinophils. *Nat Rev Immunol* 2017; 17:746-60.

Xenakis JJ, Howard ED, Smith KM, Olbrich CL, Huang Y, Anketell D, Maldonado S, Cornwell EW, and Spencer LA. Resident intestinal eosinophils constitutively express antigen presentation markers and include two phenotypically distinct subsets of eosinophils. *Immunology* 2018; 298-308.

Cardiovascular Medicine

Benson MD, Yang Q, NAGO D, Zhu Y, Shen D, Farrell LA, Sinha S, Kayes MJ, Vasan RS, Larson MG, Smith JG, Wang TJ, Gerszten RE. Genetic architecture of the cardiovascular risk proteome. *Circulation* 2018; 137:1158-72.

Butala NM, Kramer DB, Shen C, Strom JB, Kennedy KF, Wang Y, Wasfy JH, Yeh RW. Applicability of publicly-reported hospital readmission measures to unreported conditions and patient populations: a cross-sectional all-payer study. *Ann Intern Med* 2018; 168:631-39.

Gibson CM, Levitan B, Gibson WJ, Yee WJ, Yee MK, Murphy SA, Yuan Z, Chakrabarti AK, Lee M, Braunwald E. Fatal or irreversible bleeding and ischemic events with Rivaroxaban in acute coronary syndrome. *J Am Coll Cardiol* 2018; 72:129-36.

Jacob J*, Ngo D*, Finkel N, Pitts R, Gleim S, Benson MD, Keyes MJ, Farrell LA, Morgan T, Jennings LL, Gerszten RE. Application of large-scale aptamer-based proteomic profiling to planned myocardial infarctions. *Circulation* 2018; 137:1270-77. *Co-first authors.

Secemsky EA, Schermerhorn M, Carroll BJ, Kennedy KF, Shen C, Valsdottir LR, Landon B, Yeh RW. Readmissions after revascularization procedures for peripheral arterial disease: a nationwide cohort study. *Ann Intern Med* 2017; 5:1-8.

Center for Virology and Vaccine Research

Barouch DH, Tomaka FL, Wegmann F, Stieh DJ, Alter G, Robb ML, Michael NL, Peter L, Nkolola JP, Borducchi EN, Chandrashekar A, Jetton D, Stephenson KE, Li W, Korber B, Tomaras GD, Montefiori DC, Gray G, Frahm N, McElrath MJ, Baden L, Johnson J, Hutter J, Swann E, Karita E, Kibuuka H, Mpendo J, Garrett N, Mngadi K, Chinyenze K, Priddy F, Lazarus E, Laher F, Nitayapan S, Pitisuttithum P, Bart S, Campbell T, Feldman R, Lucksinger G, Borremans C, Callewaert K, Roten R, Sadoff J, Scheppeler L, Weijtens M, Feddes-de Boer K, van Manen D, Vreugdenhil J, Zahn R, Lavreys L, Nijs S, Tolboom J, Hendriks J, Euler Z, Pau MG, Schuitemaker H. Evaluation of a mosaic HIV-1 vaccine in a multicentre, randomised, double-blind, placebo-controlled, phase 1/2a clinical trial (APPROACH) and in rhesus monkeys (NHP 13-19). *Lancet* 2018; 392:232-43.

Lim SY, Osuna CE, Hraber PT, Hesselgesser J, Gerold JM, Barnes TL, Sanisetty S, Seaman MS, Lewis MG, Geleziunas R, Miller MD, Cihlar T, Lee WA, Hill AL, Whitney JB. TLR7 agonists induce transient viremia and reduce the viral reservoir in SIV-infected rhesus macaques on antiretroviral therapy. *Sci Transl Med* 2018; 10:ea404521.

Martinot AJ, Abbink P, Afacan O, Prohl AK, Bronson R, Hecht JL, Borducchi EN, Larocca RA, Peterson RL, Rinaldi W, Ferguson M, Didier PJ, Weiss D, Lewis MG, De La Barrera RA, Yang E, Warfield SK, Barouch DH. Fetal neuropathology in zika virus-infected pregnant female rhesus monkeys. *Cell* 2018; 173:1111-22.

Modjarrad K, Lin L, George SL, Stephenson KE, Eckels KH, De La Barrera RA, Jarman RG, Sondergaard E, Tennant J, Ansel JL, Mills K, Koren M, Robb ML, Barrett J, Thompson J, Kosel AE, Dawson P, Hale A, Tan CS, Walsh SR, Meyer KE, Brien J, Crowell TA, Blazevic A, Mosby K, Larocca RA, Abbink P, Boyd M, Bricault CA, Seaman MS, Basil A, Walsh M, Tonwe V, Hoft DF, Thomas SJ, Barouch DH, Michael NL. Preliminary aggregate safety and immunogenicity results from three trials of a purified inactivated zika virus vaccine candidate: phase 1, randomised, double-blind, placebo-controlled clinical trials. *Lancet* 2018; 391:563-71.

Ram DR, Manickam C, Hueber B, Permar SR, Varner V, and Reeves RK. Tracking KLRC2(NKG2C)+ memory and memory-like NK cells in rhCMV+ and SIV+ rhesus macaques. *PLoS Pathog* 14:e1007104.

Clinical Informatics

Boyer C, Gaudinat A, Hanbury A, Appel RD, Ball MJ, Carpentier M, Bergmans JP, Hochstrasser D, Lindberg D, Miller R, Peterschmitt JC, Safran C, Thonnet M, Geissbuhler A. Accessing reliable health information on the web: a review of the HON approach. *Stud Health Technol Inform* 2017; 245:1004-08.

