connected VIBRANT FLOURISHING

NORTH CAMPUS RESEARCH COMPLEX
UNIVERSITY OF MICHIGAN

2017 ANNUAL REPORT

Table of Contents

connected VIBRANT FLOURISHING

LETTER FROM THE DIRECTOR

When I wrote to you last year, I announced that the U-M Health System's clinical pathology activities would begin relocation to NCRC in 2018. I am happy to share that renovation of the four buildings they will occupy continues apace. This move will bring NCRC's total occupancy to well over 3000 people by the end of FY 2018.

One of the original purposes of the NCRC was to develop translational sciences and shift from basic research to applications in actual clinical practice—practical, feasible solutions to critical real-world health problems. The ambition that flourishes in the NCRC's culture of collaboration, and the innovation fostered by interdisciplinary invention, are key to bringing leading-edge technologies and best practices to the public with speed and parity.

A culture of diversity, equality, and inclusion is also key to doing this work. To that end, NCRC has begun partnering with the U-M's Diversity, Equality, and Inclusion training program. This spring we offered courses on intercultural communication, unconscious bias, and bystander intervention skills, and we look forward to continuing the "Many Voices, Our Michigan" conversation in the coming year.

More than half of U-M's schools and colleges are represented here. Not only engineers, doctors, and scientists, but programmers, designers, and entrepreneurs come together at NCRC to work on complex research programs that break down traditional disciplinary silos and attract world-class investigators, funding, and business support. The Comprehensive Cancer Center at NCRC, for example, recently welcomed the newly-founded Forbes Institute for Cancer Discovery, established through a $17.5 million gift from Sidney and Madeline Forbes. Director Max S. Wicha, M.D., says, "The Forbes Institute supports teams of investigators from across the university: the engineering school, the school of pharmacy, the school of public health, the business school, the law school and the medical school."

We have the capacity to support this vibrant innovation. We offer state-of-the-art research, lab, and meeting space for what U-M President Mark Schlissel—himself an M.D./Ph.D.—calls "indispensable collaborations with the private sector, nonprofit organizations, and federal, state and local governments." U-M has two stated missions for NCRC: to expand the university's strengths in translational research, and to help lead the resurgence of the Michigan economy.

In addition to our many U-M research programs, we are home to external partners, most recently welcoming private company DENSO. According to Umesh Patel, Senior Director of the Business Engagement Center at NCRC, "Since locating at NCRC, DENSO has established new collaborations with Michigan Medicine, College of Engineering, and U-M Transportation Research Institute." The connections made through company partnerships led to $284 million in corporate research funding through the Business Engagement Center last year.

We are all eager to see what's next for NCRC. Putting pathology alongside other researchers will be a fruitful collaboration of ideas. Our colleague Alec D. Gillimore, Robert J. Vlasic Dean of Engineering, agrees. "NCRC epitomizes the collaborative, public-oriented spirit of the university. Chemical Engineering faculty and students partner with peers from other units to tackle various big problems. The Biointerfaces Institute includes researchers from engineering, medicine, dentistry and pharmacy, targeting challenges faced by healthcare providers. New technologies will be translated to clinical use. We are proud partners in these important efforts to serve the common good."

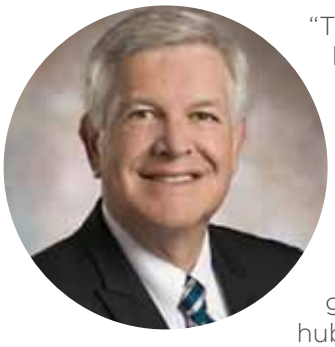
The 2017 North Campus Research Complex Annual Report details even more news of the successes on our connected, vibrant, flourishing campus. I am proud to nurture this important work.

DAVID CANTER, M.B., CH.B.
Executive Director, NCRC

LEADERSHIP VISION

"The North Campus Research Complex demonstrates the University of Michigan's commitment to research that benefits the public. The NCRC's faculty, students and staff unite several academic disciplines, more than half of U-M's schools and colleges, and key departments that save lives in Michigan Medicine. This work produces life-changing innovations through indispensable collaborations with the private sector, nonprofit organizations, and federal, state and local governments. The cutting-edge research being conducted at the NCRC is providing jobs and technology that are boosting the regional economy today, while creating exciting new possibilities for a better and more prosperous tomorrow."

– MARK S. SCHLISSEL, M.D., PH.D., UNIVERSITY OF MICHIGAN PRESIDENT



"The North Campus Research Complex has grown to reflect the vibrancy and diverse nature of our medical school faculty, researchers, staff, and students, who support our education, research and patient care missions every day. NCRC facilitates communication and collaboration across multiple disciplines, in ways that have been greatly fostered by having a centralized hub for interaction and engagement in different disciplines across faculty, staff and students. I have been increasingly impressed with the innovation and discoveries that occur at NCRC, and look forward to more intellectual and research excitement in the coming year."

– DEAN MARSCHALL S. RUNGE, M.D., PH.D., EXECUTIVE VICE PRESIDENT FOR MEDICAL AFFAIRS AND CEO OF MICHIGAN MEDICINE

"The investment that the UM made by purchasing the Pfizer Facility then turning it into the North Campus Research Complex has transformed our ability to provide outstanding wet and dry laboratory research space for carrying out cutting-edge research. Initial concerns whether investigators and trainees would want to work in a 'far away' location relative to other parts of the UM campus became quickly surpassed by what has become a hotbed for vibrant and collaborative research and one of the most desirable places on campus to be."

- BISHR OMARY, M.D., PH.D., EXECUTIVE VICE DEAN FOR RESEARCH, MEDICAL SCHOOL

"The North Campus Research Complex has emerged as a vibrant hub of innovation that spans everything from pioneering interdisciplinary research to translation to practice through our Business Engagement Center and Office of Technology Transfer. With its strong connections across campus as well as with industry, it serves as a resource for the entire U-M research community."

– S. JACK HU, PH.D., VICE PRESIDENT FOR RESEARCH

"In less than a decade the North Campus Research Complex has grown to more than 3000 dynamic individuals actively seeking solutions to today's most pressing healthcare challenges. New technologies brought from lab to clinical use by the NCRC's renowned research teams in engineering and medicine are creating the future of health care."

– ALEC D. GALLIMORE, PH.D., ROBERT J. VLASIC DEAN OF ENGINEERING

"The North Campus Research Complex has built a vibrant and inclusive learning community that thrives on bold and innovative education and discovery. The possibilities that co-location and collaboration offer the next generation of translational researchers are astonishing. Our future is very bright at Michigan Medicine."

– CAROL BRADFORD, M.D., M.S., EXECUTIVE VICE DEAN FOR ACADEMIC AFFAIRS, MEDICAL SCHOOL

connected VIBRANT FLOURISHING


M-SHIP
The University of Michigan
Packaging and
Shipping Services for
Research Materials
UnityLabServices

RESEARCH

FORBES INSTITUTE FOR CANCER DISCOVERY

Numerous University of Michigan Comprehensive Cancer Center (UMCCC) researchers have made NCRC their home. The facility brings together world-class researchers and physicians with diverse interests across the spectrum of cancer research. A recent addition is the newly-founded Forbes Institute for Cancer Discovery.

The Forbes Institute was established in June 2016, thanks to a generous $17.5 million gift from Sidney and Madeline Forbes, longtime Detroit-area philanthropists and dedicated friends of the University of Michigan. Serving at the crossroads of scientific innovation, business and philanthropy, the Institute will be the UMCCC's engine for high-risk, high-reward projects. The Institute will move rapidly to develop innovative technology and new therapies, advancing them from the laboratory concept to the clinic as quickly as possible, and its impact will be felt worldwide.

The director of the Institute is Max S. Wicha, M.D., Madeline and Sidney Forbes Professor of Oncology, and founding director emeritus of the UMCCC. His lab was part of the team that first discovered stem cells in breast cancer, the first described in any human solid tumor; since then, Dr. Wicha has become one of the leading experts on cancer stem cells. He is also active as a clinician, specializing in the treatment of breast cancer patients.

"The greatest discoveries come from crossing the boundaries between the established disciplines," says Dr. Wicha. "The Forbes Institute supports teams of investigators from across the university: the engineering school, the school of pharmacy, the school of public health, the business school, the law school and the medical school."

"THE GREATEST DISCOVERIES COME FROM CROSSING THE BOUNDARIES BETWEEN THE ESTABLISHED DISCIPLINES,"

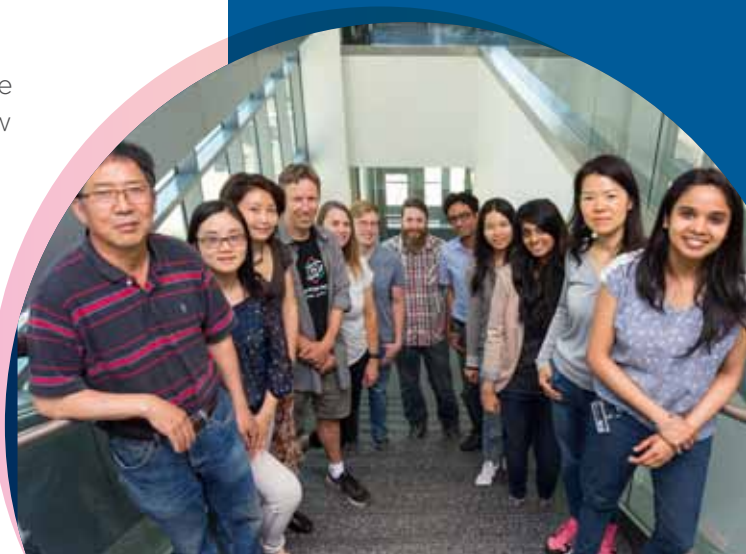
– DR. WICHA

A NEW HOPE

Engaging physicians, engineers, chemists, computer scientists, mathematicians, and even physicists, among others, the Forbes Institute for Cancer Discovery will begin with a focus on the UMCCC's proven strengths in:

- Personalized molecular therapeutics
- Cancer stem cell research
- Bioengineering
- Immunotherapy

For many of the 1.6 million Americans diagnosed with cancer every year, the Institute will offer new hope.



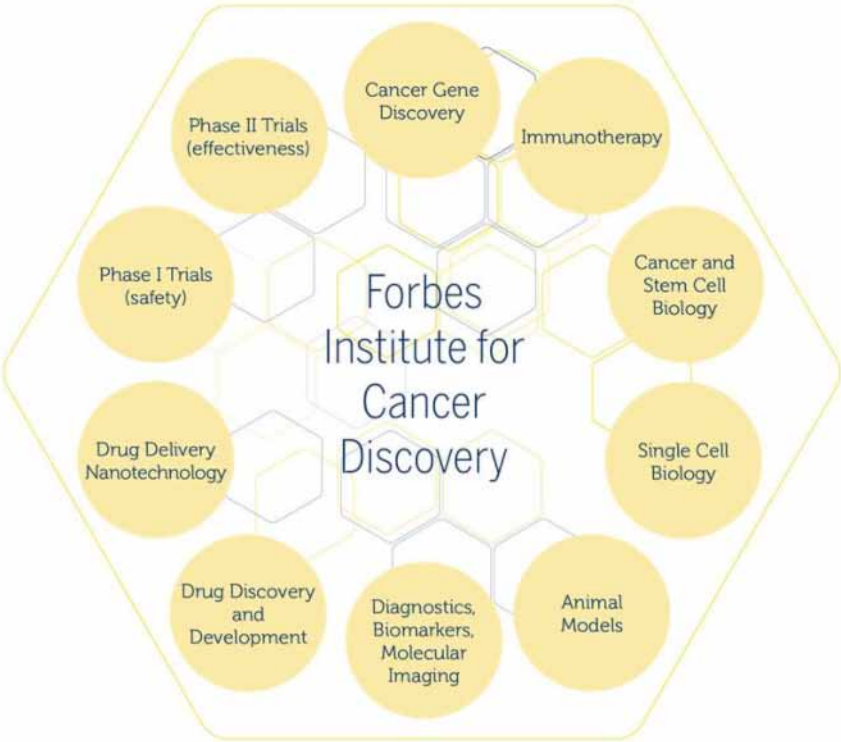
connected VIBRANT FLOURISHING

RESEARCH

FORBES INSTITUTE FOR CANCER DISCOVERY

As part of the NCRC, the Forbes Institute enables faculty partners from different schools and colleges to work side by side on their shared quest to conquer cancer. Scientists and engineers also will work with the Medical School's Fast Forward initiative, the Business Engagement Center, the Ross School of Business and U-M Tech Transfer to patent new technologies and spin off biotechnology companies that will likely be based in Southeastern Michigan. This accelerated effort will not only invigorate the economy, spearhead new industries and fuel continued investment in research, it will also ensure patients gain greater access to approaches that will help them overcome their disease.

By providing bold, cross-departmental funding opportunities, the Institute fuels game-changing initiatives that drive breakthroughs in the latest areas of cancer research. This strategy sparks advances far beyond what we would expect through the incremental funding offered by federal agencies and pharmaceutical companies, which often focuses on improving familiar approaches with periods of waiting between grants.



FORBES INSTITUTE FOR CANCER DISCOVERY

The Institute will share expertise and capital resources with research enterprises throughout the UMCCC, the Medical School, and the other schools, colleges and institutes, amplifying the entire U-M focus on conquering cancer. The Institute will truly capitalize on the breadth and depth of expertise across the university, a unique strength that cannot readily be matched by freestanding cancer centers.

In March 2017, the Forbes Institute announced its first round of grant recipients. Four grants, totaling $500K, were awarded to research teams, each of which represent multiple U-M departments and schools:

James Moon, Ph.D., John Gideon Searle Assistant Professor of Pharmaceutical Sciences, College of Pharmacy, and Assistant Professor of Biomedical Engineering, College of Engineering, was awarded $200,000 for "Towards precision cancer immunotherapy." Moon says, "The Forbes Institute will provide critical support for generating pre-clinical data that will examine this new idea and may promote bench to bedside clinical translation in personalized cancer immunotherapy."

Nouri Neamati, Ph.D., the John G. Searle Professor of Medicinal Chemistry at the College of Pharmacy, was awarded $200,000 for "Discovery of next-generation therapeutics through machine learning techniques." The team includes Mats Ljungman, Ph.D., Duxin Sun, Ph.D., and Vaibhav Sahai, M.D.

Judy Leopold, Ph.D., Research Associate Professor of Radiology and Pharmacology at the Medical School and Co-Director, Experimental Therapeutics Program, UMCCC, and Carol Fierke, Ph.D., Jerome and Isabella Karle Distinguished University Professor of Chemistry and Professor of Biological Chemistry in the Medical School, were awarded $50,000 for "Drugging the Undruggable: Design of Novel KRAS Inhibitors by Dual Targeting of the Effector and Allosteric Binding Sites."

RESEARCH

FORBES INSTITUTE FOR CANCER DISCOVERY

Lonnie D. Shea, Ph.D., William and Valerie Hall Chair and Professor, Department of Biomedical Engineering, College of Engineering, and Jacqueline S. Jeruss, M.D., Ph.D., Associate Professor of Surgery, Medical School, and Director, Breast Care Center, were awarded $50,000 for "A synthetic pre-metastatic niche for early metastasis detection." Shea's team has developed an implant that captures early metastatic cells, and the combination of these implants for early detection combined with an early intervention can improve outcomes. According to Shea, "The Forbes funds provides the seed to take the basic technology of the implant and develop a novel early diagnostic, which may ultimately enable a molecular staging of metastatic disease."

During this inaugural year of the Forbes Institute, a second round of grants will be awarded in Fall 2017.

The opportunity that NCRC provides interdisciplinary innovators to collaborate and tackle the complex problem of cancer—with a laser-sharp focus on saving lives—is unparalleled. By pooling ideas and knowledge, and looking at cancer from different angles, the Forbes Institute for Cancer Discovery and the University of Michigan Comprehensive Cancer Center will substantially accelerate discovery, and impact the way many types of cancer are treated within our lifetime.

For more University of Michigan Comprehensive Cancer Center news, visit

ncrc.umich.edu/research/clinical-research/comprehensive-cancer-center

RESEARCH

U-M INSTITUTE FOR HEALTHCARE POLICY AND INNOVATION

The Institute for Healthcare Policy and Innovation (IHPI) unites more than 500 faculty members from across U-M who are working to evaluate how healthcare works and how it can be made better, and then using that evidence to back sound practices and policies. IHPI's ambitious goals focus on improving the health and quality of life for individuals,
families and communities across our state, country, and around the world.

IHPI was launched in 2011, and moved its academic headquarters to NCRC in June 2012. Bringing researchers and focused teams together in both physical and virtual collaboration over the last five years has sparked several innovative efforts to improve the safety, affordability, and equity of healthcare services, and some of these initiatives are featured on the following page. Read more about how IHPI members are working to address the most pressing challenges in healthcare in IHPI's news magazine, *Profiles in Innovation*, at ihpi.umich.edu/pii.

Members of IHPI's Leadership Team present the recently installed sign outside Building 16 denoting IHPI's academic home.

IHPI Centers and Programs

IHPI is built upon a rich history of health services research, exemplified in dozens of pre-existing and emerging U-M centers and programs working toward the common goal of tackling today's most challenging health care topics. IHPI provides the venue and resources to bring these groups together to accelerate knowledge and improvements in the quality, safety, equity and affordability of health care.

Recently established IHPI centers and programs include:

The Michigan Integrated Center for Health Analytics and Medical Prediction (MiCHAMP), whose primary goal is to harness existing national, regional and local healthcare data sets to develop medical prediction models that address complex clinical problems

The Acute Care Research Unit (ACRU), whose mission is to improve Access, Costs, Utilization, Transitions, and Effectiveness through multidisciplinary health services research across the acute care continuum

The Center for Evaluating Health Reform (CEHR), charged with advancing our knowledge of health system reform through improving the process of academic research

The Center for Eye Policy and Innovation (CEPI), which aims to conduct innovative, collaborative research to help achieve high quality, affordable, and efficient eye care for patients with ophthalmologic diseases

connected VIBRANT FLOURISHING

Preeti N. Malani, M.D., M.S.J., chief health officer at the University of Michigan, and professor of internal medicine in the Division of Infectious Diseases, at Michigan Medicine. Malani is also the director of the University of Michigan National Poll on Healthy Aging.

