

ALLINA HEALTH RESEARCH

2018 Annual Report

Discovery

Advancing health outcomes through research

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For a complete list of Allina Health Research 2018 manuscripts, abstracts, presentations and posters, visit allinahealth.org.

Allina Health Research annual report
project manager: Lara Freyder
writer: Jennifer Syltie Johnson



Welcome to the 2018 Allina Health Research annual report.

At Allina Health, we are committed to innovative research that advances health outcomes, improves patient lives and promotes population health in the communities we serve.

Our dedicated researchers work tirelessly to advance the future of health care. From innovative discoveries in personalized medicine and genomics, to immunotherapy, new care delivery options such as telemedicine, care model redesign, and leading-edge drug and device trials. Through research opportunities and advances, we emphasize Allina Health's approach that recognizes all factors—body, mind, spirit and

community—impacting health care are connected. Through our partnerships with other organizations, we are privileged to make discoveries that impact patient care at a national level.

Combining clinical expertise with a commitment to community health

With our geographic reach and more than 29,000 employees, 6,000 associated and employed physicians, and access to an integrated electronic health record, Allina Health is uniquely positioned to advance the future of medicine through research. We are connected in a way that makes it possible for a patient in a regional hospital or clinic to be seamlessly referred to participate in one of our clinical trials or observational research studies.

This unique role in the research ecosystem provides patients with access to research studies and clinical trials usually available only in university settings. For some patients, we are able to provide options when no other options are available. For others, it represents a way to impact future discoveries in science and medicine and to advance care for future generations.

For physicians and clinicians interested in research opportunities, we offer a robust infrastructure and are poised to build on our opportunities and successes. We are dedicated to achieving more through sharing, learning, growing and leading.

Our collaborative research is supported through internal funding, through industry and government support and through generous philanthropic support from donors committed to advancing care. Community support is a stimulus to our research efforts and provides the margin of excellence for our patients. We are grateful to the individuals and entities supporting research across Allina Health.

On behalf of the research team, we invite you to learn more through this report and online at allinahealth.org. We are committed to discovery through patient-centered research and the potential our research represents to advance care, improve outcomes and save lives.

Timothy Sielaff, MD, PhD, FACS
Chief Medical Officer and Senior Vice President

Vani Nilakantan, PhD
Vice President of Research



At Allina Health, our researchers are dedicated to discovering new treatments, therapies and knowledge to advance the future of health care. Why does our community-based not-for-profit health system invest in research? Simply put, research holds the potential to improve the health of those we serve. Research plays an important role in our mission to prevent illness, restore health and provide comfort to all who entrust us with their care. We are grateful for those who make research possible—physicians, our research teams, support staff, partner organizations, generous donors and our patients.

Penny Wheeler, MD
President and CEO
Allina Health

Our values

Integrity, Trust,
Respect, Compassion,
Stewardship

Allina Health Research Vision

To be a recognized leader in innovative clinical research that advances health care, improves patient lives and promotes population health in the communities we serve.

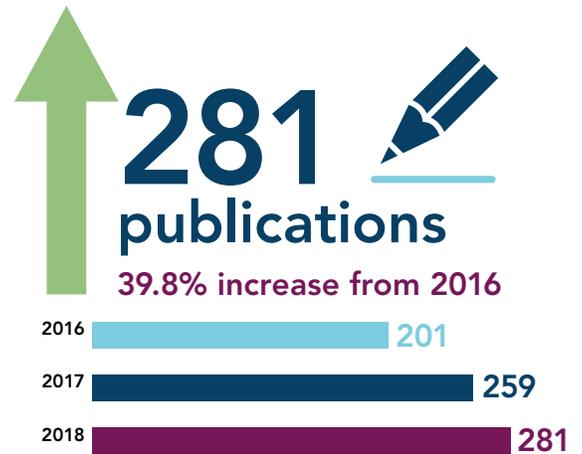
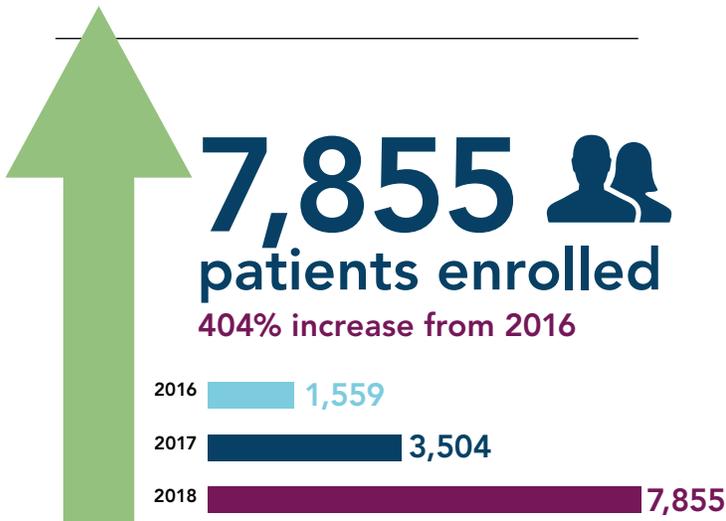
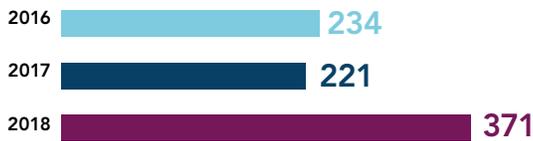
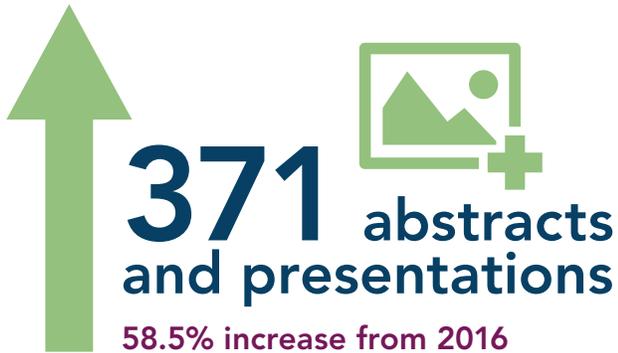
Research houses