Pandolfi F, Wright A, Slack WV, Safran C. Rethinking the outpatient medication list: increasing patient activation and education while architecting for centralization and improved medication reconciliation. *J Am Med Inform Assoc* 2018; 25:1047-53.

Pearson JF, Rodriguez JA, Safran C. Virtual care as a specialty. *JAMA* 2018; 319:2559-60.

Quintana Y, Gonzalez Martorell EA, Fahy D, Safran C. A systematic review on promoting adherence to antiretroviral therapy in HIV-infected patients using mobile phone technology. *Appl Clin Inform* 2018; 9:450-66.

Safran C. Update on data reuse in health care. *Yearb Med Inform* 2017; 26:24-27.

Clinical Nutrition

Alfaddagh A, Elajami TK, Ashfaque H, Saleh M, Bistran BR, Welty FK. Effect of eicosapentaenoic and docosahexaenoic acids added to statin therapy on coronary artery plaque in patients with coronary artery disease: a randomized clinical trial. *J Am Heart Assoc* 2017; 6: e006981.

Alfaddagh A, Elajami TK, Saleh M, Elajami M, Bistran BR, Welty FK. The effect of eicosapentaenoic and docosahexaenoic acids on physical function, exercise, and joint replacement in patients with coronary artery disease: A secondary analysis of a randomized clinical trial. *J Clin Lipidol* 2018; 12:937-47.

McCracken E, Wood GC, Prichard W, Bistran B, Still C, Gerhard G, Rolston D, Benotti P. Severe anemia after Roux-en-Y gastric bypass: a cause for concern. *Surg Obes Relat Dis* 2018; 30152-7.

Thomas DD, Istfan NW, Bistran BR, Apovian CM. Protein sparing therapies in acute illness and obesity: a review of George Blackburn's contributions to nutrition science. *Metabolism* 2018; 79:83-96.

Endocrinology, Diabetes, and Metabolism

Groopman JE, Hartzband P. The power of regret. *N Engl J Med* 2017; 377:1507-9.

Liang L, Fratzi A, Goldey G, Ramesh RN, Sugden A, Morgan J, Chen C*, and Andermann ML*. A fine-scale functional logic to convergence from retina to thalamus. *Cell* 2018; 173:1343-55.e24. *Co-last authors.

Resch JM, Fenselau H, Madara JC, Wu C, Campbell JN, Lyubetskaya A, Dawes BA, Tsai LT, Li MM, Livneh Y, Ke Q, Kang PM, Fejes-Tóth G, Náray-Fejes-Tóth A, Geerling JC, Lowell BB. Aldosterone-sensing neurons in the NTS exhibit state-dependent pacemaker activity and drive sodium appetite via synergy with angiotensin II signaling. *Neuron* 2017; 96:190-206.

Roh HC, Tsai LT-Y, Shao M, Tenen D, Shen Y, Kumari M, Lyubetskaya A, Jacobs C, Dawes B, Gupta RK, and Rosen ED. Warming induces significant reprogramming of beige, but not brown, adipocyte cellular identity. *Cell Metabolism* 2018; 27:1121-37.

Syed I, Lee J, Moraes-Vieira PM, Donaldson CJ, Sontheimer A, Aryal P, Wellenstein K, Kolar MJ, Nelson AT, Siegel D, Mokrosinski J, Farooqi IS, Zhao JJ, Yore MM, Peroni OD, Saghatelian A, Kahn BB. Palmitic acid hydroxyl stearic acids activate GPR40 which is involved in their beneficial effects on glucose homeostasis. *Cell Metabolism* 2018; 27:419-27. *Co-first authors.

Experimental Medicine

Birrane G, Beigneux AP, Dwyer B, Strack-Logue B, Kristensen KK, Francone OL, Fong LG, Mertens HDT, Pan CQ, Ploug M, Young SG, Meiyappan M. Structure of the lipoprotein lipase-GPIHBP1 complex that mediates plasma triglyceride hydrolysis. *Proc Natl Acad Sci USA* 2018; epub.

Borges TJ, Murakami N, Machado FD, Murshid A, Lang BJ, Lopes RL, Bellan LM,

Uehara M, Antunes KH, Pérez-Saéz MJ, Birrane G, Vianna P, Gonçalves JIB, Zanin RF, Azzi J, Abdi R, Ishido S, Shin JS, Souza APD, Calderwood SK, Riella LV, Bonorino C. March1-dependent modulation of donor MHC II on CD103+ dendritic cells mitigates alloimmunity. *Nat Commun* 2018; 9:3482.

Elf S, Abdelfattah NS, Baral AJ, Beeson D, Rivera JF, Ko A, Florescu N, Birrane G, Chen E, Mullally A. Defining the requirements for the pathogenic interaction between mutant calreticulin and MPL in MPN. *Blood* 2018; 131:782-6.

Prasad A, Kulkarni R, Shrivastava A, Jiang S, Lawson K, Groopman JE. Methamphetamine functions as a novel CD4+ T-cell activator via the sigma-1 receptor to enhance HIV-1 infection. *Scientific Reports*. In press.



RESEARCH MATTERS: PUBLICATIONS (CONTINUED)

Gastroenterology

Ballou S, Hirsch W, Singh P, Rangan V, Nee J, Iturrino J, Sommers T, Zubiago J, Sengupta N, Bollom A, Jones M, Moss AC, Flier SN, Cheifetz AS, Lembo A. Emergency department utilisation for inflammatory bowel disease in the United States from 2006 to 2014. *Aliment Pharmacol Ther* 2018; 47:913-21.

Curry MP, Tapper EB, Bacon B, Dieterich D, Flamm SL, Guest L, Kowdley KV, Lee Y, Milligan S, Tsai N, Younossi Z, Afdhal NH. Effectiveness of 8- or 12-weeks of ledipasvir and sofosbuvir in real-world treatment-naïve, genotype 1 hepatitis C infected patients. *Aliment Pharmacol Ther* 2017; 46:540-8.