FACTS + FIGURES

IHPI is the nation's leading university-based institute of health services researchers evaluating how healthcare works and how it can be improved, and advising policy makers to inform change.

500+ **faculty members from 18 schools, colleges, and institutes across 3 U-M campuses**

20+ **specialized research centers**

Access to *20* Terabytes of shared healthcare data

2,000 **research papers published annually**

$700M **in active health services research funding**

87,000 **square feet to support interdisciplinary collaboration**

RESEARCH

U-M INSTITUTE FOR HEALTHCARE POLICY AND INNOVATION

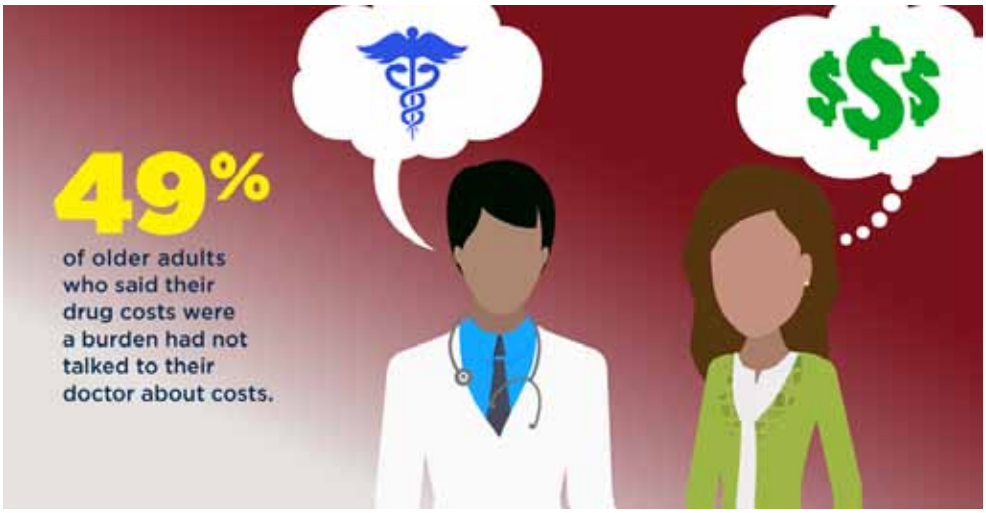
The National Poll on Healthy Aging

Understanding the key health issues facing older Americans

Through the National Poll on Healthy Aging, launched earlier this year, IHPI is tapping into the perspectives of older adults and caregivers to help inform the public, healthcare providers, policymakers, and aging advocates on issues related to health, healthcare and health policy affecting Americans 50 and older.

The poll is a recurring, nationally representative household survey of US adults, designed by a U-M team. Both U-M faculty and AARP, a poll sponsor, contribute to poll topics, which in the first year will include a closer look at prescription drugs, oral health, sleep, and caregiving.

The first poll results, released in June 2017, revealed that many older adults in the US aren't getting—or asking for—as much help as they could from their doctors and pharmacists to find lower-cost drug options. This is true even as the majority of Americans over age 50 take two or more prescription medicines to prevent or treat health problems, and many say the costs present a financial burden.



U-M INSTITUTE FOR HEALTHCARE POLICY AND INNOVATION

Michigan-OPEN (Opioid Prescribing Engagement Network)

Focusing on prevention in the struggle against opioid misuse and abuse

One IHPI-led initiative is taking a novel preventive approach to disrupting the epidemic of prescription pain medication dependence and misuse. This problem is particularly acute in Michigan, where the number of deaths related to prescription opioids is higher than the US average and continues to rise.

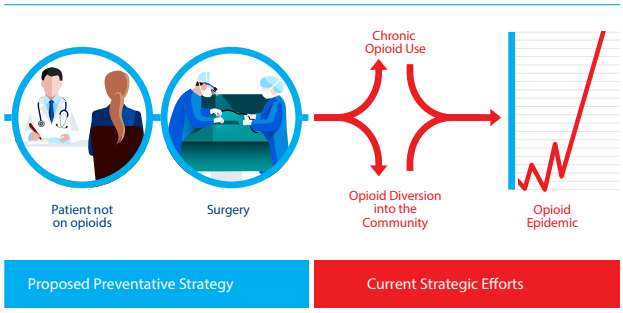
Prevention through appropriate prescribing

Most people who become dependent on prescription opioids receive their first dose following acute care, such as surgery, dentistry, and emergency medicine. And while nearly 40 percent of the medications surgeons prescribe are opioids, they have few resources to guide them in appropriate prescribing. In response, the Michigan-OPEN (Opioid Prescribing Engagement Network) initiative partners with networks of providers and hospitals throughout the state to systematically improve prescribing practices and ensure appropriate postoperative and acute care pain management.

For example, Michigan-OPEN is partnering with the Michigan Surgical Quality Collaborative (MSQC), also based at IHPI, to collect pain and opioid use data to inform the gap between opioid prescription and consumption, and to develop best practices for prescribing opioids to patients undergoing common surgical procedures.

The effort is funded through a five-year, $1.4 million per year grant from the state of Michigan, with equal funding from U-M. Through additional funding from the Substance Abuse and Mental Health Services Administration (SAMHSA) Opioid State Targeted Response Grant, Michigan-OPEN is now expanding efforts to include dentistry and transitions of care between acute care prescribing and primary care providers.

Preventing Chronic Opioid Use and Abuse Before it Starts



RESEARCH

U-M INSTITUTE FOR HEALTHCARE POLICY AND INNOVATION

Safe disposal of unused pain medications

Michigan-OPEN also partners with hospitals and police departments around the state to organize drug take-back events to properly dispose of unused medications. Its May 2017 drive across six Michigan locations (Ann Arbor, Escanaba, Jackson, Pontiac, Saginaw, and Traverse City) removed 421 pounds of pills from circulation, including more than 15,000 excess opioids, and 12,000 sedatives, stimulants and antidepressants.

Across the drives, surgery was the most common reason people had surplus pain medications on hand. Data indicate that more than 70 percent of opioids prescribed after surgery go unused. Of those people using prescription opioids non-medically, 70 percent obtained those medications from a friend or relative (with or without their knowledge).

Some of the Ann Arbor-based team who staffed a community pain medication take-back event in May 2017; the statewide effort collected 15,000 unused opiods.

U-M INSTITUTE FOR HEALTHCARE POLICY AND INNOVATION

Evaluating the Healthy Michigan Plan

Working to understand how healthcare reform affects the most vulnerable in our state

Since 2014, IHPI has partnered with the Michigan Department of Health and Human Services (MDHHS) to evaluate the impact of the state's expansion of its Medicaid program, known as the Healthy Michigan Plan (HMP). The evaluation is examining whether the plan reduces costs, improves health behaviors and outcomes, and improves access to effective care.

The evaluation has surveyed and interviewed thousands of Michigan primary care providers and HMP enrollees and has developed a yearly report on uncompensated care and insurance premium rates for the state legislature.

The evaluation has also resulted in significant research on HMP more broadly, including these findings from U-M researchers:

- Additional employment associated with federal Medicaid expansion spending peaked at over 39,000 jobs in 2016 and is projected to support approximately 30,000 jobs in 2021.
- Increased personal income associated with new employment in Michigan is expected to be relatively stable, at $2.2-2.4 billion per year.
- Added economic activity is projected to yield $145-153 million per year in new state tax revenue.
- Hospitals' uncompensated care costs decreased by almost half after Medicaid expansion. For the average hospital in Michigan, annual uncompensated care expenses fell from $7.2 million in FY13 to $3.8 million in FY15.
- Uncompensated care costs decreased from 5.2 percent of overall costs in FY13 to 2.9 percent in FY15.

IHPI CLINICIAN SCHOLARS 2017-19

Eight scholars were selected to join the IHPI CSP's second cohort, beginning their training in July 2017:

Nauzley Abedini, M.D.
third-year internal medicine resident at the University of Washington

Nnenaya Agochukwu, M.D.
urology resident at Yale New Haven Hospital

Jade Burns, Ph.D., RN, CPNP-PC
completed Ph.D. at U-M School of Nursing in 2016

Calista Harbaugh, M.D.
general surgery resident at U-M

Alan (Taylor) Kelley, M.D.
(VA Scholar) completed residency training in internal medicine and pediatrics at Yale-New Haven Hospital

Cathryn Lapedis, M.D., M.P.H.
(VA Scholar) completed residency at Boston University Medical School and fellowships in renal pathology and surgical pathology at Brigham and Women's Hospital, as well as GI pathology at U-M

Daphna Stroumsa, M.D., M.P.H.
trained in obstetrics and gynecology at Henry Ford Hospital in Detroit

Mary C. Vance, M.D.
(VA Scholar) completed her postgraduate training at the MGH McLean Adult Psychiatry Residency Program, currently a Public Psychiatry Fellow of the American Psychiatric Association

RESEARCH

U-M INSTITUTE FOR HEALTHCARE POLICY AND INNOVATION

- Medicaid appointment availability increased at 4 months and remained increased 1 year after expansion, and more appointments were scheduled with non-physician providers over time.

- Appointment availability increased 6 percentage points for new Medicaid patients and decreased 2 percentage points for new privately insured patients following Medicaid expansion, while wait times remained stable at 1-2 weeks for both groups.

- With implementation of the Healthy Michigan Plan, the proportion of hospitalized non-elderly adult patients who were uninsured decreased 4 percentage points, and the proportion with Medicaid coverage increased 6 percentage points.

IHPI Clinician Scholars Program

Preparing early-career clinician-researchers to transform health and healthcare policy

Since 1994, the Robert Wood Johnson Foundation Clinical Scholars program at U-M consistently provided world-class training and mentorship in health services research and policy to early-career clinicians—126 individuals over the program's history.

In June 2017, the final cohort of seven scholars completed the RWJ-funded program, which has been succeeded by the IHPI Clinician Scholars Program. The IHPI CSP expands upon the foundation of the RWJ program by offering the training experience to doctoral-level nurses and pharmacists as well as physicians, and by allowing scholars to concentrate their research on global healthcare issues beyond the United States.

IHPI hosts the program at U-M as part of the National Clinician Scholars Program, in partnership with the VA Center for Clinical Management Research housed at IHPI. There are similar program sites at UCLA, Penn, and Yale. The first cohort of IHPI scholars began their second year of training in July 2017 alongside a new crop of scholars (see sidebar), as well as early-career clinicians earning a master's degree in health and health care research through the program.

U-M INSTITUTE FOR HEALTHCARE POLICY AND INNOVATION

The Neighborhood-Based Community Health Worker initiative

Leveraging the power of community in responding to the needs of Detroit's underserved

Through a unique partnership between IHPI investigators, the Detroit Health Department, health systems, community development organizations, and Medicaid health plans, the newly launched Neighborhood-Based Community Health Worker initiative is developing a new collaborative model for recruiting, training, and employing community health workers to serve the Detroit Cody-Rouge neighborhood.

Focused on the complicated association between health and poverty, the initiative, funded in part through a U-M Poverty Solutions grant, aims to more broadly strengthen human capital, economic productivity, and community infrastructure by improving health outcomes, boosting employment, and promoting greater coordination among community organizations, social service agencies, health centers and local businesses.

The initiative draws upon Community-Based Participatory Research principles to bring together key neighborhood stakeholders to identify and address barriers preventing access to health and social services. Community Health Workers (CHWs) are recruited from and have a deep understanding of the communities they serve, facilitating access to health and social services and working to improve the quality and cultural competence of service delivery.

IHPI and its partners will assess the impact of the program on health service utilization, health status, quality of life, satisfaction with care, and reductions in care gaps for Medicaid enrollees, as well as job satisfaction and burnout reduction among CHWs. The ultimate goal is to promote standardized CHW workforce training and identify opportunities to improve local and state policies that could positively impact CHW programs across the state.

For more IHPI updates, read IHPI's news magazine, *Profiles in Innovation*, at **ihpi.umich.edu/pii**

For more information on IHPI's many initiatives, visit

ihpi.umich.edu

RESEARCH

U-M INSTITUTE FOR HEALTHCARE POLICY AND INNOVATION

The Michigan Medicine/IHPI Program on Value Enhancement (MPrOVE)

Identifying, implementing, and evaluating ways to more rapidly enhance value in healthcare

The Michigan Medicine/IHPI Program on Value Enhancement (MPrOVE)'s efforts focus on improving quality and demonstrating the value of care within our own health system—and then disseminating the most promising approaches to promote the delivery of high-value health services across the state and the country.

MPrOVE's efforts focus on assessment and enhancement of optimal care by improving the appropriateness of clinical services, concentrating on common and costly areas in which both underuse and overuse are frequent. While many efforts within Michigan Medicine focus on improving care, MPrOVE also focuses on proving, through rigorous evaluations, whether these interventions are effective; and on innovating, by systematically engaging stakeholders in flexible and rapid intervention testing that uses the principles of design thinking.

In addition to improving value and quality of care at Michigan Medicine, MPrOVE aims to catalyze collaborative research efforts which can ultimately inform state and national policy decisions. To this end, in September 2017 MPrOVE launched a Research Innovation Challenge to encourage the development of interdisciplinary research projects focused on high-value/low-value care, and to support the submission of collaborative grant proposals for external funding.

RESEARCH

CARDIOVASCULAR RESEARCH CENTER

NCRC's unique, collaborative environment has positioned Cardiovascular Research Center (CVRC) researchers for success. In the past year, CVRC investigators have been successful in securing federal funding in a very competitive environment. In addition, collaboration with industry has led to a multi-million dollar grant to support a new imaging suite. Fostering collaboration has been key to the CVRC remaining at the cutting edge of research and innovation.

The Office of Technology Transfer and the Venture Accelerator have also increased CVRC's entrepreneurship endeavors, leading to new inventions and patents. Support for results-based innovation is also provided by a pre-doctoral training program focused on cardiovascular research and entrepreneurship. In addition, the Flux High Performance Computing facility provides close, friendly support of CVRC's large scale computer modeling.

The Michigan Translational Research and Commercialization for Life Sciences Program support has enabled the launching of a new company, CARTOX, LLC, developer of an innovative human stem cell-derived cardiac monolayer plating technology that significantly advances preclinical drug cardiotoxicity testing. The Michigan Biology of Cardiovascular Aging Program greatly increases the potential of CVRC to generate knowledge about the mechanisms of cardiovascular diseases and arrhythmias related to aging, including atherosclerosis, and atrial fibrillation.

TOOLS FOR THE JOB

The CVRC maintains unique experimental resources to improve understanding and therapy for cardiovascular diseases, including:

- optical mapping, patch clamping, and molecular and cell biology suites
- confocal microscopy
- a state-of-the-art interventional and electrophysiology suite
- an induced pluripotent stem cell laboratory

Cardiovascular Core Services at CVRC also offers the following methods of cardiovascular system measurement:

- ultrasound imaging, including assessment of cardiac performance, and vascular anatomy and function, of both small and large animal models
- microsurgery, including aortic constriction (TAC or AAB), myocardial ischemia (LAD occlusion), and microcatheter-based approaches for measuring function and drug delivery
- state-of-the-art phenotyping services for animal models ranging from zebrafish all the way to large animals, with a primary focus on mouse and rodent models of disease
- telemetry with implantable probes, for measuring EKG, blood pressure, blood glucose, temperature and activity in conscious, freely-moving animals

RESEARCH

CARDIOVASCULAR RESEARCH CENTER

CVRC represents the vanguard of medical research. Its teams at NCRC are at the forefront of:

- using multi-scale modeling and advanced medical imaging to understand the progression of pulmonary hypertension, and to obtain new markers for improved patient stratification
- the development of a human heart in a dish for cardiotoxicity testing, using human stem cell-derived cardiac muscle cells
- Michigan Biology of Cardiovascular Aging (MBoCA): experimental studies in mice to understand how aging impacts vascular disease
- a state of the art blood flow simulation, modeling the cardiovascular system
- pioneering novel large animal models for a wide range of human diseases including cardiovascular diseases, infectious diseases, genetic diseases and regenerative medicine
- the Virtual Physiological Rat Project, an NIH-supported National Center for Systems Biology initiative to simulate, analyze, and predict physiological function in healthy and diseased subjects
    - the launch of an iPSC Regeneration Core
    - piloting computation systems models in improving and refining diagnosis for cardiovascular disease
    - the creation of an Animal Model Phenotyping and Preclinical Research Course
    - new strategies to treat both civilian and military trauma
- novel high-resolution technologies to accurately map and diagnose atrial fibrillation in human patients

CARDIOVASCULAR RESEARCH CENTER

- the invention of Smart Ablation, a safer way to cure cardiac arrhythmias
- the study of arrhythmogenic inheritable cardiac diseases associated with intracellular calcium dysfunction
- Co-location at NCRC supports the innovative approaches that allow the CVRC to shed light on the molecular mechanisms underlying the development and progression of cardiovascular diseases. By examining the interplay between aging and inflammation on cardiovascular health; investigating genetic and molecular mechanisms of inheritable cardiac diseases; and safely, effectively, and efficiently testing potential new drugs, CVRC is making great advances in the prevention and treatment of cardiovascular diseases.

In 2017 the FCVC established the Cardiovascular Regeneration Core Laboratory, located in the Center for Arrhythmia Research. The mission of the Cardiovascular Regeneration Core Laboratory is to provide services and support for U-M projects that utilize patient-specific induced pluripotent stem cells (iPSCs) and derived cardiovascular cell types. Services include:

- somatic cell expansion
- reprogramming to iPSCs, cryobanking and differentiation of cardiovascular cells
- generation of patient-specific cardiac muscle cells to be used for cardiac disease modeling and cardiotoxicity screening
- testing of new cancer therapies for potential cardiac off-target effects
- pro-arrhythmia screening using optical mapping approaches in high throughput screens

THE LAST FIVE YEARS

Since 2012 BI Researchers have:

Published ***800+*** journal articles

Contributed ***100+*** inventions and ***60+*** patents

Launched ***4*** start-up companies

RESEARCH

BIOINTERFACES INSTITUTE

Designed to break down disciplinary silos and promote continual collaboration between scientists, engineers, and clinicians, the Biointerfaces Institute (BI) is home to 27 research groups comprised of more than 350 students and researchers from the School of Dentistry, the College of Engineering, the School of Medicine, and the College of Pharmacy, co-located in over 55,000 square feet of dedicated, state-of-the-art facilities. BI leverages its expertise in five research clusters: nanotechnology, advanced materials and drug delivery, cell and tissue engineering, neural engineering and single cell technologies.

This fertile research environment leads to numerous research and faculty awards. In 2017:

- Prof. William Stacey (Neurology) received the 2017 Dreifuss-Penry Epilepsy Award from the American Academy of Neurology.
- Prof. Mike Solomon (Chemical Engineering) was elected Fellow of the American Association for the Advancement of Science for his contribution to the field of colloid science.
- Prof. Tim Bruns (Biomedical Engineering) received a National Science Foundation Faculty Early Career Development (CAREER) Award.
- Graduate student Rui Kuai (Pharmaceutical Sciences, Advisor: James Moon) won the 2017 Innovation in Biotechnology Award from the American Association of Pharmaceutical Scientists (AAPS). He was recognized for a paper entitled “Designer vaccine nanodiscs for personalized cancer immunotherapy,” a joint project between Anna Schwendeman and James Moon.

BIOINTERFACES INSTITUTE

BI operates from the premise that, without exception, great minds deserve great resources. Accordingly, our state-of-the-art collaboratory features:

- A configurable 1500 square foot Integration Space where BI researchers and their academic and industry partners catalyze intellectual energy and accelerate bench-to-bedside results

- Superbly equipped facilities, including shared office spaces, wet labs, and collaboration space designed to promote interaction and spur new ideas within the BI community

- Strategic investment in equipment that supports breakthrough, interdisciplinary research, housed in stand-alone specialty research centers including:

  - 950 square foot Nanotechnicum for nanomaterial characterization and analysis

  - Optical Image and Analysis Lab for imaging and characterization of a wide range of materials from colloids to tissues

  - Single-Cell Technology Lab for isolating and evaluating single cells

  - Visualization Lab (VisLab), for modeling and understanding complex materials

To further promote collaboration BI hosts a series of interdisciplinary workshops known as Challenges. These fast-paced, two-day events bring BI researchers together with industrial partners and a broad range of faculty from other U-M departments to address a major biomedical topic. A seed fund competition held in conjunction with each Challenge provides funding opportunities that virtually eliminate the lag between concept and execution, promoting spontaneous collaboration.

CHALLENGES OUTPUT

6 Challenges

+ $1.2 million
in seed funds to 17 research teams

= $4 million
in follow-on grant funding

For more Biointerfaces news, go to

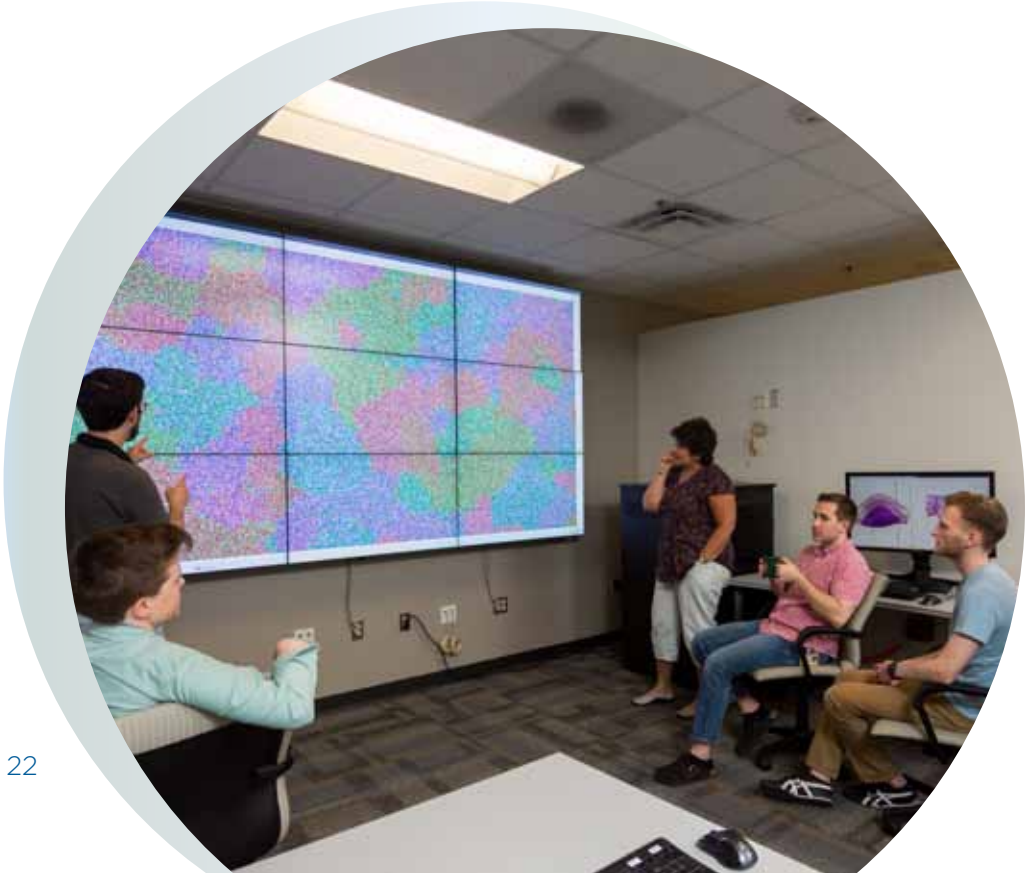
biointerfaces.umich.edu

RESEARCH

BIOINTERFACES INSTITUTE

BI's collaborative spirit extends beyond their faculty to include non-faculty researchers. The Biointerfaces Institute Research Group (BIRG) supports a culture of collaboration amongst our non-faculty researchers through seminars, educational workshops, social events and STEM outreach activities. These BIRG events provide researchers with rich opportunities for interaction, enhancing the flow of knowledge across disciplines, labs, and individuals. When BIRG co-hosted a microposter session in conjunction with BI's 2017 Inaugural Symposium, research projects from over 50 researchers were showcased.

The Biointerfaces Institute has designed a new blueprint for biomedical research that encourages out-of-the-box thinking, drives innovation, and accelerates the path from basic research to real-world health outcomes, all while serving as an ideal training site for the next generation of scientists and thought leaders.

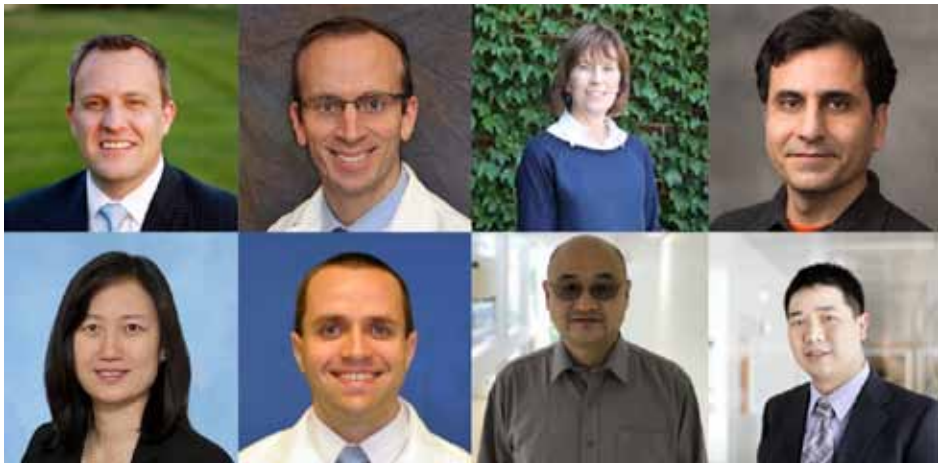


RESEARCH

MICHIGAN CENTER FOR INTEGRATIVE RESEARCH IN CRITICAL CARE

Critical illness and injury is a silent epidemic that affects more than 5.7 million Americans every year. It has an enormous societal and economic toll, yet is not well understood. The Michigan Center for Integrative Research in Critical Care (MCIRCC) was started just four years ago with the goal of transforming critical care medicine to improve patient care and outcomes.

Led by Kevin Ward, M.D., MCIRCC's mission is to accelerate science from bench to bedside. Dr. Ward notes, "The integration strategies and resources we have launched are producing collaborations and creativity on a scale that I don't think has ever been witnessed or achieved in the field of critical illness and injury. We are truly developing and realizing solutions that for decades simply seemed out of reach."



From left to right:
Rodney Daniels, M.D., *Pediatrics and Communicable Diseases*
Robert Dickson, M.D., *Pulmonary and Critical Care Medicine*
Kathleen Stringer, PharmD, *Pharmacy*
Kayvan Najarian, Ph.D., *Computational Medicine and Bioinformatics*
Kathleen To, M.D., *Acute Care Surgery*
Michael Maile, M.D., *Anesthesiology*
Xudong (Sherman) Fan, Ph.D., *Biomedical Engineering*
Jianping Fu, Ph.D., *Mechanical Engineering and Biomedical Engineering*

FOSTERING MULTIDISCIPLINARY TEAM SCIENCE

Over the past 30 years, there have been limited developments in the way that critically ill and injured patients are cared for. To challenge conventional thinking and generate new ideas, MCIRCC has broken down research silos by bringing together investigators from disciplines across the University of Michigan. At the forefront of this endeavor are MCIRCC's Associate Directors, who represent several major pillars of critical care:

- **Pulmonary and Critical Care Medicine (Robert Dickson, M.D.)**
- **Biomedical Engineering (Xudong Fan, Ph.D.)**
- **Pediatrics and Communicable Diseases (Rodney Daniels, M.D.)**
- **Mechanical Engineering (Jianping Fu, Ph.D.)**
- **Computational Medicine and Bioinformatics (Kayvan Najarian, Ph.D.)**

With their leadership, MCIRCC has fostered collaborations between researchers across 32 departments (from 7 U-M Schools and Colleges) and paired them with key stakeholders for maximum impact.

FY 2017 NUMBERS

170+ **world-class scientists, clinicians, and engineers across 32 departments**

10 **new invention disclosures**

2 **MCIRCC spinoff companies**

8 **new patents pending**

181 **member-authored or co-authored critical care journal articles**

7 **schools and colleges represented by members**

$280K **from FFMI Kickstart**

$635K **from FFMI MTRAC**

$451K **from Coulter Translational Research Partnership Program**

$1.2M **from Joyce and Don Massey Family Foundation**

$24.6M **in federal funding**

$159K **in industry funding**

$82K **in foundation funding**

RESEARCH

MICHIGAN CENTER FOR INTEGRATIVE RESEARCH IN CRITICAL CARE

The Catalyst Framework

MCIRCC uses a unique Catalyst Framework, an innovative business model which unifies scientists, clinicians, engineers, industry partners, and diverse funding streams. The Catalyst provides end-to-end management of the research pipeline, utilizing multidisciplinary team science, big data analytics, specialized funding sources, and tailored commercialization plans to push research beyond the idea stage:

- Proposal Development Unit: Intensive proposal development support for multidisciplinary teams, including proposal integration, production, and submission.
- Commercialization Coaching: Tailored entrepreneurial services, such as project management and startup creation, that accelerate innovative solutions to the bedside.
- Clinical Research Unit: Streamlines the process for investigators by assisting with the development and execution of clinical pilot studies, and with IRB protocol support, patient engagement, and data collection.
- Large Animal ICU Facility: One-of-a-kind lab that provides viable, demonstrable models to accurately simulate complex human disease and treatment options in the pre-clinical stages of critical care.
- Data Science Team: Responsible for developing an advanced analytics platform that captures high-fidelity physiological waveform data from critical care patient beds, which can be utilized for research and clinical needs.
- Funding Opportunities: Access to funding through MCIRCC's Grand Challenge, which targets big problems in critical care and rewards bold solutions.

MICHIGAN CENTER FOR INTEGRATIVE RESEARCH IN CRITICAL CARE

The Grand Challenge

Each year MCIRCC hosts its Grand Challenge competition, which funds high-impact, milestone-driven research that addresses a major critical care problem. The Grand Challenge has thus far focused on developing innovative solutions for sepsis and traumatic brain injury, but will broaden its scope in the coming years to cover additional critical care issues, such as cardiac arrest and pediatric critical care.

A generous gift from the Joyce and Don Massey Family Foundation provided support for MCIRCC's 2017 event, the second Massey TBI Grand Challenge, which addressed the golden hours of care after severe traumatic brain injury (TBI). TBI affects more than 1.7 million Americans each year, and poses a significant challenge in the armed forces where it is considered a "signature injury." MCIRCC has partnered with the Department of Defense's Combat Casualty Care Research Program to help accelerate the movement of translation research outputs into both battlefield and civilian settings.

"Our emphasis on strategic teaming with industry and partnerships with key stakeholders like the Department of Defense, the Massey Foundation, FFMI, Coulter, the U-M Office of Technology Transfer and others are also helping us drastically cut the development cycle to get our innovations to impact."

- Executive Director Kevin Ward, M.D.

Following a rigorous application and review process, seven teams received funding totaling $680,000 to develop innovative diagnostic, device, therapeutic, and health IT solutions.

connected VIBRANT FLOURISHING

MICHR'S IMPACT INCLUDES:

900: average number of investigators MICHR serves each year

90% IND, IDE, and expanded access requests to the FDA MICHR's investigator assistance program supports

1200 annual attendees at MICHR education and mentoring workshops,

97% graduates who remain in clinical and translational research after completing the MICHR KL2 program

72,000 number of study participant visits to the Michigan Clinical Research Unit since 2009

442,000 specimens processed by MCRU for research studies since 2009

1109 research development consultations and grant editing services provided to investigators since 2007

$21M amount MICHR has awarded in pilot grants since 2007

$224M amount of extramural funding pilot grant recipients have self-reported since 2007

RESEARCH

MICHIGAN INSTITUTE FOR CLINICAL & HEALTH RESEARCH

The next breakthrough in cancer, heart disease, multiple sclerosis, Alzheimer's, Parkinson's, or many other conditions may be supported by the Michigan Institute for Clinical & Health Research (MICHR), which recently received a $58 million grant from the National Institutes of Health to help make those breakthroughs happen.

Director George A. Mashour, M.D., Ph.D., who also serves as Associate Dean of the Medical School and Executive Director of Translational Research in the U-M Office of Research, said, "The new funding means more chances to translate U-M ideas into knowledge and breakthroughs that can eventually help patients and the general public."

MICHR serves 170 unique University of Michigan units across campus, and engages local communities in the research process. Their knowledgeable faculty and staff educates, funds, connects, and supports research teams with dozens of resources and services, including:

- Consultation: Free, expert advice on everything from study aims, feasibility, biostatistics, and bioethics to budgeting, collaboration, regulatory support, community engagement, participant recruitment, and informatics tools.

- Clinical Research Unit: Facility with clinical staff, resources, and infrastructure necessary to conduct adult and pediatric human clinical research protocols. A highly-skilled clinical research team provides extended-stay services and outpatient appointments, a mobile clinical research team, and a core research lab for specimen collection, processing, shipping, and storage.

- Education and Training: Competency-based education for clinical trial conduct, based on international good clinical practice standards; training relevant to clinical research through degree, certificate, and mentored research programs; community-based participatory research; grant writing, budgeting, informatics tool workshops, and more.

MICHIGAN INSTITUTE FOR CLINICAL & HEALTH RESEARCH

- Community Engagement: Tailored educational presentations, partnership development, and community-engaged research consultations.

- Funding: A variety of award mechanisms, including traditional pilot and seed grants, translational science awards, Mentored Clinical Scientists Career Development Award (MICHR K), and Community-University Partnership Seed.

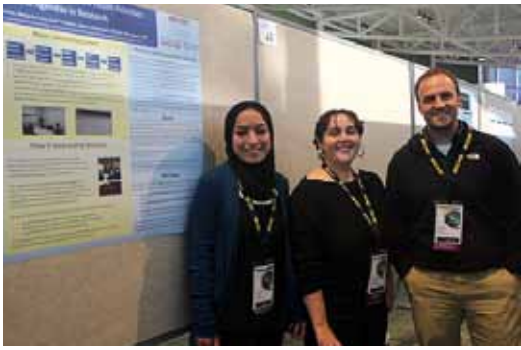
- Grant Writing Support: Careful editing and review of your grant to identify red flags in the content; ensure logic, flow and clarity of ideas; eliminate jargon; improve sentence structure and grammar; and clarify unclear text to strengthen proposals.

- Regulatory Support: Investigational New Drug (IND) and Investigational Device Exemption (IDE) application preparation and submission services, as well as training.

- Research Management: Biostatistics support, data capture tools, study management mentoring and monitoring, and database development are just some of the management services MICHR offers.

All U-M research teams are encouraged to post their studies at UMHealthResearch.org to be matched with nearly 30,000 volunteers who are registered and ready to participate in studies. More than 140,000 secure messages have been sent between volunteers and study teams within the site, providing improved communication throughout the experience.

MICHR is also a research hub in the NIH's Clinical & Translational Science Award (CTSA) Consortium, which allows it to partner with more than 50 other universities nationwide, accelerating discoveries toward better health.