Feuerstein JD, Nguyen GC, Kupfer SS, Falck-Ytter Y, Singh S. American Gastroenterological Association Institute Guideline on therapeutic drug monitoring in inflammatory bowel disease. *Gastroenterol* 2017; 153:827-34.

Liu L, Ghaziani TT, Wolf JL. Acute fatty liver disease of pregnancy: Updates in pathogenesis, diagnosis, and management. *Am J Gastroenterol* 2017; 112:838-46.

Ukleja A, To C, Alvarez A, Lara LF. Long-term therapy with teduglutide in parenteral support-dependent patients with short bowel syndrome: A case series. *JPEN J Parenter Enteral Nutr* 2018; 42:821-25.

General Medicine

Basu S, Landon BE, Williams JW Jr, Bitton A, Song Z, Phillips RS. Behavioral health integration into primary care: a microsimulation of financial implications for practices. *J Gen Intern Med* 2017; 32:1330-42.

Graham KL, Auerbach AD, Schnipper JL, Flanders SA, Kim CS, Robinson EJ, Ruhnke GW, Thomas LR, Kripalani S, Vasilevskis EE, Fletcher GS, Sehgal NJ, Lindenauer PK, Williams MV, Metlay JP, Davis RB, Yang J, Marcantonio ER, Herzig SJ. Preventability of early vs. late hospital readmissions in a national cohort of general medicine patients. *Ann Intern Med* 2018; 168:766-74.

Herzig SJ, LaSalvia MT, Naidus E, Rothberg MB, Zhou W, Gurwitz JH, Marcantonio ER. Antipsychotics and the risk for aspiration pneumonia in non-psychiatric hospitalized patients: a cohort study. *J Am Geriatr Soc* 2017; 65:2580-6.

Mafi JN, Gerard M, Chimowitz H, Anselmo M, Delbanco T, Walker J. Patients contributing to their doctors' notes: insights from expert interviews. *Ann Intern Med* 2018; 168:302-5.

Genetics

Bester AC, Lee JD, Chavez A, Lee YR, Nachmani D, Vora S, Victor J, Sauvageau M, Monteleone E, Rinn JL, Provero P, Church GM, Clohessy JG, Pandolfi PP. An Integrated genome-wide CRISPRa approach to functionalize lncRNAs in drug resistance. *Cell* 2018; 173:649-64.e20.

Bezzi M, Seitzer N, Ishikawa T, Reschke M, Chen M, Wang G, Mitchell C, Ng C, Katon J, Lunardi A, Signoretti S, Clohessy JG, Zhang J, Pandolfi PP. Diverse genetic-driven immune landscapes dictate tumor progression through distinct mechanisms. *Nat Med* 2018; 24:165-75.

Chen M, Zhang J, Sampieri K, Clohessy JG, Mendez L, Gonzalez-Billalabeitia E, Liu XS, Lee YR, Fung J, Katon JM, Menon AV, Webster KA, Ng C, Palumbieri MD, Diolombi MS, Breitkopf SB, Teruya-Feldstein J, Signoretti S, Bronson RT, Asara JM, Castillo-Martin M, Cordon-Cardo C, Pandolfi PP.

An aberrant SREBP-dependent lipogenic program promotes metastatic prostate cancer. *Nat Genet* 2018; 50:206-18.

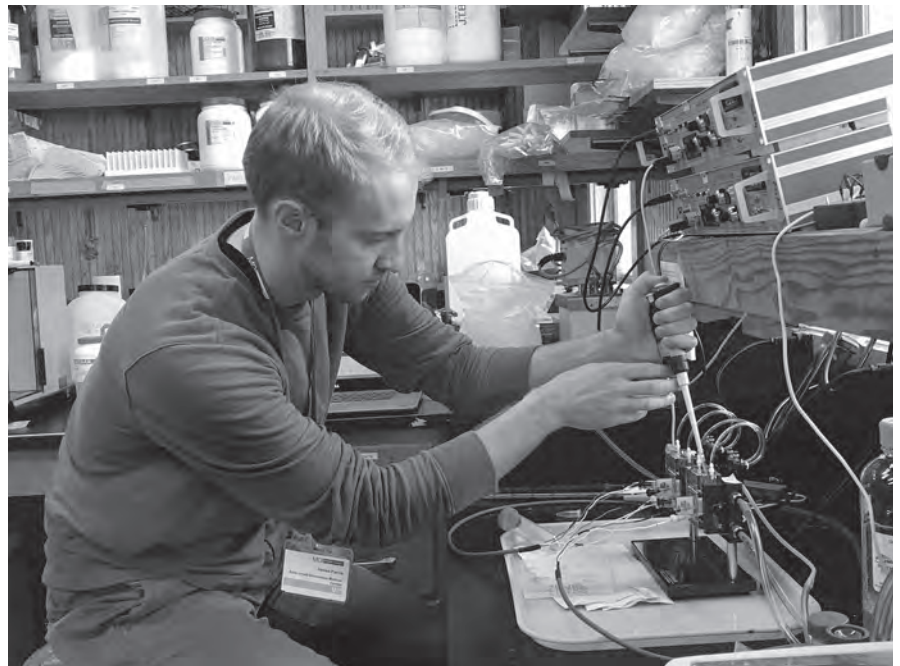
Guarnerio J, Mendez LM, Asada N, Menon AV, Fung J, Berry K, Frenette PS, Ito K, Pandolfi PP. A non-cell-autonomous role for Pml in the maintenance of leukemia from the niche. *Nat Commun* 2018; 9:66.