FOR MORE INFORMATION ABOUT ALL OF MICHR'S SERVICES AND RESOURCES, VISIT

michr.umich.edu

connected VIBRANT FLOURISHING

RESEARCH AREAS

Catalysis and Reactions: Understanding reactions and finding the most efficient pathways to biofuels and other important chemicals

Biomolecular Engineering: Discovering and applying chemistry of life for medicine and more

Cellular Engineering: Understanding the chemical drivers of cell behavior and harnessing cells' processing power

Computing and Simulation: Refining theory and guiding experiments

Nanotechnology: Applying new chemical behaviors at small scales

Materials: New properties for new devices and purposes

Polymers and Complex Fluids: Understanding soft matter

Energy: Sustainable solutions for energy harvesting and storage

Microfabricated Systems: Electronics and ultraportable, accurate diagnostic tools

RESEARCH

CHEMICAL ENGINEERING

Health research in the University of Michigan Department of Chemical Engineering includes faculty working on drug delivery, microbiology, the human microbiome, and many other disease treatments. Other faculty are working on advanced energy catalysis, energy storage, and the development of new materials, such as high strength nanocomposites and self-healing polymers.

Recent Awards

Ralph Yang was appointed the John B. Fenn Distinguished University Professor of Engineering. Distinguished University Professorships "recognize senior faculty with exceptional scholarly or creative achievements," and only seven were appointed this year.

Mike Solomon is one of nine University of Michigan faculty members recently elected fellows of the American Association for the Advancement of Science (AAAS). He received this honor for his distinguished contributions to the field of colloid science, particularly for creating and understanding colloidal self-assemblies with new symmetries and new functions.

The American Chemical Society (ACS) has announced that **Nicholas Kotov** will receive the 2017 ACS Award in Colloid Chemistry. This award recognizes and encourages outstanding scientific contributions to colloid chemistry. Kotov was recognized for his "foundational work on self-organization of nanoparticles in dispersions and on surfaces."

CHEMICAL ENGINEERING

Lola Eniola Adefeso has been named a Senior Fellow of the Michigan Society of Fellows by President Mark Schlissel. The Society of Fellows was established in the Rackham Graduate School and is an interdisciplinary group of outstanding scholars at Michigan.

Suljo Linic is the recipient of the 2017 Paul H. Emmett Award in Fundamental Catalysis from the North American Catalysis Society (NACS). He received this award in recognition of his groundbreaking contributions at the interface of heterogeneous catalysis, surface chemistry, nanoscience, and computational catalysis.

For more information and Chemical Engineering news, visit engin.umich.edu/che

FACTS + FIGURES

RESEARCH

Total Research Expenditures: ***$15,044,909***

Total Externally Sponsored Research Expenditures: ***12,000,000***

Papers published: ***138***

Invention Disclosures: ***87***

Patents: ***51***

INFRASTRUCTURE

Total Lab Space: ***41,714 SF***

Student and Research Offices: ***23,756 SF***

Clean Room: ***3029*** H.H. Dow

Confocal Microscope Lab: ***3075*** H.H. Dow

Electron Microbeam Analysis Laboratory (EMAL): West basement of Space Research Building

Mammalian Cell Culture Lab: ***3327*** G.G. Brown

FACULTY

Faculty: ***26*** tenured or tenure-track, ***7*** joint appointed

National Academy Members: ***5***

National Science Foundation Career Awards: ***11***

Named Professorships: ***13***

Internal Awards: ***28*** U-M and College of Engineering awards for teaching, research, and service

National/International Awards: ***13*** American Institute of Chemical Engineering (AIChE) Awards; ***39*** awards from other national societies and organizations

Editorships & Editorial Boards: ***7***

FACTS + FIGURES

As of January 2017, the OoR has supported:

2,500+ faculty and staff served by the Biomedical Research Core Facilities

3,100+ proposals processed by Grant Review & Analysis Office

$81 million in industry-sponsored awards from Fast Forward Medical Innovation

$70 million in new funding from Research Development's R01 Boot Camp Program

300,000+ samples in the Central Biorepository

3.9 million patient records accessible through the Data Office for Clinical & Translational Research

240,000 SF of animal care laboratory space in the Unit for Laboratory Animal Medicine

169 Fast Forward Medical Innovation invention reports

1,600+ active clinical trials tracked by the Clinical Trials Support Office

RESEARCH

MEDICAL SCHOOL OFFICE OF RESEARCH

The Medical School Office of Research (OoR) supports an internationally recognized research enterprise at NCRC, where the shared goal is pursuing innovative science and improving the lives of patients and their families. The OoR is also leading the implementation of the multi-million dollar Strategic Research Initiative, a project involving the entire U-M Medical School research enterprise, to fast-forward to tomorrow's cures.

OoR team members touch virtually every facet of Medical School research:

- Creating and maintaining strategic resources to enhance investigators' competitiveness
- Streamlining research processes to increase research team satisfaction
- Building and refining coordinated infrastructure to support high-quality research
- Accelerating and enhancing research through external partnerships to impact health

"The state-of-the-art facilities and support provided by the NCRC help us serve the research community and, ultimately, contribute to positive patient impact," notes Steven Kunkel, Ph.D., U-M Medical School Senior Associate Dean for Research. "Across the spectrum, our primary mission is to support a culture of innovation and efficiency."

MEDICAL SCHOOL OFFICE OF RESEARCH

All OoR units work together to facilitate and impact key research functions and processes at the Medical School:

- Calendar Review & Analysis Office
- Central Biorepository
- Clinical Trials Support Office
- Data Office for Clinical & Translational Research
- Fast Forward Medical Innovation
- Institutional Review Boards – Medical School
- MiChart Research
- Michigan Institute for Clinical & Health Research
- Research Development
- Research Intelligence and Analytics
- Unit for Laboratory Animal Medicine

Discover more about the Office of Research at research.med.umich.edu

connected VIBRANT FLOURISHING

FACTS + FIGURES

For ***2*** of the past ***3*** years, EM has been ranked first in the nation in NIH-funded emergency research.

U-M EM has the ***largest number*** of NIH-funded principal investigators of any emergency department in the country. In fact, it receives more than ***12%*** of the NIH funding awarded to emergency medicine PIs.

EM research spans from prevention research to ground breaking critical care research in its Emergency Critical Care Center (EC3), which is the ***first and largest*** Emergency Department based ICU in the country.

Faculty publish in top-tier journals, and publications have steadily increased.

RESEARCH

EMERGENCY MEDICINE

As one of the most successful, productive academic emergency medicine programs in the country, the U-M Department of Emergency Medicine's (EM) research capacity has flourished in the last decade. EM's broad-scope strength in research has led to high-impact initiatives and with a hub of activity located at NCRC, momentum is picking up thanks to synergy with research across campus.

EM is a leader in training future researchers, with five faculty currently funded with K-equivalent awards. In addition, U-M recently received a prestigious K12 training grant that will ensure a continuing pipeline of future EM researchers by providing a platform for transitioning junior EM faculty to independent careers in federally funded research.

EM is home to seven major centers and programs that provide national leadership in such areas as neurologic emergencies, pediatric emergency care, injury prevention, critical care, stroke, and more. Four of those groups are located at NCRC, primarily in Building 10:

Acute Care Research Unit

Led by Mahshid Abir, M.D., M.Sc., the ACUTE Care Research Unit (ACRU), in partnership with the U-M Institute for Healthcare Policy and Innovation (IHPI), applies quantitative, qualitative, mixed methods, and community-based participatory research to study intra- and inter-setting dynamics and improve Access, Costs, Utilization, Transitions, and Effectiveness (ACUTE) through multidisciplinary health services research.

EMERGENCY MEDICINE

With a goal of unifying the delivery of acute care along the continuum of prehospital, emergency, inpatient, and ambulatory care, ACRU conducts research, performs program and policy assessment, provides educational opportunities, and promotes interdisciplinary collaboration. Dr. Abir says, "ACRU facilitates multidisciplinary collaboration involving all the relevant fields around the continuum of acute care. NCRC provides the physical space for these collaborations to occur. It provides close proximity to our regular collaborators within the university and the Institute for Healthcare Policy and Innovation as well as larger conference spaces to host our collaborators from other institutions."

Michigan Emergency Department Improvement Collaborative

Supported by Blue Cross Blue Shield of Michigan and Blue Care Network, the Michigan Emergency Department Improvement Collaborative (MEDIC) is a quality-improvement program that collects/analyzes data, identifies best practices, and improves overall performance.

MEDIC is an integrated adult and pediatric emergency medicine-led project encompassing the full spectrum of care across diverse emergency department settings, including academic and community, urban and suburban, and general and pediatric hospitals. Led by Keith Kocher, M.D., MEDIC measures, evaluates, and enhances the experience and outcomes of patients seeking care in emergency departments across Michigan.

MEDIC is recruiting new hospitals annually. Regular consortium meetings ensure engagement of all sites, as well as enable dissemination of new findings, and shared knowledge and experience of site participants, combined with timely feedback on performance on quality measures, helps inform improved patient care.

FACTS + FIGURES

5 EM researchers are among the ***top 50*** most highly NIH-funded emergency medicine researchers in the country.

EM houses investigator-initiated clinical trials (such as the EROCA (ExtraCorporeal CPR for Refractory Cardiac Arrest) study, but also leads and participates in large national clinical trial networks (NETT, PECARN, StrokeNet, PETAL).

U-M leads the only CDC-funded injury control research center housed in an emergency medicine environment.

"NCRC provides an ideal venue for our growing research team and for our many educational events ... As a multidisciplinary program, being co-located with others passionate about reducing injury—in various disciplines—has accelerated collaborations and communication."

- REBECCA CUNNINGHAM, M.D., DIRECTOR OF THE U-M INJURY CENTER

RESEARCH

EMERGENCY MEDICINE

University of Michigan Injury Center

The U-M Injury Center is a comprehensive research program working to reduce injury—the leading cause of death for people ages one to 44—through research and education. It is one of only nine CDC-funded injury centers in the country, and it has called NCRC home for almost four years now.

The Center, led by Rebecca Cunningham, M.D., focuses on preventing:

- prescription drug overdose
- concussion
- violence
- transportation injury
- sexual violence

Ongoing research projects focus on making young drivers more safe, providing effective interventions to prevent opioid misuse and youth violence, and developing resources to reduce incidence of sport concussion in youth.

In addition, the Center is actively engaged in developing a significant surveillance system to identify opioid overdose incidents in real time, and is working with both law enforcement and public health agencies to develop responses that support communities.

The Center is currently working to produce a massive open online course (MOOC) on pediatric injury prevention, to which thousands of medical students, clinical staff, and public health practitioners across the country will subscribe. The Center also produces educational events throughout the year to disseminate best practices and evidence-based interventions for injury prevention.

EMERGENCY MEDICINE

International Partnerships

Peking University and the University of Oslo

MCIRCC and researchers from across Michigan Medicine welcomed cardiac arrest researchers from the University of Oslo's OSlo CArdiopulmonary Resuscitation research network (OSCAR), a global leader in cardiac arrest research, to the University of Michigan. The visiting researchers, alongside counterparts from U-M, presented research in resuscitation, cardiovascular emergencies and critical care. The conference paved the way for what will hopefully be an ongoing collaboration between two of the finest research institutions in the world, improving outcomes for cardiac arrest patients in the future.

U-M and Peking University researchers are also working together, developing a clinical research platform that will enable multicenter interventional clinical trials in ED settings. The Emergency Critical Care Center (EC3) at Michigan Medicine provides a unique collaboration opportunity with the well-established Resuscitation Unit and Intensive Care Unit at Peking University.

New Faculty

Dr. Prashant Mahajan

Dr. Prashant Mahajan joined the Department of Emergency Medicine in October 2016 to engage, facilitate and push the needle of the research mission of the division of Children's Emergency Services at C.S. Mott Children's Hospital. He is the Vice-Chair of the Department of Emergency Medicine, and Section Chief of Children's Emergency Services. A Professor of Emergency Medicine and Pediatrics, he also serves as the Chair of the Section of Emergency Medicine for the American Academy of Pediatrics (AAP).

RESEARCH

EMERGENCY MEDICINE

Much of Dr. Mahajan's work has focused on identifying novel diagnostic approaches to the investigation of bacterial and non-bacterial infections in the emergency setting. For over 15 years he has led a multidisciplinary team of investigators with expertise in emergency medicine, infectious diseases, immunology, genomics, and bioinformatics to develop novel tools to change the paradigm in the evaluation of febrile illnesses.

Dr. Mahajan brought with him to U-M an AHRQ award to investigate clinical decision making, safety, and quality in the emergency department. This research focus on errors in decision-making in the context of quality of care for children in the inpatient and outpatient setting, and on understanding the impact of systems and processes that preclude us from delivering high-quality care.

Within six months of joining the faculty at U-M and the Institute for Healthcare Policy and Innovation (IHPI), Dr. Mahajan has developed cross-disciplinary collaborations with:

- Acute Care Research Unit: collaborating on the application of a mixed methodological approach to the evaluation of clinical decision-making in the pediatric emergency setting

- Department of Learning Health Sciences: developing software for natural language processing to aid in the assessment of clinical decision-making

- Computer Engineering and the School of Nursing: utilizing augmented reality, an innovative and disruptive technology, to foster clinical education, with the long-term goal of changing the paradigm for pediatric ED care delivery at pediatric centers and general EDs

EMERGENCY MEDICINE

Ongoing Research

Advancing basic and translational research

In addition to the research mentioned above, a number of additional Emergency Medicine investigators, including Drs. Robert Neumar, Scott VanEpps, Tulasi Jinka, Cindy Hsu, and M. Hakam Tiba occupy research space at NCRC in Building 26.

Individually, each group provides national and regional leadership in their fields, and each is known for their multidisciplinary research approach. Their co-location with other groups at NCRC facilitates interdisciplinary research collaboration that would not be possible elsewhere.

Such interdisciplinary collaborations include studies with Dr. Robert Bartlett, examining novel strategies for treating cardiac arrest using extracorporeal cardiopulmonary resuscitation (ECPR), and Dr. Hasan Alam, studying traumatic brain injury biosensor, both from the Department of Surgery.

These clinician scientists are advancing basic and translational research in the areas of:

- **stroke**
- **traumatic brain injury**
- **cardiac arrest**
- **bloodstream infections associated with intravascular devices**
- **development of novel materials to prevent adhesion of bacteria to artificial surfaces**
- **post-cardiac arrest therapeutic hypothermia**
- **shock**
- **critical care**

"As we continue to grow a robust, productive research portfolio, we are working to bring in new researchers in emergency medicine as well as continue to develop research capabilities in our clinical faculty, who contribute significantly to our overall body of work. Having a physical space that can serve as 'home' to our research functions allows us to cultivate talent and ensure connection with other groups with mutual interests."

- BOB NEUMAR, CHAIR OF EMERGENCY MEDICINE

For more information on how Emergency Medicine is creating the future of emergency care, visit

medicine.umich.edu/dept/emergency-medicine

RESEARCH

EMERGENCY MEDICINE

EM is always looking to expand its research portfolio. To that end, Thomas Sanderson, Ph.D., a newly recruited faculty member, will be joining EM in August of 2017. Dr. Sanderson's research will focus on brain damage caused by cardiac arrest/resuscitation, mitochondrial dysfunction/modulation of electron transport, and chain activity to confer neuroprotection.

Emergency Medicine Annual Research Forum

Second annual William G. Barsan Emergency Medicine Research Forum

In celebration of the full spectrum of the department's research, as well as to gain a better understanding of the impact and full spectrum of the departments research, the second annual William G. Barsan Emergency Medicine Research Forum, named for the department's founding chair, convened at NCRC again in 2017. The forum featured a keynote address by Dr. Lynne D. Richardson from The Icahn School of Medicine at Mount Sinai (NY), one of the most accomplished investigators in emergency medicine and a nationally recognized expert in health services research.

Rebecca Cunningham, Associate Chair for Research for Emergency Medicine, says, "Emergency Medicine, by definition, touches a broad array of specialties and disciplines, and our research portfolio spans bench research to large clinical trials. The NCRC location has provided a unique research environment and resource for our faculty. The location near the Institute for Healthcare Policy and Innovation and so many other collaborators has worked as a force multiplier to bring multidisciplinary teams to share ideas that will position U-M well to continue to lead the country in Emergency Medicine research."

153 attendees (an increase of 34% over the inaugural event) included EM research groups, along with clinical faculty, other research faculty, fellows, residents, and staff.

Additional events include presentations by 13 faculty, residents, and fellows, as well as a poster session that highlighted work from 38 research projects and initiatives. Six outstanding individuals were also honored with special awards for excellence in research.

EXTERNAL PARTNERSHIPS

BUSINESS ENGAGEMENT CENTER

2017 marks the ten-year anniversary of the Business Engagement Center (BEC), founded in 2007 as a joint venture by U-M's Office of Research and Office of University Development. For the last five years, the BEC has called NCRC home for their offices, staff, and corporate partnership meetings. As Executive Director Stella Wixom shares, "NCRC allows us the space and flexibility to meet the needs of our corporate partners and be close to our research colleagues. We began in another location early in our history, but we found our home at NCRC."

In fact, co-location extends to BEC's corporate partners as well. One of its close industry collaborators also resides at NCRC. DENSO's collaborative space in Building 300 provides space, equipment and other resources where students, faculty, and DENSO researchers can work together. Umesh Patel, Senior Director at the BEC, works closely with DENSO, and explains, "DENSO's lab at NCRC has been a key success factor in facilitating new student projects, internships, and new faculty research projects. Since locating at NCRC, DENSO has established new collaborations with Michigan Medicine, College of Engineering, and U-M Transportation Research Institute."

Wixom adds, "Our mission is to serve as the front door connecting faculty and students with companies for mutually beneficial partnerships, exceptional experiences and opportunities to grow industry engagement at U-M. Our relationships with companies like Ford Motor Company, Procter and Gamble, and Google are enriched by the facility at the NCRC."

Senior Director Susan Shields concurs: "Being at NCRC allows us to co-locate with U-M Tech Transfer, facilitating communications for the evolving relationships of our companies as their research results become of greater importance. The space at NCRC helps us have a coordinated team approach."