Matsumoto A, Pasut A, Matsumoto M, Yamashita R, Fung J, Monteleone E, Saghatelian A, Nakayama KI, Clohessy JG, Pandolfi PP. mTORC1 and muscle regeneration are regulated by the LINC00961-encoded SPAR polypeptide. *Nature* 2017; 541:228-32.

Gerontology

Berry SD, Rothbaum RR, Lee Y, Kiel DP, Mitchell SA. Association of surgical repair of hip fracture with clinical outcomes in nursing home residents with advanced dementia. *JAMA Int Med* 2018; 178:774-80.

Jiang X, O'Reilly PF, Aschard H, Hsu YH, Richards JB, Dupuis J, Ingelsson E, Karasik D, Pilz S, Berry D, Kestenbaum B, Zheng J, Luan J, Sofianopoulou E, Streeten EA, Albanes



Chief Medical Resident James Parris, MD

D, Lutsey PL, Yao L, Tang W, Econs MJ, Wallaschofski H, Völzke H, Zhou A, Power C, McCarthy MI, Michos ED, Boerwinkle E, Weinstein SJ, Freedman ND, Huang WY, Van Schoor NM, van der Velde N, Groot LCPGM, Enneman A, Cupples LA, Booth SL, Vasan RS, Liu CT, Zhou Y, Ripatti S, Ohlsson C, Vandenput L, Lorentzon M, Eriksson JG, Shea MK, Houston DK, Kritchevsky SB, Liu Y, Lohman KK, Ferrucci L, Peacock M, Gieger C, Beekman M, Slagboom E, Deelen J, Heemst DV, Kleber ME, März W, de Boer IH, Wood AC, Rotter JJ, Rich SS, Robinson-Cohen C, den Heijer M, Jarvelin MR, Cavadino A, Joshi PK, Wilson JF, Hayward C, Lind L, Michaëlsson K, Trompet S, Zillikens MC, Uitterlinden AG, Rivadeneira F, Broer L, Zgaga L, Campbell H, Theodoratou E, Farrington SM, Timofeeva M, Dunlop MG, Valdes AM, Tikkanen E, Lehtimäki T, Lyytikäinen LP, Kähönen M, Raitakari OT, Mikkilä V, Ikram MA, Sattar N, Jukema JW, Wareham NJ, Langenberg C, Forouhi NG, Gundersen TE, Khaw KT, Butterworth AS, Danesh J, Spector T, Wang TJ, Hyppönen E, Kraft P, Kiel DP. Genome-wide association study in 79,366 European –ancestry individuals informs the genetic architecture of 25-hydroxyvitamin D levels. *Nat Commun* 2018; 9:260.

Kim DH, Schneeweiss S, Lipsitz LA, Glynn R, Rockwood K, Avorn J. Measuring frailty in Medicare data: development and validation of a claims-based frailty index. *J Gerontol A Biol Sci Med Sci* 2018; 73:980-7.

Manor B, Yu W, Zhu H, Harrison R, Lo OY, Lipsitz L, Trivison T, Pascual-Leone A, Zhou J. Smartphone app-based assessment of gait during normal and dual-task walking: demonstration of validity and reliability. *JMIR Mhealth Uhealth* 2018; 6:e36.

Samelson EJ, Demissie S, Cupples LA, Zhang X, Xu H, Liu CT, Boyd SK, McLean RR, Broe KE, Kiel DP, Boussein ML. Diabetes and deficits in cortical bone density, microarchitecture, and bone size: Framingham HR-pQCT Study. *J Bone Miner Res* 2018; 33:54-62.

Hematology/Oncology

Brand R, Borazanci E, Speare V, Dudley B, Karloski E, Peters MLB, Stobie L, Bahary N, Zeh H, Zureikat A, Hogg M, Lee K, Tsung A, Rhee J, Ohr J, Sun W, Lee J, Moser AJ, DeLeonardis K, Krejdivsky J4, Dalton E, LaDuca H, Dolinsky J, Colvin A, Lim C, Black

MH, Tung N. Prospective study of germline genetic testing in incident cases of pancreatic adenocarcinoma. *Cancer* 2018; 124:3520-27.

Hidalgo M, Martinez-Garcia M, Le Tourneau C, Massard C, Garralda E, Boni V, Taus A, Albanell J, Sablin MP, Alt M, Bahleda R, Varga A, Boetsch C, Franjkovic I, Heil F, Lahr A, Lechner K, Morel A, Nayak T, Rossomanno S, Smart K, Stubenrauch K, Krieter O. First-in-Human Phase I Study of Single-agent Vanucizumab, A first-in-class bispecific anti-angiopoietin-2/Anti-VEGF-A antibody, in adult patients with advanced solid tumors. *Clin Cancer Res* 2018; 24:1536-45.

McDermott DF, Huseni MA, Atkins MB, Motzer RJ, Rini BI, Escudier B, Fong L, Joseph RW, Pal SK, Reeves JA, Sznol M, Hainsworth J, Rathmell WK, Stadler WM, Hutson T, Gore ME, Ravaud A, Bracarda S, Suárez C, Danielli R, Gruenewald V, Choueiri TK, Nickles D, Jhunjhunwala S, Piault-Louis E, Thobhani A, Qiu J, Chen DS, Hegde PS, Schiff C, Fine GD, Powles T. Clinical activity and molecular correlates of response to atezolizumab alone or in combination with bevacizumab versus sunitinib in renal cell carcinoma. *Nat Med* 2018; 24:749-57.

Motzer RJ, Tannir NM, McDermott DF, Arén Frontera O, Melichar B, Choueiri TK, Plimack ER, Barthélémy P, Porta C, George S, Powles T, Donskov F, Neiman V, Kollmannsberger CK, Salman P, Gurney H, Hawkins R, Ravaud A, Grimm MO, Bracarda S, Barrios CH, Tomita Y, Castellano D, Rini BI, Chen AC, Mekan S, McHenry MB, Wind-Rotolo M, Doan J, Sharma P, Hammers HJ, Escudier B; CheckMate 214 Investigators. Nivolumab plus ipilimumab versus sunitinib in advanced renal-cell carcinoma. *N Engl J Med* 2018; 378:1277-90.

Pectasides E, Stachler MD, Derks S, Liu Y, Maron S, Alpert L, Kwak H, Polite B, Sharma MR, Allen K, O'Day E, Lomnicki S, Maranto M, Kanteti R, Fitzpatrick C, Weber C, Setia N, Xiao SY, Hart J, Nagy RJ, Kim KM, Choi MG, Min BH, Nason KS, O'Keefe L, Watanabe M, Baba H, Lanman R, Agoston AT, Oh DJ, Dunford A, Thorner AR, Ducar MD, Wollison BM, Coleman HA, Ji Y, Posner MC, Roggin K, Turaga K, Chang P, Hogarth K, Siddiqui U, Gelrud A, Ha G, Freeman SS, Rhoades J, Reed S, Gydush G, Rotem D, Davison J, Imamura Y, Adalsteinsson V, Lee J, Bass AJ, Catenacci DV. Genomic heterogeneity as a barrier to precision medicine in gastroesophageal adenocarcinoma. *Cancer Discov* 2018; 8:37-48.

Hemostasis and Thrombosis

De Ceunynck K, Peters CG, Jain A, Higgins SJ, Aisiku O, Fitch-Tewfik JL, Chaudhry SA, Dockendorff C, Parikh SM, Ingber DE, Flaumenhaft R. PAR1 agonists stimulate APC-like endothelial cytoprotection and confer resistance to thromboinflammatory injury. *Proc Natl Acad Sci U S A*. 2018; 115:E982-91.

Jain A, Barrile R, van der Meer AD, Mammoto A, Mammoto T, De Ceunynck K, Aisiku O, Otieno MA, Loudon CS, Hamilton GA, Flaumenhaft R, Ingber DE. Primary human lung alveolus-on-a-chip model of intravascular thrombosis for assessment of therapeutics. *Clin Pharmacol Ther* 2018; 103:332-40.

Higgins SJ*, De Ceunynck K*, Kellum JA, Chen X, Gu X, Chaudhry SA, Schulman S, Libermann TA, Lu S, Shapiro NI, Christiani DC, Flaumenhaft R*, Parikh SM*. Tie2 protects the vasculature against thrombus formation in systemic inflammation. *J Clin Invest* 2018; 128:1471-84. *Co-first or Co-last authors.

Peng S, Xue G, Gong L, Fang C, Chen J, Yuan C, Chen Z, Yao L, Furie B, Huang M. A long-acting PAI-1 inhibitor reduces thrombus formation. *Thromb Haemost* 2017; 117:1338-47.

Interdisciplinary Medicine and Biotechnology

Agniel D, Kohane IS, Weber GM. Biases in electronic health record data due to processes within the health care system: retrospective observational study. *BMJ* 2018; 361:k1479.

Costa MD, Davis RB, Goldberger AL. Heart rate fragmentation: a symbolic dynamical approach. *Front Physiol* 2017; 8:827.

Ma Y, Shi W, Peng CK, Yang AC. Nonlinear dynamical analysis of sleep electroencephalography using fractal and entropy approaches. *Sleep Med Rev* 2018; 37:85-93.

Seth P, Cszimadia E, Hedblom A, Vuerich M, Xie H, Li M, Serena LM, Wegiel B. Deletion of lactate dehydrogenase-A in myeloid cells triggers antitumor immunity. *Cancer Res* 2017; 77: 3632-43.

Sowalsky AG, Ye H, Bhasin M, Van Allen EM, Loda M, Lis RT, Montaser-Kouhsari L, Calagua C, Ma F, Russo JW, Schaefer RJ, Voznesensky OS, Zhang Z, Bubley GJ, Montgomery B, Mostaghel EA, Nelson PS, Taplin ME, Balk SP. Neoadjuvant-intensive androgen deprivation therapy selects for prostate tumor foci with

RESEARCH MATTERS: PUBLICATIONS (CONTINUED)

diverse subclonal oncogenic alterations. *Cancer Res* 2018; 78: 4716-30.

Immunology

Cuenca M, Puñet-Ortiz J, Ruat M, Terhorst C, Engel P. Ly9 [SLAMF3] receptor differentially regulates iNKT cell development and activation. *Eur Journal Immunol* 2018; 48:99-105.

Herzog RW, Cooper M, Perrin GQ, Biswas M, Ashley T, Martino AT, Terhorst C, Hoffman BE. Regulatory T cells and TLR9 Activation shape antibody formation to a secreted transgene product in AAV muscle gene transfer. *Clinical Immunology* 2017. In press.

Laurie SJ, Liu D, Wagener ME, Stark PC, Terhorst C, Ford ML. 2B4 [SLAMF4] Mediates Inhibition of CD8+ T cell responses via attenuation of glycolysis and cell division. *J Immunol* 2018; 201:1536-48.

Yigit B, Wang N, Terhorst C. SLAMF receptors: Immune regulators in health and disease. 2018. *Clinical Immunology*, Special Edition about SLAMF Receptors, Pablo Engel, ed. In press.

Yurchenko M, Skjesol A, Ryan L, Wang N, Terhorst C, Husebye H, Espevik T. 2018. CD150 [SLAMF1] regulates Type I IFN production in *E.coli* phagosomes. *J Cell Biol* 2017:1411-29.