FACTS + FIGURES

Staff: ***14***

Company relationships: ***1200+***

2016 Corporate Philanthropy: ***$55 million***

2016 Corporate Research Expenditures: ***$85 million***

2016 Corporate Research Awards: ***$144 million***

Industry visits last year, many at NCRC: ***835***

Geese living outside BEC windows: ***4***

connected VIBRANT FLOURISHING

IN THEIR OWN WORDS

"While NCRC facilitates much of our business relationships, it also greatly enhances our work lives. From the open, expansive buildings to the cafeteria and gym to the accessible parking and location, NCRC has been a great place to work every day," says Charmaye Wiley of the BEC administrative staff. Favorite aspects of working at NCRC for BEC staff also include the beautiful campus-like environment, art installations throughout the buildings, and numerous great meeting rooms.

For more information about the BEC, please visit

bec.umich.edu

EXTERNAL PARTNERSHIPS

BUSINESS ENGAGEMENT CENTER

The BEC facilitates corporate engagement across all units and departments at U-M, from small faculty-specific research endeavors to large university-wide research initiatives, such as Mcity and the Exercise and Sport Science Initiative (ESSI). The relationship managers at the BEC work with industry partners to identify areas for research collaboration and philanthropic support.

The 10th Anniversary marks a significant milestone for the BEC. Considered a groundbreaking venture, the BEC has become the gold standard for facilitating industry engagement in higher education and is known globally for its organization and expertise.

CENTER FOR CLINICAL MANAGEMENT RESEARCH, VA ANN ARBOR HEALTHCARE SYSTEM

The unique combination of expertise, service mission, and supportive environment at the VA Center for Clinical Management Research (CCMR) allows their investigators to conduct research in cutting-edge health services and implementation. This collaborative, interdisciplinary work advances both science and practical solutions for the common—and costly—clinical management challenges facing our nation's Veterans.

CCMR is currently conducting research in three focus areas:

1. optimizing healthcare decisions based on individual patient characteristics and preferences;

2. improving safe clinical care, especially for the most vulnerable, complex, and costly patients;

3. improving patient outcomes with lower resource expenditures by engaging patients and their caregivers in self-management.

Optimizing healthcare decisions

Ensuring patients do not receive risky and costly treatment when they are at low risk for a disease, and identifying patients who have the most to gain from screenings and treatment

CCMR and U-M investigators in the Center for Bioethics and Social Sciences in Medicine (CBSSM) have demonstrated the feasibility of using a machine-learning risk prediction model to identify patients at high and low risk for chronic hepatitis C (CHC). Such a model could be of tremendous benefit to VHA, given the large amount of resources currently devoted to pharmaceuticals for the treatment of CHC in Veteran patients. This past year CCMR received a four-year, $1.1 million grant from VHA to develop such a model for VHA patients, and to engage Veterans in determining how to implement risk-based treatment.

connected VIBRANT & FLOURISHING

FACTS + FIGURES

Founded in ***1978***, CCMR is one of the oldest VA centers for health services research

158 publications in the top 15 healthcare journals over the past 5 years

Average of ***88*** unique funded projects per year for the past 5 years

Collaborations with investigators from over ***33*** different VA facilities around the country

Average funding of ***$18.5 million*** per year for the past 5 years from VA, DoD, NIH, AHRQ

18,000 miles walked per year on our 6 shared treadmills in our common areas

CCMR consists of 35 core investigators, both MDs and PhDs. These investigators work for VHA the majority of their time (at least 5/8), but also have U-M appointments in a number of different U-M divisions and departments, including:

General Medicine

Pulmonary and Critical Care Medicine

Gastroenterology

Urology

Plastic Surgery

Psychiatry

Learning Health Sciences

Health Management and Policy

Health Behavior and Health Education.

The Center also includes over 100 support staff, who provide administrative, data management, data analysis, project management, and research assistant support

EXTERNAL PARTNERSHIPS

CENTER FOR CLINICAL MANAGEMENT RESEARCH, VA ANN ARBOR HEALTHCARE SYSTEM

Another collaboration between CCMR and CBSSM investigators has produced a web-based decision support tool for helping clinicians determine if a patient should get a screening colonoscopy, based on personalized risk and benefit estimates. This tool is being used as part of a VHA-funded study to promote patient-centered colorectal cancer screening among older Veterans with comorbid illness. CCMR investigators have also been working with the Center for Health Communications Research (CHCR) to develop, implement, and evaluate a web-based decision support tool to help VHA clinicians discuss the risks and benefits of lung cancer screening, based on a patient's individual risk of developing lung cancer.

Improving safe clinical care

Systems-based solutions for our most vulnerable, complex, and costly patients, including hospitalized patients and patients with significant mental health or substance use disorders

One of the major challenges of treating hospitalized patients is enhancing their safety by promoting appropriate use of urinary catheters. CCMR investigators are part of the VA/U-M Patient Safety Enhancement Program, which received funding from the Agency for Healthcare Research and Quality to reduce catheter-associated urinary tract infections (CAUTI) in US hospitals. A study of the program, published this past year in the New England Journal of Medicine, showed that it is possible to reduce catheter use and UTIs, thereby reducing both suffering and costs. These results were achieved through a concerted effort in 926 units in 603 hospitals in 30 states, which provided training and tools for doctors and nurses, as well as feedback reports on performance. By the end of the 18-month program, UTI rates among hospital patients in general wards had dropped by one-third. Catheter use had also decreased. During the same time period, hospital-acquired UTI rates rose nationwide.

CENTER FOR CLINICAL MANAGEMENT RESEARCH, VA ANN ARBOR HEALTHCARE SYSTEM

CCMR research on improving the care of patients with mental health or substance use disorders includes efforts to address problems associated with opioid prescribing, especially non-medical use and overdose. One new study will evaluate the use of mobile technology to assess non-medical opioid use and pain level, and to deliver motivational messages. The goal of the project is to decrease inappropriate opioid use following a visit to the emergency department where opioids were prescribed for pain management. This study is funded by the Substance Abuse and Mental Health Services Administration (SAMHSA), and involves the collaborative effort of CCMR investigators and researchers from the U-M Injury Center, Center for Engineering and Patient Safety, and Department of Psychiatry.

Engaging patients and their caregivers

Supporting self-management and improving patient outcomes through technology

CCMR investigators participating in the QUICCC (Quality Improvement for Complex Chronic Conditions) partnership with U-M are conducting research on the use of interactive voice response (IVR) to collect data and provide feedback to patients and their caregivers, to encourage self-management of their chronic conditions. One of these projects is providing automated feedback to non-household family members or friends willing to act as "CarePartners" supporting patients in their self-management. Another is using artificial intelligence to personally tailor a plan, based on patient data provided via IVR, to help patients with chronic pain manage their symptoms.

Another partnership with the Center for Health Communications Research focuses on optimizing patient-centered prostate cancer survivorship care through the use of personalized, automated telephone monitoring and self-management support calls, paired with tailored print material. The goal of this intervention is to help patients manage the sequelae of their prostate cancer treatment, including urinary and bowel incontinence, erectile dysfunction, and hormone imbalance.

All of the above research is taking place in the collaborative environment of IHPI, which enables CCMR research teams to work closely with U-M partners.

To learn more about what's going on at the VA Center for Clinical Management Research, visit

www.annarbor.hsrd.research.va.gov/

EXTERNAL PARTNERSHIPS

CENTER FOR CLINICAL MANAGEMENT RESEARCH, VA ANN ARBOR HEALTHCARE SYSTEM

CCMR investigators praise the benefits of the NCRC environment, saying:

- "Now I can rapidly integrate colleagues from multiple specialties, and bring in folks from around the University to solve Veterans' problems."
- "I meet regularly for educational or research purposes with groups in the Clinical Scholars Program and the Division of General Medicine, as well as CCMR. Having them all within the same building dramatically increases my efficiency."
- "It's been a tremendous boon for connecting with other researchers here at IHPI...I am part of a translation center that may not have happened so smoothly without being here at NCRC. We are the envy of many other research groups—researchers who visit here love it and wish they had the same."
- "It is wonderful having all of health services research co-located. It helps foster informal conversation and attendance at other conferences such as CHOP (Center for Healthcare Outcomes and Policy)'s Friday session, the IHPI medicine sub-specialty group, Mi-CHAMP (Michigan Integrated Center for Health Analytics and Medical Prediction), etc. With no commute to these conferences, I can attend more and spend more time doing research and interacting with other health services researchers."
- "I think it's benefited mentees outside of CCMR by having access to the CCMR PIE (Partnerships in Implementation and Evaluation) Lab; many of these folks are able to come to our monthly meetings. I think it's fostered a stronger opportunity to network and develop links to implementation research programs and projects."
- "The intellectual environment within IHPI has contributed to developing new research ideas, not only for our faculty, but also for our trainees in mental health and substance abuse. Our move to NCRC has stimulated multiple collaborations that would not have occurred had we not made the move to this interdisciplinary research environment."

TECH TRANSFER VENTURE ACCELERATOR

U-M Tech Transfer plays a key role in the university's efforts to foster innovation and entrepreneurship by working with researchers, business partners and entrepreneurs to transform research discoveries into products and services that enhance our economy and improve our quality of life. Tech Transfer licensing and business development professionals help university investigators license their inventions to existing companies, and create new business entities to help bring these technologies to market.

Tech Transfer also has a Venture Center, a one-stop hub for entrepreneurs and investors interested in U-M startup opportunities. Included within the Venture Center is the Venture Accelerator, with lab and office facilities for emerging U-M startups. The Venture Accelerator is located adjacent to the offices of Tech Transfer, and in proximity to other NCRC resources. The Venture Center team also provides tenants with networking opportunities to accelerate their progress, as well as a robust Mentors in Residence program that brings seasoned leaders of high-growth technology startups into the university to assist with commercialization activities.

A RECORD-SETTING YEAR

Tech Transfer set several performance records in FY16:

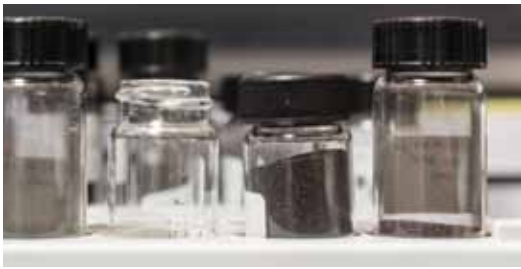
428 **new inventions assessed**

135 **patents issued**

173 **licenses and option agreements**

12 **new startups**

$23 **million in revenue**



Working with U-M inventors, Tech Transfer licensing professionals provide technology assessment, protection, market analysis and licensing services to faculty and business partners. They evaluate the technical and market potential of new concepts, and create action plans to protect and market these inventions to new and existing businesses.

EXTERNAL PARTNERSHIPS

TECH TRANSFER VENTURE ACCELERATOR

Tech Transfer works with many partners within U-M to educate and encourage faculty and advance high potential projects. These partners include:

- Business Engagement Center
- Center for Entrepreneurship
- Fast Forward Medical Innovation
- Zell-Lurie Entrepreneurial Institute
- SPH Center for Innovation and Social Entrepreneurship

Tech Transfer also works with external economic development partners, including Ann Arbor SPARK and the Michigan Economic Development Corporation.

Over the past five years, Tech Transfer has received over 2,000 new inventions from faculty, had 655 patents issued, completed 716 option and license agreements, and helped to launch 65 new startups, or one every four weeks. In this time period, Tech Transfer agreements have produced $148 million in revenues for U-M inventors and the university to re-invest in continued innovation and entrepreneurship.

For more news about U-M Tech Transfer and the Venture Center, go to **techtransfer.umich.edu**

HEALTH INFORMATION TECHNOLOGY & SERVICES - HITS HELP ME NOW

In 2014, the first "Help Me Now" (HMN) location opened in Building 18 (near the NCRC Cafeteria), with the goal of providing convenient, no-appointment-necessary access to IT services and support in a location that is usually no more than a five-minute walk from many offices, labs, and classrooms.

Since then, Health Information Technology and Services (HITS) has opened two additional HMN locations:

- Taubman Health Sciences Library (4th floor, Office 4020)
- Towsley Center for Continuing Medical Education (G2413, near the UH Cafeteria)

Staff at all three locations are available Monday through Friday, 8 a.m. to 5 p.m. (excluding U-M holidays) to help with many kinds of common IT-related questions and issues, including:

- Computer drop-off for repairs or routine maintenance
- Password assistance
- Checking out common "loaner" items such as adapters, dongles, and audio-visual equipment
- Duo two-factor authentication
- AirWatch installations on tablets, phones, and laptop computers

HITS HELP

HITS also provides expert help and resources related to:

- audiovisual and telepresence needs
- computation and data storage
- content development and publishing
- device support and connectivity
- learning technologies
- research and laboratory solutions
- support for clinical applications, such as MiChart
- virtual server and application hosting
- website development and hosting

SCIENTIFIC SUPPORT

HEALTH INFORMATION TECHNOLOGY & SERVICES - HITS HELP ME NOW

Together, staff at the three locations have helped Michigan Medicine faculty, physicians, researchers, students, and staff address approximately 7,500 individual issues.

HMN represents just one of the many ways HITS supports research, education, and patient care efforts across Michigan Medicine. As the institution's major developer and provider of high-quality IT tools, services, and support, HITS is responsible for maintaining complex systems needed to collect and store sensitive patient medical records, such as MiChart. HMN staff are available to assess a wide variety of concerns, and are able to resolve most issues on-site, or route more complex problems to the appropriate HITS team for resolution.

For more information about Help Me Now, or to get help with an IT-related question or concern, contact the HITS Service Desk at (734) 936-8000 or visit

hits.medicine.umich.edu

SCIENTIFIC SUPPORT

THE MICHIGAN CENTER FOR MATERIALS CHARACTERIZATION

The Michigan Center for Materials Characterization, also known as (MC)2, is the University of Michigan's state-of-the-art facility dedicated to the nanoscale analysis of materials. Only two years old, (MC)2, housed in Building 22 of the North Campus Research Complex, continues on its successful path to provide state-of-the-art instruments, professional training, and in-depth education for students and researchers from all across campus, local industry, and sister academic institutions.

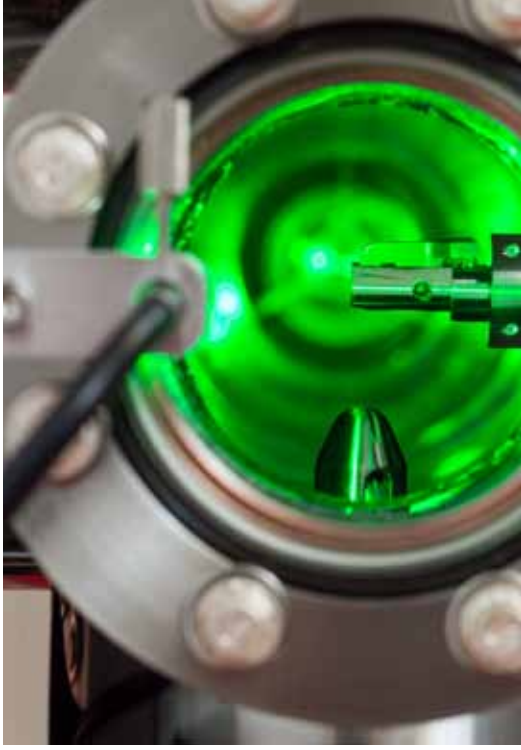
Two new members joined the Center in early March 2016: Bobby Kerns, the new Center Manager, and Allen Hunter, Ph.D., Instrument Scientist. Together, Kerns and Hunter bring unique expertise in facility management, instrument maintenance, and advanced SEM and FIB operation.

(MC)2 also introduced three new instruments this year, adding capabilities and upgrading existing techniques:

- The Hysitron TI950 triboindenter enables mechanical and tribological characterization from the nano to microscale for a wide range of materials and structures. It is complemented by the Hysitron PI 95 Pico-indenter, a specialty holder for direct observations of nanomechanical testing inside a transmission electron microscope.

- A new Tescan scanning electron microscope with X-ray energy dispersive spectrometry and electron backscattered diffraction capabilities joined (MC)2's series of existing electron columns.

- A new atom probe tomography microscope, a Cameca LEAP 5000XR, has recently been installed and introduced to U-M's Materials Science and Engineering community, replacing the Cameca LEAP 4000XHR instrument. The new LEAP incorporates a brand new, higher efficiency detector design that significantly increases the ability to measure nanoscale features such as precipitates, interfaces, and dilute elements. The user interface and system controls are also redesigned to simplify operation.



FACTS + FIGURES

13 **individual instruments**

5 **professional staff members**

101 **PIs supported by (MC)2 in their research**

Users from *21* departments within CoE, LS&A, Dental, Pharmacy, Public Health, and the Medical School

Over *500* total active users

Microscopes spanning 8 orders of magnitude in imaging length scales, from millimeters down to tens of picometers

SCIENTIFIC SUPPORT

THE MICHIGAN CENTER FOR MATERIALS CHARACTERIZATION

(MC)2 is also in the process of upgrading the camera on the JEOL 3100 R05 microscope to facilitate in-situ imaging, fast acquisition video recording, and low-dose electron energy loss spectroscopy, by installing a Gatan K2 camera.

Center director, Emmanuelle Marquis, Ph.D., Associate Professor of Materials Science and Engineering, together with a number of colleagues from across campus, recently received a grant from the National Science Foundation - Major Instrumentation (NSF-MRI) Program, which will allow (MC)2 to acquire a new scanning electron microscope for real-time studies of materials behaviors. This system, the exact configuration of which is currently being finalized, will be a variable pressure SEM, with in-situ Raman spectroscopy and imaging capability, a full cathodoluminescence system, an electron back-scattered diffraction system, an X-ray energy dispersive spectrometry system and a high temperature heating stage. Installation of this system is expected to take place in late summer or early fall 2017.

In addition, the acquisition of a system that will introduce a new technique to the range of tools in the center is planned. X-ray micro computed tomography (micro CT) is X-ray imaging in 3D, using a similar method to that of hospital CT (or "CAT") scan systems, but on a fine scale with significantly increased resolution. As a 3D microscopy technique, it will allow the very fine scale internal structure of objects to be imaged non-destructively. The configuration and manufacturer of the system is currently under negotiation.

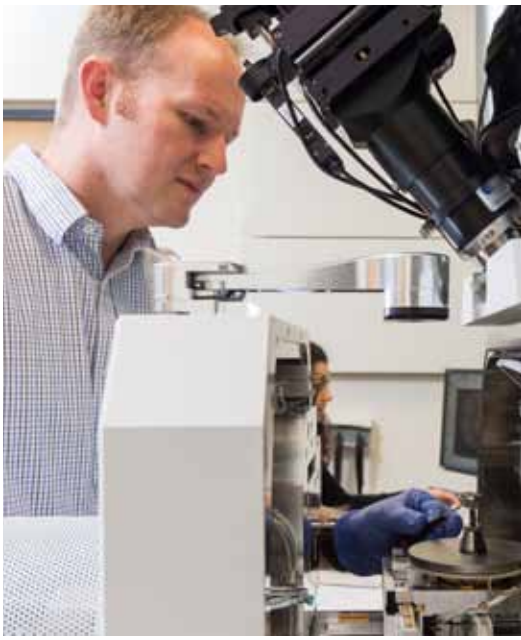
Education and training remain a top priority for (MC)2 staff as the Center broadens its mission to include education and experiential learning in advanced materials characterization. Education Director John Mansfield has initiated outreach activities at local schools and museums, bringing

THE MICHIGAN CENTER FOR MATERIALS CHARACTERIZATION

a portable scanning electron microscope to demonstrate principles of electron microscopy in a fun and interactive way, and encouraging young students to operate the microscope. Past events include participation at the Butterfly Festival organized by the University of Michigan Museum of Natural History, and a visit to the Creekside Intermediate School in Dexter, Michigan.

(MC)2 has also changed some access requirements, making it easier for students and researchers from local universities to access the Center; (MC)2 has since welcomed users from Wayne State University, Michigan State University, and from Central, Eastern, and Western Michigan Universities.

Weekly lectures, open to the public, provide introduction to (MC)2 techniques and instruments before individual hands-on training. They will soon offer training tools and educational materials online, as well, on their YouTube channel.



To learn more about accessing the facility, discussing future acquisition, or organizing an educational event involving microscopy, visit

mc2.engin.umich.edu

ACCESS, COLLECTION, PROCESSING AND STORAGE SOLUTIONS

- Over 360,000 specimens available
- Annotated biospecimens discoverable through DataDirect, a self-serve query tool
- Standardized informed consent documents allow broad future research
- CBR participant data protected by NIH Certificate of Confidentiality
- DNA from over 40,000 individuals linked with extensive genotype data as part of the Michigan Genomics Initiative
- Strict Quality Management System, ensuring standardized practices and validated processes

SCIENTIFIC SUPPORT

CENTRAL BIOREPOSITORY

The Central Biorepository (CBR) is a unit of the Medical School Office of Research, and part of the Strategic Research Initiative. The mission of the CBR is to facilitate discovery and improve healthcare outcomes by providing high-quality, highly annotated biospecimens donated for basic, clinical and translational research. Participants in the CBR provide consent to researchers for use and distribution of their biospecimens and associated data for genomics, proteomics, metabolomics, and other research areas in efforts to help understand the biology of disease.

In addition, participants agree to allow approved investigators secure access to detailed clinical, laboratory, and genetic data. Scientists identify biospecimens for investigation based on this information through a controlled-access, compliant data portal called DataDirect. Any researcher may request biospecimens for use in their own studies by submitting a research proposal. Decisions regarding the use of these materials are governed by a steering committee with expertise in the field of study.

NCRC is an ideal location for the CBR, which requires an abundance of open space providing efficient and safe storage of controlled temperature units, facilitating unique engineering requirements, and offering state-of-the-art infrastructure to support operations. Biospecimens are collected at the U-M medical campuses, geographically separated from the CBR. NCRC provides cold-chain courier services between the CBR and clinics where samples are collected, permitting the safe and efficient transfer of materials. The CBR also works closely with other NCRC tenants, routinely meeting with members of the Medical School Office of Research as well as the Institutional Review Boards, and several of the Biomedical Research Core Facilities.

For more information, visit research.medicine.umich.edu/office-research/biorepository

CENTRAL BIOREPOSITORY

. CBR leadership is now working with NCRC Plant Operations and Health Information Technology Services, as well as architecture and engineering construction teams, to design new dedicated, streamlined, efficient laboratories and storage areas for a new CBR opening in 2017-18. Use of existing physical infrastructure and sharing utilities and design concepts with co-located medical school departments and core laboratories will speed the construction of this new state-of-the-art purpose-built facility. The brand-new CBR will feature:

- Dedicated space for ultra-cold and cryogenic storage
- Streamlined layouts for automated processing and distribution of biospecimens
- Central location for improved interaction with collaborators

ACCESS, COLLECTION, PROCESSING AND STORAGE SOLUTIONS

- **Secure, 24/7-monitored cryostorage of biospecimens in a CAP-accredited biorepository**
- **Processing of biospecimens to specified analytes, such as DNA, RNA, and plasma**
- **Information technology support for study management, specimen chain of custody, and lifecycle recordkeeping**

Primary Research Cohort	DNA	Frozen Tissue	Plasma	Serum	FFPE	Whole Blood**	Urine & Derivatives	Fibroblasts	Stool	SNP*** Genetic data
Bipolar Disorder	x		x							
Breast Cancer*					x					
Cardiovascular Disease	x	x	x	x						x
Chronic Kidney Disease	x	x	x	x		x	x			
Head and Neck Cancer	x	x		x	x					x
Interstitial Lung Disease	x	x	x		x	x		x		
Inflammatory Bowel Disease	x	x		x		x			x	
Metabolic Disorders	x	x	x	x		x	x			x
Pain	x									x
Skin Cancer	x	x		x	x					
Michigan Genomics Initiative	x		x							x

Primary research cohort indicates the original investigative purpose for sample collection. Samples from Michigan Medicine will have data related to these indications, as well as the full complement of the electronic health records. Additional data specific to the primary research area may be available through the Principal Investigator of that program. All cohorts have oversight committees governing use and distribution, and secondary uses are subject to approval.

*Tissue Microarray only and part of the Breast Oncology Program. For more information contact Dr. Dafydd Thomas at thomasda@med.umich.edu **Stored in PaxGene Tubes for DNA or RNA isolation. *** SNP = Small Nucleotide Polymorphism

CO-LOCATION, CORE LOCATION

Nearly half of the BRCF Cores are located at the NCRC, including:

- *Bioinformatics Core*
- *Biomedical Research Store*
- *DNA Sequencing Core*
- *Flow Cytometry Core*
- *Microscopy & Image Analysis Laboratory*

SCIENTIFIC SUPPORT

BIOMEDICAL RESEARCH CORE FACILITIES

With eleven Biomedical Research Core Facilities (BRCF) spanning nearly 25 locations around the University of Michigan Medical School campus, it's no surprise that the locations of our facilities play a crucial role in the advancement of our research and projects. Part of the University of Michigan Medical School Office of Research, the BRCF is a group of centralized labs and resources that aim to provide researchers access to the latest technologies and equipment in biomedical research.

Founded in 2012, the Bioinformatics Core at the University of Michigan Medical School assists researchers with interpreting complex, high-throughput biological data, including DNA, RNA and Protein. The Core offers technical expertise in software and analysis, including developing custom software, databases, and visualization tools to meet these needs. The Bioinformatics Core serves nearly 100 labs across Campus and completed 150 projects in FY16.

Since opening the NCRC location in 2011, the Biomedical Research Store has more than tripled their stock on location. The Store stocks more than 700 items from 10 vendors at 5 locations around campus, available for immediate purchase. Since the launch of the NCRC delivery service in January 2014, the Store has made more than 1200 deliveries around the NCRC; in FY17, it made about 450 deliveries at NCRC.

BIOMEDICAL RESEARCH CORE FACILITIES

The DNA Sequencing Core is one of the largest facilities in the Midwest, processing more than 310,000 samples in FY16. This Core occupies approximately 10,000 square feet of laboratory space in the NCRC, with 31 highly trained support staff. They operate a wide variety of instruments that perform DNA sequencing, genotyping, gene expression analysis, DNA quantification and quality control.

The Flow Cytometry Core at NCRC has acquired several state-of-the-art instruments in cell sorting, including the Sony SH800, which has four lasers and six detectors. Analysis at the Flow Core can be scheduled within 24 hours. For cell sorting, appointments are made within 48 hours, reducing wait time from weeks to just a day or two—and thanks to the advancements in digital acquisition, sorting is now 3-10 times faster.

The Microscopy & Image Analysis Laboratory (MIL) is accessible to trained and authorized users 24 hours a day, 7 days a week. MIL offers expert consultation, training and experimental design, and state-of-the-art equipment for microscopic imaging. The Microscopy Lab serviced nearly 300 grants in FY16.

"The spontaneous interactions between people using the Core Facilities, both at the customer and staff level, produce powerful synergies and processes for research," said Cassandra Wong, Director of the Biomedical Research Core Facilities. "In no situation is this more apparent than with the Bioinformatics, Epigenomics Core, and DNA Sequencing Cores, who are at the forefront of collaboration in their fields."

To learn more about the Core Facilities, go to

research.medicine.umich.edu/office-research/biomedical-research-core-facilities

"The shipment of research samples involves compliance with multiple governmental agencies. This process should also take into account the high cost of generating these samples. It was reassuring to find the MShip staff willing and able to discuss and troubleshoot the intricacies of complex shipping. Many thanks for a job well done!"

- HOLLY EVANOFF, RESEARCH LABORATORY SPECIALIST, PATHOLOGY

SCIENTIFIC SUPPORT

RESEARCH SERVICES

In 2011, when NCRC leadership first began planning service provisions to support research, their main goal was to offer the tactical functions that enable researchers to focus on their highest priority work.

Six years later, in 2017, these services have expanded to support the Medical Center, with an onsite services team that directly benefits occupants by taking care of daily lab operations. This support will allow investigators more time to perform research, regain valuable space within the lab footprint, and increase surplus sales volume.

Research Services currently supports the following services at the Medical Center:

MShip Packaging and Shipping Services

A full packaging and shipping service for all Medical School departments for domestic and international shipments of research hazardous materials, MShip offers

1. Convenience - Packaging, labeling, and shipping forms completed for researchers

2. Compliance - Verification via My LINC that all required training is current

3. Cost Effectiveness - Cost to departments is the courier shipping fee only, and departments providing correct content information are not responsible for any subsequent fines resulting from non-compliant shipments

MShip has already processed over 400 shipments for the Medical School. Catherine Meldrum, Clinical Nurse IV, Pulmonary and Critical Care Medicine, says that MShip "has helped us ship research specimens seamlessly to their destinations, both nationally and internationally."

RESEARCH SERVICES

Biohazardous Waste Removal

Removing biohazardous waste to be treated offsite has significantly increased time for "clean" autoclaving and reduced onsite waste safety hazards. In addition, moving all biohazardous waste offsite will save U-M $327K each year.

As Brenda Franklin, Microbiologist Staff Specialist for the Department of Microbiology and Immunology, notes, "The new Medical School biohazardous waste removal program process is clear, logical and effective. Our laboratory staff has a cleaner and safer environment, and the autoclaves are now available for continued research, whereas in the past the autoclave units were often not available due to numerous cycles of biohazardous waste 'dirty autoclaving.' In addition, this process has reduced wear and tear on the units, and there is less down time due to waste being melted in the units. It's also a huge time-saver for laboratory staff, since they are able to easily take biohazardous waste to the designated area, knowing that it will properly be disposed of in a timely manner."

Janet Follo, Biological Safety Manager of Environment, Health, and Safety, adds, "The volume of untreated waste held in the labs while waiting to use the autoclave has been minimized, leading to an improvement in housekeeping. The new service has also simplified the handling of biological waste, reducing the amount of follow-up needed from our office due to improper management of waste."

AUTOCLAVING AND GLASS WASHING PILOT PROGRAM AT THE BIOMEDICAL SCIENCE RESEARCH BUILDING

The Research Services team envisions a door-to-door glass washing and autoclave cleaning service at BSRB, including:

- Glass wash
- Drying
- Glassware sterilization
- Instrument sterilization
- Growth media sterilization
- Custom wash and sterilization

These services would be free of charge to the user. If successful at BSRB, this program will be expanded to the entire Medical Center.

For more information on the Research Services offerings at NCRC and the Medical Center, visit

ncrc.umich.edu/life-ncrc/services

SCIENTIFIC SUPPORT

RESEARCH SERVICES

Property Disposition Facilitation

Research Services coordinates a centrally operated and funded service to aid departments in expedited disposal of surplus property. So far, nine truckloads of unwanted lab and office equipment have been removed to Property Disposition, clearing over 1700 square feet of space that can now be used for research.

Lori Longeway-Mirabitur of Cell and Developmental Biology writes, “We have a new chair coming in August, and were running a bit behind schedule turning over a lab for them. We were able to have some equipment moved the day we contacted Research Services, and the rest removed a few days later. This service and the dedicated staff who oversaw the process certainly helped CDB move forward with renovation, and make space for our new chair.”

Biological Sample Transport Courier Services

Over the last year Unity Lab Services (ULS) has made more than 1300 biological sample transport runs between the Medical Center and NCRC, including the East Ann Arbor and Domino Farms locations.

As Anna Colvig of the Unit of Laboratory Animal Medicine reports, “We would lose a large amount of employee time without the help of ULS with lab operations from shipping and biohazard waste to courier services and supplies. Our lab knows we can turn to them for anything, both as we collaborate within NCRC, and continue to interact with the Medical Center.”

NCRC AMENITIES

NCRC is committed to creating a healthy, inclusive workplace that supports a holistic approach to the wellness of its diverse community. On-site fitness programs, support for families and for breastfeeding moms, the Janus Safety Lab, an interfaith reflection space, and Green NCRC are just a few of the many ways NCRC improves quality of life for everyone in the NCRC Community.

Supporting Families

The North Campus Children's Center (NCCC) cares for children ages 3 months to 5 years, offering childcare and early childhood education year-round, up to 12 hours per day. In addition to conveniently located childcare and support for breastfeeding moms—the NCRC campus has four private lactation rooms with Wi-Fi—the center also offers a summer camp program for school-age children. The NCCC is available to children of faculty, staff, and students, as well as those of Ann Arbor community members.

Holistic Wellness

NCRC now has a full-time MHealthy representative available in the Wellness Center for consultation. NCRC also hosts convenient on-site StayWell® Wellness Screenings with health professionals, who review blood pressure, cholesterol, weight and height data and provide individualized recommendations. MHealthy exercise and relaxation classes such as body sculpting, cardio, yoga, Nordic walking, and dance fitness are also among the offerings of the Wellness Center at NCRC.

Other MHealthy programs offer weight management, ergonomics awareness, tobacco cessation, and support for mental and emotional health. NCRC also provides an Interfaith Reflection Room for prayer, contemplation, meditation and reflection in Building 14, Room D104. The Reflection Room is an inclusive quiet space for NCRC's many diverse occupants, whether they ascribe to a religious faith or not.

NCRC EXPO

Each year NCRC hosts the NCRC EXPO, an opportunity for groups that enhance the NCRC Community's quality of life to promote their offerings. In 2016 more than 20 service units at NCRC participated, showcasing their work for over 500 visitors.

- Biomedical Research Core Facilities
- Biomedical Research Store
- Department of Public Safety & Security - Emergency Management
- Fire Safety
- Flow Cytometry Core
- Health Information Technology and Services (HITS)
- Mcard & Security Services
- Medical School Office of Research
- MHealthy
- Michigan Center for Materials Characterization

(Continued on next page)

NCRC EXPO

- Michigan Institute for Clinical & Health Research (MICHR)
- Microscopy & Image Analysis Laboratory
- MLibrary@NCRC
- NCRC Administration & Facilities
- NCRC Building Incident Response Team (BIRT)
- NCRC Research Services
- North Campus Children's Center
- Occupational Safety and Environmental Health (OSEH)
- Physiology Phenotyping Core
- Picasso@NCRC
- PNC Bank
- ULAM
- UM Bioinformatics Core
- UM Division of Public Safety & Security (UMDPSS)
- UM DNA Sequencing
- UMMS Central Biorepository
- Zilke Vegetable Farm

(Continued on next page)

COMMUNITY

NCRC AMENITIES

Green NCRC

The NCRC Energy Management Working Group was formed in 2016 in support of President Schlissel's 2015 Greenhouse Gas Reduction Committee Report and subsequent Greenhouse Gas Reduction Initiative. This document established a goal of 25% reduction of carbon dioxide equivalent or metric tons of carbon dioxide ($MTCO_2$) for the University of Michigan by 2025.

The baseline for NCRC was established at 60,000 $MTCO_2$, for a 25% reduction goal of 15,000 $MTCO_2$ by 2025. Over 100 completed projects have been identified by the NCRC Energy Management Working Group that would yield a sustainable reduction in greenhouse gas emissions.

As of September 1, 2017, the group has documented a reduction of over 31,000 $MTCO_2$, representing an achievement of over twice the established goal in less than one year.

This is equivalent to the yearly energy use of 3,350 homes, using 3.5 million gallons of gas or burning more than 33 million pounds of coal.

In addition to reducing CO_2 emissions through co-generation, NCRC has adopted the U-M composting program. All post-consumer waste, such as compostable plates, cups, flatware, bowls, napkins, and take out containers, along with uneaten or unwanted food, can be placed in specially marked bins at the usual locations.

It's easy to take green transportation to get to NCRC, too. While NCRC has ample parking, including paid visitor parking, as well as a Park & Ride Lot within one mile of NCRC, many NCRC employees bicycle to work, so bike racks are conveniently located all over the campus. NCRC residents are also able to easily access other U-M campuses on university buses and the city of Ann Arbor AATA buses, which offer several quick routes to Central Campus, the Medical School and UMHS, and downtown Ann Arbor.