Infectious Diseases

Alonso CD, Braun DA, Patel I, Akbari M, Oh DJ, Jun T, McMasters M, Hammond SP, Glotzbecker B, Cutler C, Leffler DA, Ballen KK, Kelly CP. A multicenter, retrospective, case-cohort study of the epidemiology and risk factors for *Clostridium difficile* infection among cord blood transplant recipients. *Transpl Infect Dis* 2017; 19:e12728.

Bartley A, King AD, Sawhney MS. Randomized comparison of 3 high-level disinfection and sterilization procedures for duodenoscopes. *Gastroenterology* 2017; 153:1018-25.

Snyder GM, Wright SB, Smithey A, Mizrahi M, Sheppard M, Hirsch EB, Chuttani R, Heroux R, Yassa DS, Olafsdottir LB, Davis RB, Anastasiou J, Bapat V, Bidari K, Pleskow DK, Leffler D, Lane B, Chen A, Gold HS, Stack CM, Gold HS, Wright SB, Baldini LM. Perioperative antimicrobial prophylaxis and prevention of hepatobiliary surgical site infections. *Infect Control Hosp Epi* 2018. In press.

Pollock N, Dhiman R, Daifalla N, Farhat M, Campos-Neto A. Discovery of a unique *Mycobacterium tuberculosis* protein through proteomic analysis of urine from patients with active tuberculosis. *Microbes and Infection* 2018; 20:228-35.

Zash R, Jacobson DL, Diseko M, Mayondi G, Mmalane M, Essex M, Petlo C, Lockman S, Makhema J, Shapiro RL. Comparative Safety of Antiretroviral Treatment Regimens in Pregnancy. *JAMA Pediatr* 2017; 171:e172222.

Nephrology

Higgins SJ, De Ceunynck K, Kellum JA, Chen X, Gu X, Chaudhry SA, Schulman S, Libermann TA, Lu S, Shapiro NI, Christiani DC, Flaumenhaft R, Parikh SM. Tie2 protects the vasculature against thrombus formation in systemic inflammation. *J Clin Invest* 2018; 147:1-84.

Kupferman J, Ramírez-Rubio O, Amador JJ, López-Pilarte D, Wilker EH, Laws RL, Sennett C, Robles NV, Lau JL, Salinas AJ, Kaufman JS, Weiner DE, Scammell MK, McClean MD, Brooks DR, Friedman DJ. Acute kidney injury in sugarcane workers at risk for Mesoamerican nephropathy. *Am J Kidney Dis* 2018; 30697-8.

Leeaphorn N, Pena JRA, Thamcharoen N, Khankin EV, Pavlakis M, Cardarelli F. HLA-DQ Mismatching and kidney transplant outcomes. *Clin J Am Soc Nephrol* 2018; 763-71.

Schell JO, Cohen RA. Communication strategies to address conflict about dialysis decision making for critically ill patients. *Clin J Am Soc Nephrol* 2018; 1248-50.

Yu W, Hill WG, Robson SC, Zeidel ML. Role of P2X(4) Receptor in mouse voiding function. *Sci Rep* 2018; 1838.

Pulmonary, Critical Care, and Sleep Medicine

Banzett RB, Schwartzstein RM, Lansing RW, O'Donnell CR. Aerosol furosemide for dyspnea: High-dose controlled delivery does not improve effectiveness. *Resp Physiol Neurobiol* 2018; 247:24-30.

Moskowitz A, Chen KP, Cooper AZ, Chahin A, Ghassemi MM, Celi LA. Management of atrial fibrillation with rapid ventricular response in the intensive care unit: A secondary analysis of electronic health record data. *Shock* 2017; 48:436-40.

Rice MB, Rifas-Shiman SL, Litonjua AA, Gillman MW, Liebman N, Kloog I, Luttmann-Gibson H, Coull BA, Schwartz J, Koutrakis P, Oken E, Mittleman MA, Gold DR. Lifetime air pollution exposure and asthma in a pediatric birth cohort. *J Allergy Clin Immunol* 2018; 141:1932-34. e7.

Stevens JP, Wall MJ, Novack L, Marshall J, Hsu DJ, Howell MD. The critical care crisis of opioid overdoses in the United States, *Ann of the Am Thorac Soc* 2017; 14:1803-09.

Thomas RJ, Wood C, Bianchi MT. Cardiopulmonary coupling spectrogram as an ambulatory clinical biomarker of sleep stability and quality in health, sleep apnea and insomnia. *Sleep* 2018; 41:1-11.

Rheumatology and Clinical Immunology

Dai H, He F, Tsokos GC, Kyttaris VC. IL-23 limits the production of IL-2 and promotes autoimmunity in lupus. *J Immunol* 2018; 200:3077-86.

Geha M, Bosse R, De Waal Malefyt R, Iwakura Y, Dalle Lucca JJ, Tsokos M, Tsokos GC. IL-17A produced by innate lymphoid cells is essential for intestinal ischemia-reperfusion injury. *J Immunol* 2017; 199:2921-29.

Lieber SB, Fowler ML, Zhu C, Moore A, Shmerling RH, Paz Z. Clinical characteristics and outcomes in polyarticular septic arthritis. *Joint Bone Spine* 2017; 85:469-73.

Kono M, Yoshida N, Maeda K, Tsokos GC. Transcriptional factor ICER promotes Glutaminolysis and the generation of Th17 cells. *Proc Natl Aca Sci USA* 2018; 115:2478-83

Suarez-Fueyo A, Bradley SJ, Kyttaris VC, Moulton VR, Tsokos GC. Downregulation of CD3 in natural killer cells from systemic lupus erythematosus patients confers a pro-inflammatory phenotype. *J Immunol* 2018; 200:3077-86.