NCRC AMENITIES

Health and Safety

NCRC's Janus Safety Lab, which opened in 2015, educates and raises safety awareness for those visiting the facility. A retrospective survey of 14 months of lab inspection data revealed that just 28 of 471 possible errors accounted for 58% of all mistakes noted by lab inspectors. NCRC has ensured that these items are reflected in the Janus Safety Lab. A variety of safety and health topics are presented, including biological safety, chemical storage and labeling, electrical safety, fire safety, compressed gas use and handling, personal protective equipment, and hazardous waste management.

The NCRC also has a Building Incident Response Team (BIRT) program to ensure a safe community. The BIRT program was developed by the Office of Emergency Preparedness in concert with the University of Michigan Police Department, using best practices from emergency first response disciplines. NCRC Building Incident Response Teams are led by NCRC Facilities; team leaders are appointed BIRT Liaisons, and are trained to interface with first responders. Together, BIRT Liaisons and BIRT Members will assist in quickly evacuating buildings due to a fire condition, or directing people to shelter in the event of severe weather.

CLOSE AND CONVENIENT

- As a convenience to employees, NCRC offers an Mcard Office where one can get a new badge or arrange special NCRC access

- Interactive digital signs are displayed in all NCRC lobbies, and map to nearly all occupants at NCRC, as well as displaying their contact information

- To arrange free notary service, NCRC occupants may contact Bonnie Pond via email at bmckie@med.umich.edu

Questions about NCRC Amenities? Go to

ncrc.umich.edu/life-ncrc/occupant-amenities

COMMUNITY

NCRC ART PROGRAM

The NCRC Art Program is an art exhibition and performance program at the North Campus Research Complex that enhances the quality of life of those who work at and visit the facility. It has also become a bridge between the very diverse communities of artists, scientists and the general public. The Art Program spurs the type of creative thinking that drives innovation.

Work by some of the most important contemporary artists in the region has been featured in over 45 exhibitions since the Art Program's inception in 2011, alongside art made by University of Michigan faculty and students. In fact, the NCRC Galleries have more exhibitions each year than many small museums do, and are now considered the most prestigious and beautiful galleries exhibiting in our region. Over 100 pieces have been donated by exhibiting artists, and are now part of the permanent collection. Art maps are available for self-guided art tours.

Learn more about visiting the NCRC Art Galleries at

ncrc.umich.edu/life-ncrc/occupant-amenities/art-program

If I can stop one heart from breaking, by Anne Mondro.

NCRC ART PROGRAM

HighWire

A complement to the art in NCRC's Building 18 galleries, NCRC's HighWire can be experienced on the ground floor of Building 18. Composed of nearly two miles of robotically-formed steel wire integrated with an array of microphones and motion sensors, HighWire is a room-scale interactive installation that embodies NCRC's unique collaborative environment. HighWire explores the adaptation of the physical environment to support social interaction, and creates a place where people across disciplines contribute, interact, and share ideas.

The beautiful architecture of NCRC provides the perfect setting for exhibiting contemporary art, and its location links the University of Michigan community to the broader Metro Detroit. The Art Program's success is in large part due to this environment and audience, as well as the tremendous support of NCRC's administrative team.

Bearing Witness, **by Carolie Harris**

2016 - 2017 EXHIBITIONS

The high quality of the art featured in the 2016-17 Exhibition season reflects the NCRC Art Program's excellent reputation in the area.

Larry Cressman
Rotunda Gallery
January 7 - May 15

Janet Hamrick
Connection Gallery
January 5 - May 20

Lawrence Street Gallery
Rotunda Gallery
June 2 - August 26

Heidi Marshall
Connections Gallery
June 6 - August 31

Nancy Thayer
Rotunda Gallery
September 28 - December 15

Ding Fang – Confucius Institute
Connections Gallery
September 18 - December 15

Marcia Freedman
Rotunda Gallery
January - April

Anne Mondro
Connections Gallery
January - April

Carole Harris
Rotunda Gallery
May - August

Jeremy Thacker-Mann
Connections Gallery
May - August

PICASSO'S PRIORITIES

72% of all products are sourced from local suppliers

PRG works extensively with MHealthy dieticians to create MHealthy options

PRG uses only antibiotic-free, steroid-free, free range chicken

Food is made from scratch: no frozen soups; all deli salads are made in-house

PRG's first deli was located at Domino Farms—it was only ***500*** SF

COMMUNITY

PICASSO@NCRC

At NCRC, Picasso Restaurant Group (PRG) designed and developed a cutting edge micro-restaurant concept. Picasso@NCRC is proof of PRG's passion for turning cafeterias into upscale eateries that make guests feel like they are enjoying a meal out.

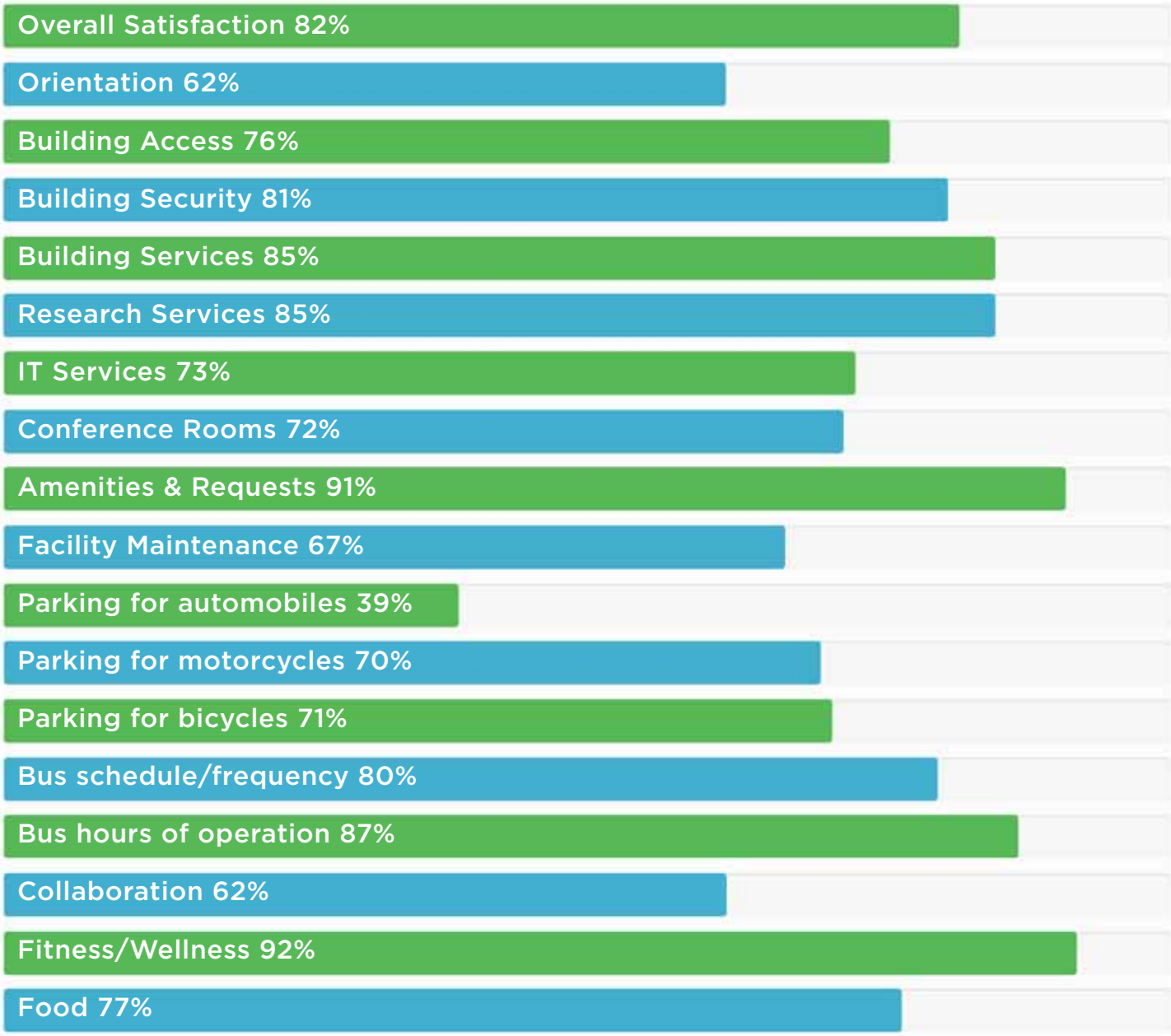
Gerald Attee and his wife Nihad opened their first deli in Ann Arbor over 25 years ago. Still based in Ann Arbor, PRG now operates 15 restaurants and eateries in some of the most prestigious buildings in the Metro Detroit area.

Personalized guest interactions are PRG's passion. Guests at Picasso@NCRC are even offered an interactive feedback board to open lines of communication with the PRG team.

To create an exceptional guest experience, PRG hires people with personality and drive. PRG prides itself in the diversity of its employee partners, and strives to develop each and every one of them.

Learn more about Picasso@NCRC and its offerings, including catering, at ncrc.umich.edu/life-ncrc/ncrc/occupant-amenities/picasso-ncrc

QUALITY OF LIFE SURVEY



connected VIBRANT FLOURISHING

MLIBRARY@NCRC OFFERS

- Training to search databases and web resources–from PubMed to Google–more effectively
- Expertise in bioinformatics, data management, expert literature searching, and more
- Consultation and instruction on citation management tools, such as Endnote and Mendeley
- Training and individual consultation on grant-seeking
- Help resolving grant compliance issues related to the NIH Public Access Policy
- Advice on creating data management and sharing plans in compliance with funder mandates
- Library books delivered to your NCRC departmental mailbox and returned through the MLibrary@NCRC book drop

COMMUNITY

MLIBRARY@NCRC

MLibrary@NCRC, located on the ground floor of Building 18, is a branch of the University Library dedicated to providing diverse information services to and partnership with NCRC researchers, staff, and affiliates. The University Library spends over $20M each year to license and provide access to electronic information resources for U-M researchers, including journals, e-books, and citation databases. Informationists collaborate with faculty on research, conduct complex literature searches, and offer individual and group consultations, as well as instruction on topics such as:

- systematic review searches
- utilizing data visualization tools
- ScienCV
- tools to calculate citation-based research impact indicators

MLibrary@NCRC has launched a series of workshops and will soon introduce a monthly workshop series that will build upon the success of this year's offerings, which included:

- PubMed Tips and Tricks
- Ease the Task of Finding Research Funding: Resources and Techniques
- NIH Public Access Policy (NIHPAP)

MLIBRARY@NCRC

Recent Accomplishments

Research Development Initiatives

MLibrary@NCRC informationists partnered with the Medical School Office of Research and other campus representatives to plan research development symposiums and provide panel sessions on grant seeking, data management plans, and data repositories. Informationists participated on a core proposal review team to select a Research Information Management System for highlighting faculty expertise and fostering collaboration.

Expansion of Available Informationist Expertise

There is now a full complement of informationists at NCRC, with a wide variety of expertise.

Training for Staff

Informationists provided workshops and consultations for NCRC staff to assist them in their role in the research enterprise, including National Institutes of Health Public Access Policy (NIHPAP) Compliance, and citation management tool (EndNote) training.

Deepened Role of Embedded Informationist

MLibrary@NCRC's bioinformationist is embedded in both the Bioinformatics Core and the Medical School's Department of Computational Medicine and Bioinformatics, providing information and project management expertise.

Expansion of Student Engagement

Informationists train students on a vast range of information skills, including Technology Transfer Interns, and Institute for Healthcare Policy and Innovation summer students. Informationists also provide individual, in-depth consultations for students working with faculty across NCRC to help prepare them as future researchers.

To learn more about MLibrary@NCRC, visit

lib.umich.edu/mlibrary-ncrc

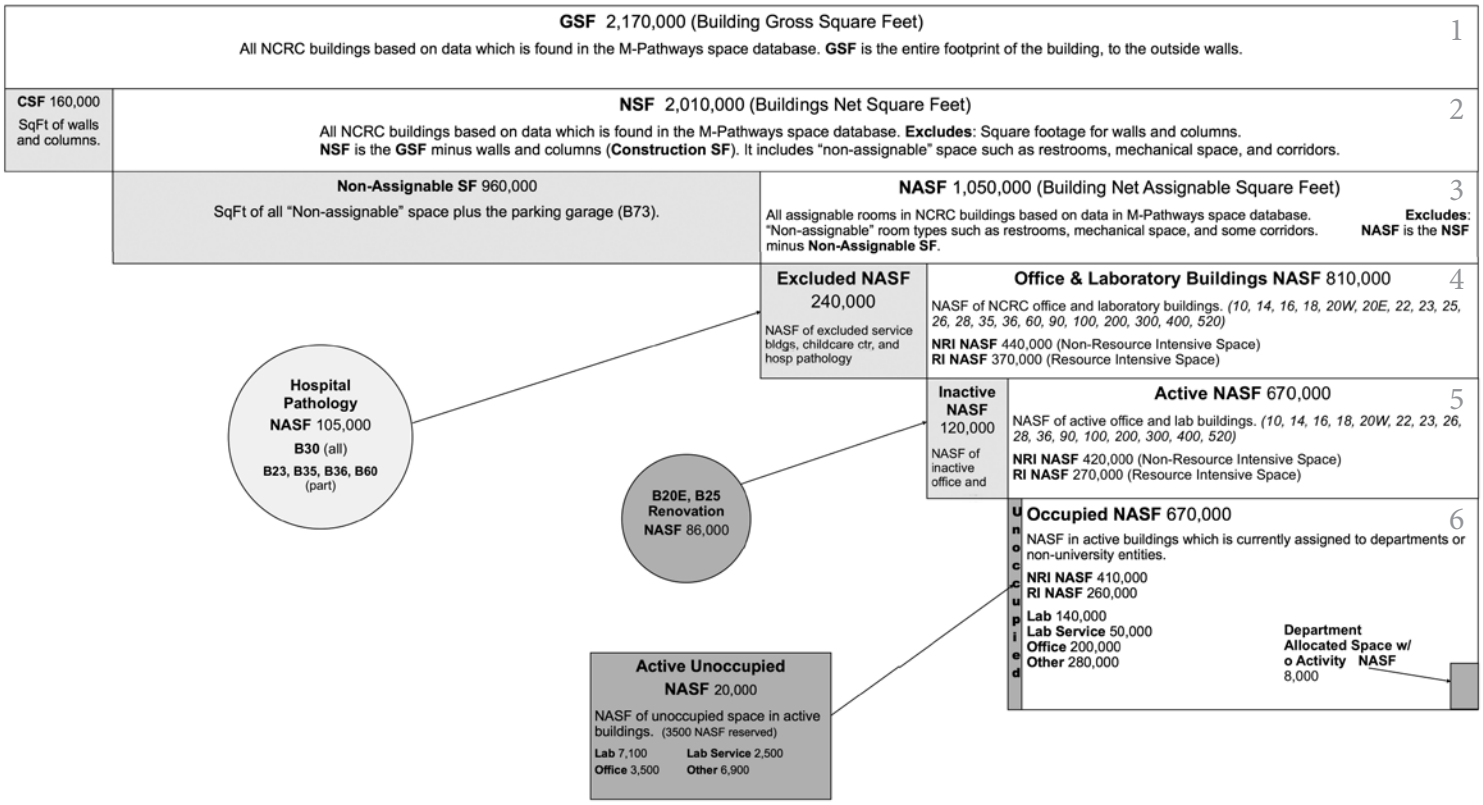
SNAPSHOT

SPACE USAGE AT NCRC

1. Starting with 2.2 million gross building SF,
2. The occupiable sqft at NCRC is approximately 1.05 million (net assignable SF - NASF).
3. Excluding 240,000 NASF which is comprised of utility buildings, the childcare center, the GMP facility, and hospital pathology, there is 810,000 SF of office and lab buildings.
4. Of this office and lab building space, 690,000 SF is considered active.
5. Of the active NASF, 670,00 SF is currently occupied.
6. This leaves about 20,000 NASF of unoccupied office and lab building. In summary, 97% of NCRC's active NASF and 83% of its total capacity (active and inactive NASF space) is occupied.

NCRC RI/NRI Space Analysis Inclusions & Exclusions

Data current as of June 30, 2017. Gray boxes show excluded space.



All data pulled from M-Pathways SCAP and Campus tables (FY16 Period 12).