Signal Transduction

Breitkopf SB, Taveira MO, Yuan M, Wulf GM, Asara JM. Serial-omics of P53-/-, Brca1-/- Mouse breast tumor and normal mammary gland. *Sci Rep* 2017; 7:14503.

Clement E, Inuzuka H, Nihira NT, Wei W, Toker A. Skp2-dependent reactivation of AKT drives resistance to PI3K inhibitors. *Sci Signal* 2018; 11:eaa03810.



Investigator Vassiliki Boussiotis, MD, PhD

Lien EC, Ghisolfi L, Geck RC, Asara JM, Toker A. Oncogenic PI3K promotes methionine dependency in breast cancer cells through the cystine-glutamate antiporter xCT. *Sci Signal* 2017; 10:eaa06604.

Liu H, Murphy CJ, Karreth FA, Emdal KB, White FM, Elemento O, Toker A, Wulf GM, Cantley LC. Identifying and targeting sporadic oncogenic genetic aberrations in mouse models of triple-negative breast cancer. *Cancer Discov* 2018; 8:354-69.

Yuan M, Breitkopf SB, Asara JM. Serial-omics characterization of equine urine. *PLoS One* 2017; 12:e0186258.

Translational Research and Technology Innovation

Freedman SD. Breast milk fats and lipids: expanding benefits to fragile infant populations. *Breastfeed Med* 2018; 13:S26-27.

Lu J, Lu L, Yu Y, Cluette-Brown J, Martin CR, Claud EC. Effects of intestinal microbiota on brain development in humanized gnotobiotic mice. *Sci Rep* 2018; 8:5443.

Martin CR, Osadchiy V, Kalani A, Mayer EA. The brain-gut-microbiome axis. *Cell Mol Gastroenterol Hepatol* 2018; 6:133-48.

Shanahan KH, Yu X, Miller LG, Freedman SD, Martin CR. Early serum gut hormone concentrations associated with time to full enteral feedings in preterm infants. *J Pediatr Gastroenterol Nutr* 2018; 67:97-102.

Stevens J, Wyatt C, Brown P, Patel D, Grujic D, Freedman SD. Absorption and safety with sustained use of RELiZORB evaluation (ASSURE) study in patients with cystic fibrosis receiving enteral feeding. *J Pediatr Gastroenterol Nutr* 2018; 67:527-32.

Quality Improvement

Delbanco S, Delbanco T. Technology and transparency: empowering patients and clinicians to improve health care value. *Ann Intern Med* 2018; 168:585-86.

Huang GC, Kriegel G, Wheaton C, Sternberg S, Sands K, Richards J, Johnston K, Aronson M. Implementation of diagnostic pauses in the ambulatory setting. *BMJ Qual Saf* 2018; 27:492-7.

Lucier D, Folcarelli P, Totte C, Carbo AR, Sokol-Hessner L. Surveying care teams after in-hospital deaths to identify preventable harm and opportunities to improve advance care planning. *Jt Comm J Qual Patient Saf* 2018; 44:84-93.

Sokol-Hessner L, Folcarelli PH, Annas CL, Brown SM, Fernandez L, Roche SD, Sarnoff Lee B, Sands KE. A road map for advancing the practice of respect in health care: interdisciplinary modified Delphi consensus study. Practice of respect Delphi study group. *Jt Comm J Qual Patient Saf* 2018; 44:463-76.

Zerillo JA, Goldenberg BA, Kotecha RR, Tewari AK, Jacobson JO, Krzyzanowska MK. Interventions to improve oral chemotherapy safety and quality: a systematic review. *JAMA Oncol* 2018; 4:105-17.

Medical Education

Cooper AZ, Hsieh G, Kiss JE, Huang GC. Flipping out: does the flipped classroom learning model work for GME? *J Grad Med Educ* 2017; 9:392-3.

Hale AJ, Ricotta DN, Freed J, Smith CC, Huang GC. Adapting Maslow's hierarchy of needs as a framework for resident wellness. *Teach Learn Med* 2018; 1-10.

Matos J, Petri C, Mukamal K, Vanka A. Spaced education in medical residents: an electronic intervention to improve competency and retention of medical knowledge. *PLoS ONE* 2017; 12:e0181418.

Schwartzstein RM, Roberts DH. Saying goodbye to lectures in medical school: Paradigm shift or passing fad? *New Engl J Med* 2017; 377:605-07.

Tess AV, Mattison MLP, Leo JR, Reynolds EE. Should this patient receive prophylactic medication to prevent delirium?: Grand Rounds discussion from Beth Israel Deaconess Medical Center. *Ann Intern Med* 2018; 168:498-505.

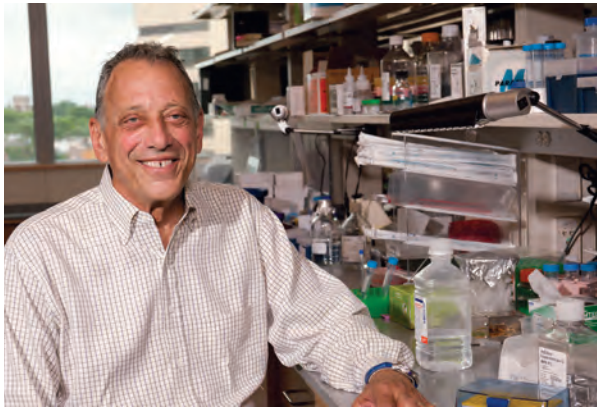
RESEARCH MATTERS: FUNDING

2018 Research Funding

DIVISION	FUNDING SOURCE	TOTAL AWARD	DIRECT AWARD	INDIRECT AWARD
Allergy and Inflammation	Federal Non-Federal	\$1,173,859 \$107,550	\$719,292 \$93,209	\$454,567 \$14,341
Cardiovascular Medicine	Federal Non-Federal	\$7,854,238 \$15,539,532	\$5,302,107 \$13,132,549	\$2,552,131 \$2,406,983
Clinical Informatics	Federal Non-Federal	\$506,575 \$139,450	\$411,219 \$121,261	\$95,356 \$18,189
Clinical Nutrition	Federal Non-Federal	— \$26,950	— \$26,950	— —
Endocrinology, Diabetes and Metabolism	Federal Non-Federal	\$12,248,489 \$3,636,824	\$8,083,503 \$3,354,467	\$4,164,986 \$282,357
Experimental Medicine	Federal Non-Federal	\$747,955 \$952,563	\$490,438 \$853,252	\$257,517 \$99,311
Gastroenterology	Federal Non-Federal	\$7,507,927 \$4,164,696	\$4,499,059 \$3,243,262	\$3,008,868 \$921,434
General Medicine	Federal Non-Federal	\$10,193,085 \$7,632,531	\$9,055,878 \$6,829,129	\$1,137,207 \$803,402
Genetics	Federal Non-Federal	\$7,772,526 \$4,839,123	\$5,011,034 \$4,375,927	\$2,761,492 \$463,196
Gerontology	Federal Non-Federal	\$98,784 \$175,663	\$98,784 \$164,671	— \$10,992
Gerontology/Hebrew Senior Life	Federal Non-Federal	\$7,958,106 \$2,023,161	\$5,673,892 \$1,750,631	\$2,284,214 \$272,530
Hematology/Oncology	Federal Non-Federal	\$18,303,828 \$13,504,032	\$12,148,649 \$11,814,825	\$6,155,178 \$1,689,207
Hemostasis and Thrombosis	Federal Non-Federal	\$2,204,566 \$711,625	\$1,623,257 \$476,659	\$581,309 \$234,967
Immunology	Federal Non-Federal	\$66,419 \$49,413	\$38,172 \$54,601	\$28,247 —
Infectious Diseases	Federal Non-Federal	\$1,647,066 \$323,166	\$1,282,920 \$291,596	\$364,146 \$31,570
Interdisciplinary Medicine and Biotechnology	Federal Non-Federal	\$1,809,658 \$808,744	\$1,298,202 \$499,934	\$511,456 \$308,810
Nephrology	Federal Non-Federal	\$6,274,069 \$5,490,534	\$4,081,454 \$4,454,438	\$2,192,615 \$1,036,096
Pulmonary, Critical Care and Sleep Medicine	Federal Non-Federal	\$904,588 \$315,995	\$788,207 \$288,825	\$116,380 \$27,170
Rheumatology and Clinical Immunology	Federal Non-Federal	\$2,103,892 \$613,759	\$1,349,678 \$550,143	\$754,214 \$63,616
Signal Transduction	Federal Non-Federal	\$131,066 \$1,131	\$74,941 \$2,320	\$56,125 —
Translational Research and Technology Innovation	Federal Non-Federal	\$121,191 \$922,356	\$70,053 \$851,741	\$51,139 \$70,615
Transplant Immunology	Federal Non-Federal	\$4,131 \$165,536	\$1,593 \$155,856	\$2,537 \$9,681
Virology and Vaccine Research	Federal Non-Federal	\$36,200,166 \$15,995,477	\$30,658,232 \$13,354,970	\$5,541,934 \$2,640,507
	Total Federal Total Non-Federal	\$125,832,183 \$78,139,81	\$92,760,563 \$66,741,216	\$33,071,620 \$11,398,595
GRAND TOTAL		\$203,971,994	\$159,501,779	\$44,470,215

IN MEMORIAM

This year marked the passing of two longtime and beloved faculty members in the Department of Medicine. In their distinct and distinguished ways, each promoted the BIDMC mission immeasurably.



Terry Strom, MD, Chief of our Division of Transplant Immunology, was a Professor of Medicine and Surgery at Harvard Medical School. He was a world leader in transplantation immunology, whose discoveries in the domain of cellular immunology transformed the field. Strom trained and collaborated with all of the foremost leaders in this field and helped develop the highly successful therapies we have today in solid organ transplantation. In addition to being an outstanding investigator, he was a superb physician and a master transplant nephrologist as well as an outstanding teacher and mentor.



Warner Vincent Slack, MD, was a Professor of Medicine at Harvard Medical School, co-founder of our Division of Clinical Informatics, and a pioneer in the field of medical informatics. With longtime partner Howard Bleich, MD, Slack oversaw creation of some of the earliest and most effective clinical computing and online medical record systems. Over his remarkable 50-year career, Slack was concerned first and foremost with the wellbeing and rights of individual patients. He was a forceful advocate for patient privacy and a critic of using computer technology in such a way that reduced human beings to numbers or undermined personal relationships in medicine.

DEPARTMENT OF MEDICINE

2018 ANNUAL REPORT



Beth Israel Deaconess Medical Center 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.

BIDMC is in the community with Beth Israel Deaconess Hospital-Milton, Beth Israel Deaconess Hospital-Needham, Beth Israel Deaconess Hospital-Plymouth, Anna Jaques Hospital, Cambridge Health Alliance, Lawrence General Hospital, Signature Healthcare, Beth Israel Deaconess HealthCare, Community Care Alliance and Atrius Health. BIDMC is also clinically affiliated with the Joslin Diabetes Center and Hebrew SeniorLife and is a research partner of Dana-Farber/ Harvard Cancer Center and The Jackson Laboratory. BIDMC is the official hospital of the Boston Red Sox. For more information, visit www.bidmc.org.

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