OCCUPANCY, PEOPLE, JOBS AND EVENTS

NORTH CAMPUS RESEARCH COMPLEX
FACT SHEET

WORK AT NCRC

3,056 PEOPLE
Work at NCRC as of July 2017

267 TOTAL
Faculty Members

81
Wet Lab Faculty Members

GROWTH

11 ADVANCED INSTRUMENTS
Let scientists and engineers study materials at the most detailed level

7 RESEARCH GROUPS
- Biointerfaces Institute
- Cardiovascular Research Center
- Chemical Engineering
- Comprehensive Cancer Center
- Computational Medicine and Bioinformatics
- Emergency Medicine
- Michigan Center for Integrative Research in Critical Care

9
Shared research facilities

1 INSTITUTE
Institute for Healthcare Policy and Innovation

PARTNERSHIPS

2 PRIVATE COMPANIES
Denso
Ford

1 PUBLIC
Veterans Affairs

65
Launched Venture Accelerator Companies

10
University of Michigan Schools

BUS

541,336
Rides on the North-East Shuttle (July 2014 - July 2017)

1,578
Rides on the Bio Research Shuttle (June 2014 - July 2017)

COMMUNITY

15 NEW BUSINESSES
Opened up on Plymouth Rd since June 2009

82% SATISFIED WITH QUALITY OF LIFE

EVENTS

FINANCES

EXPENSES
$135M in operating expenses
$82M in total capital expenses
FY2010 - FY2017

$108 MILLION
To acquire NCRC in 2009

MCARD

32 ACRES
Of NCRC land transformed into Mcity, a testing ground for connected and automated vehicles by the Mobility Transformation Center

14,024
Mcards Granted NCRC Access (July 2017)

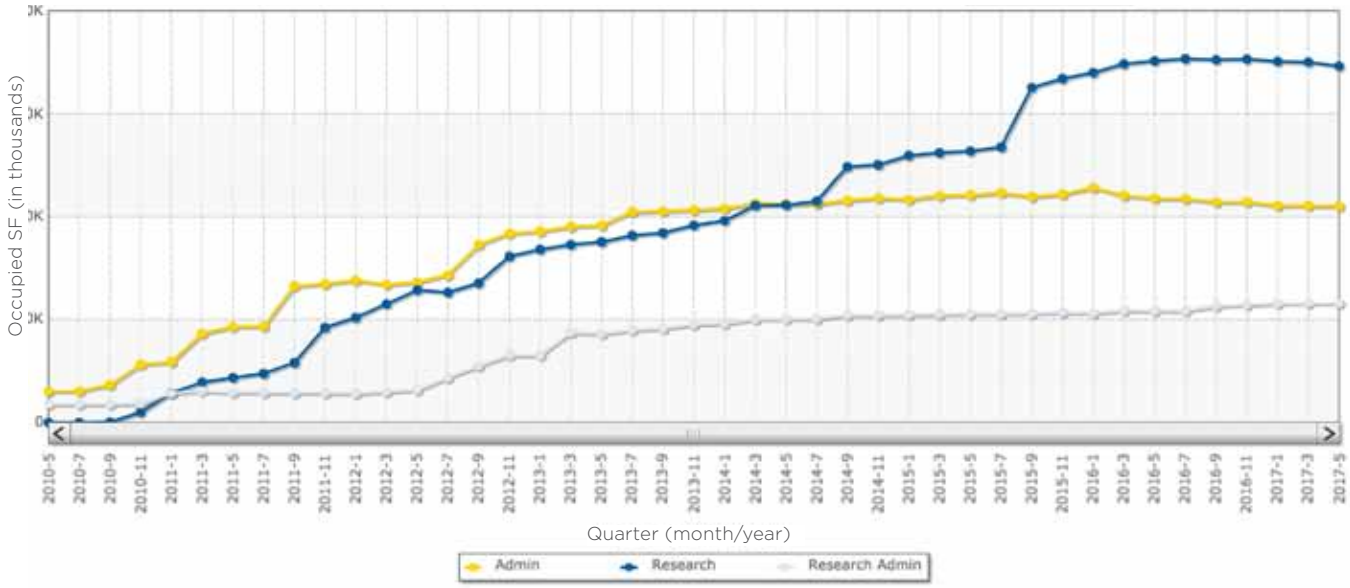
ART

41
Total art exhibits

SNAPSHOT

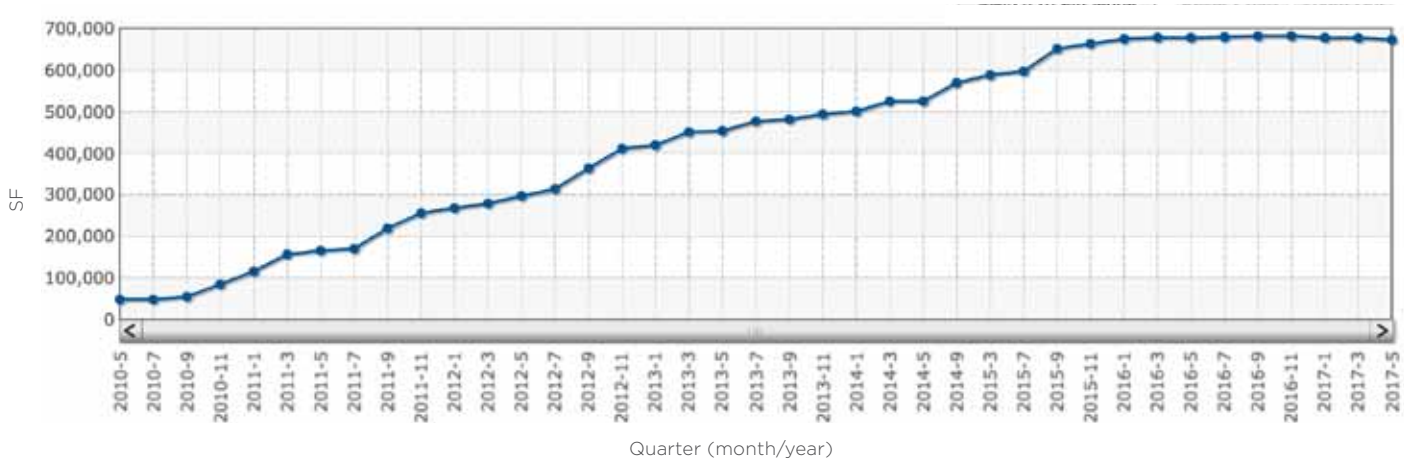
OCCUPANCY, PEOPLE, JOBS AND EVENTS

NCRC Occupied Space Research vs. Admin



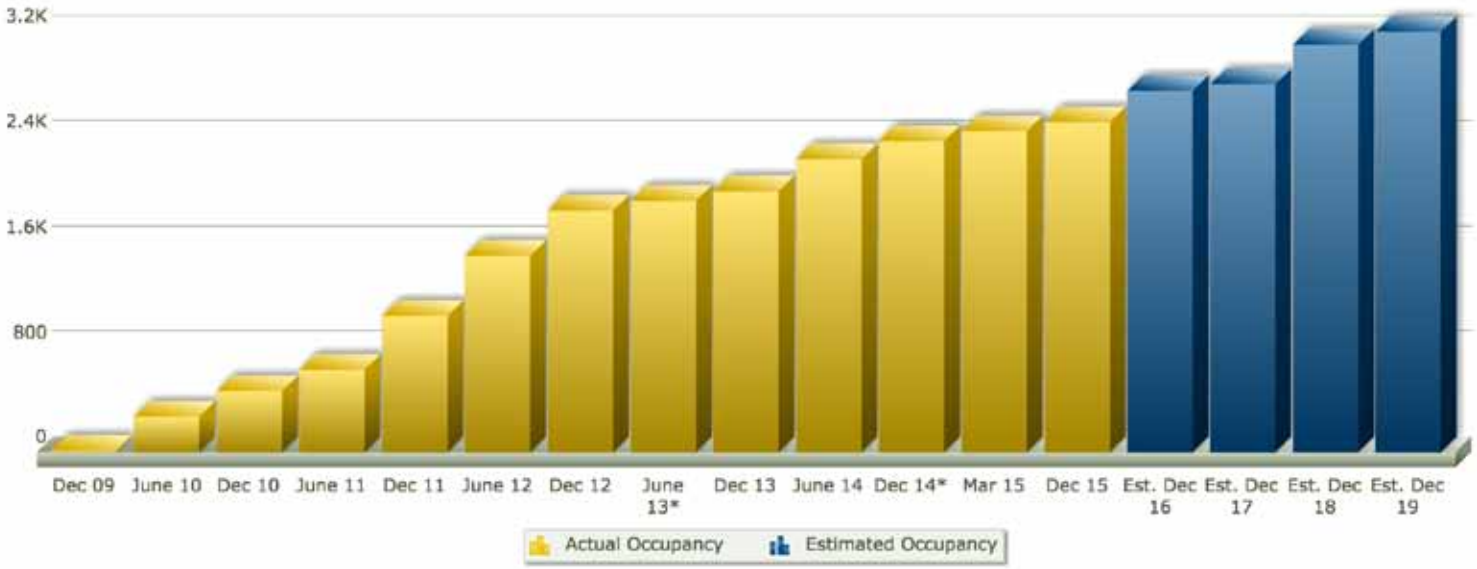
NCRC Total Occupancy

Occupancy Facts: Current Capacity (active space): 590,000 net sq. ft. | Occupied Space: 469,000 net sq. ft.

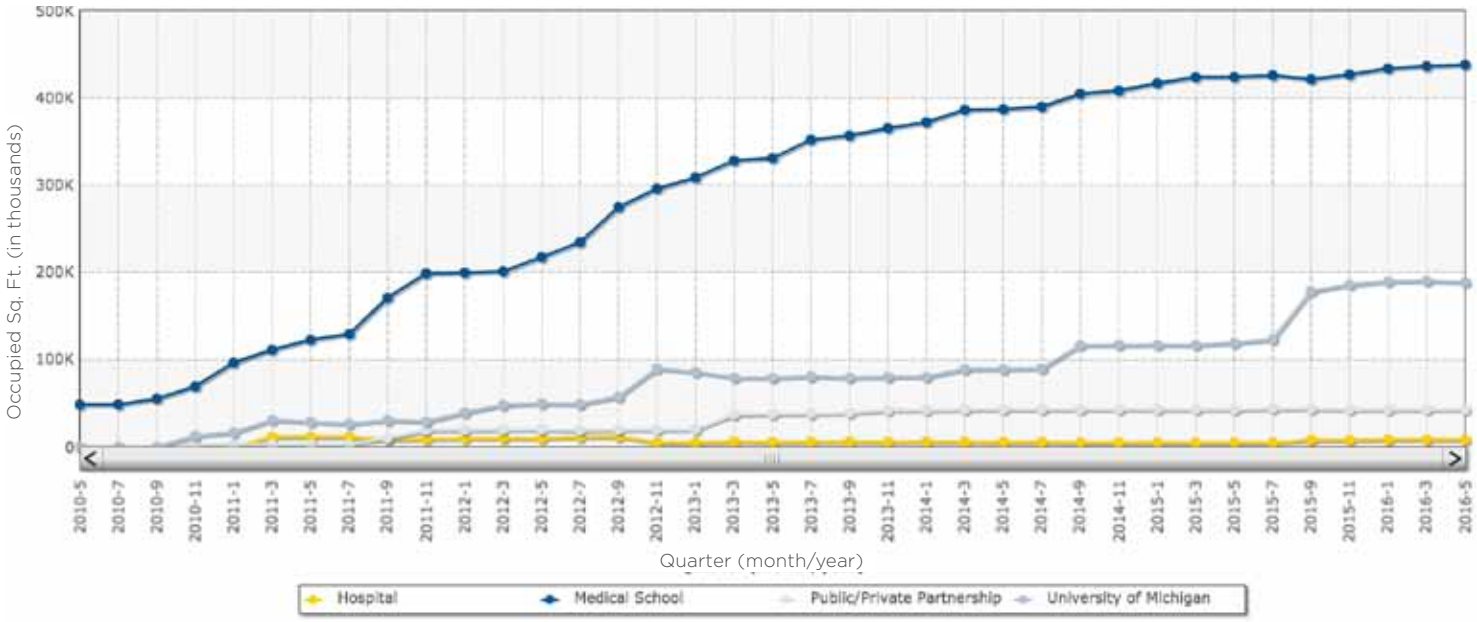


OCCUPANCY, PEOPLE, JOBS AND EVENTS

NCRC Actual and Estimated Occupancy Over Time



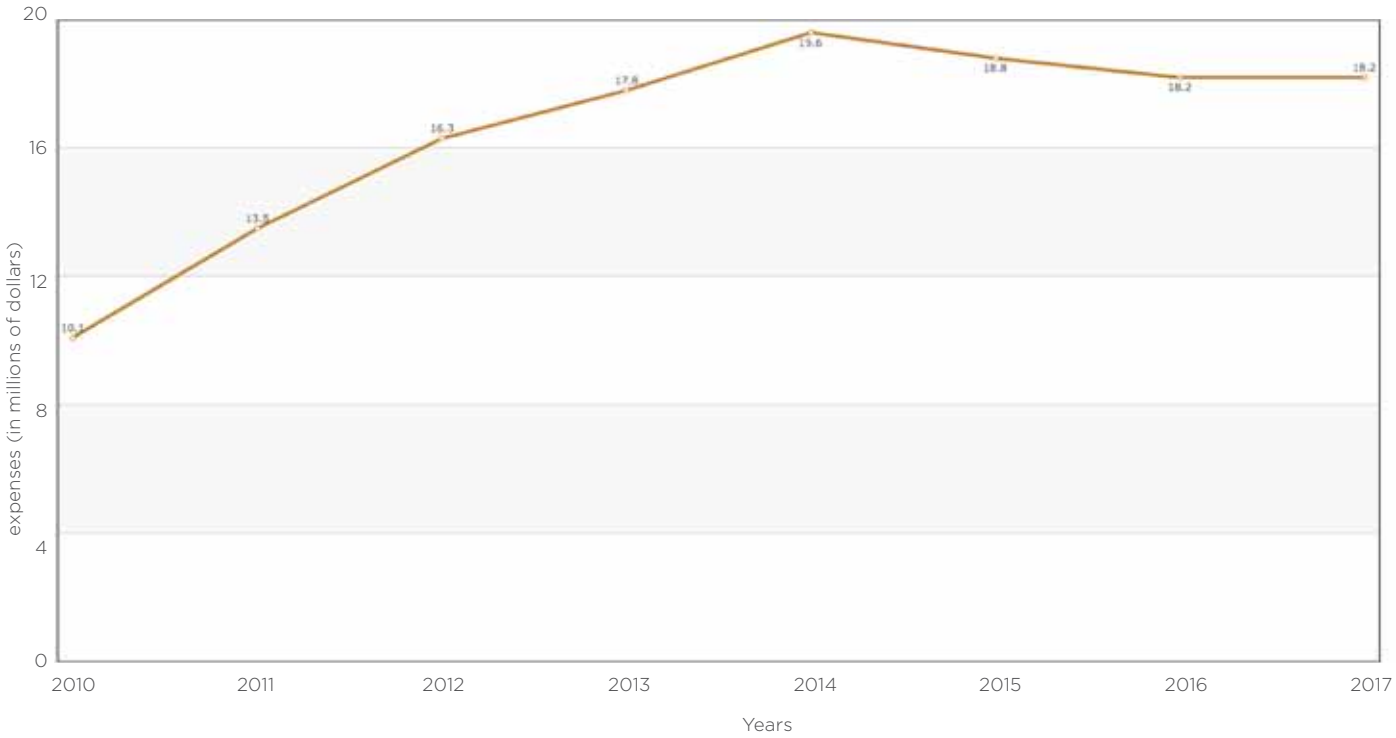
NCRC Occupied Space (by Organization)



SNAPSHOT

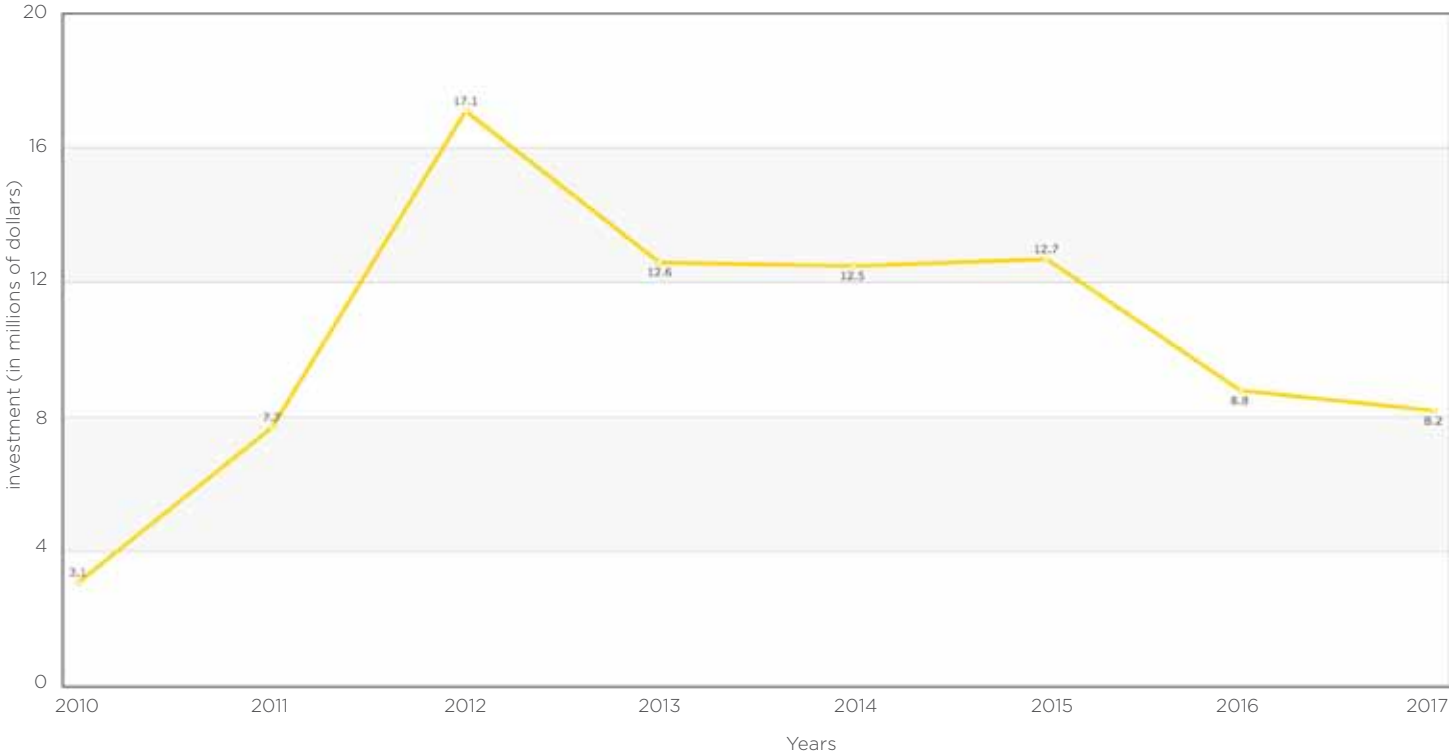
CAPITAL AND OPERATING COSTS

OPERATING EXPENSES



CAPITAL INVESTMENT

After the initial capital expenditure for its purchase, capital expenditure at NCRC has been less than projected.



Additional investment by campus and the hospital are not included in the totals for the capital investment graph

AR.UMNCRC.ORG/2017