Allina Health considers research an essential component of supporting its patients, families and communities. The institutional investment in research provides the necessary infrastructure for advancing research across the organization and fosters a supportive environment for the research community. Research at Allina Health is organized into clinically focused research houses. This structure aligns with and supports the strategic mission of the Allina Health Clinical Service Lines.

Allina Health considers research an essential component of supporting its patients, families and communities.



Research portfolio 2018



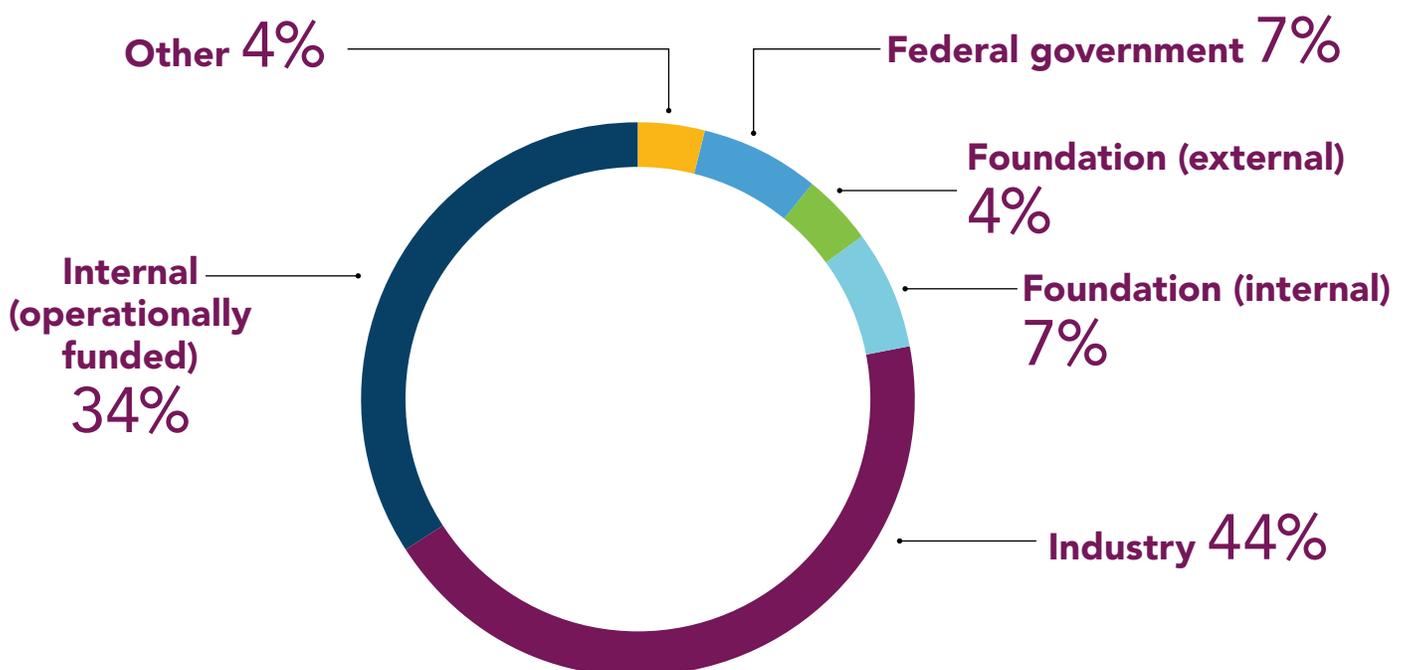
↓ **45** grants
8.1% decrease from 2016



↓ **revenue**
\$11,787,937
1.7% decrease from 2016



↓ **expenses**
\$16,429,119
13% decrease from 2016





Profiles in research

Allina Health has 261
principal investigators
and hundreds of dedicated
researchers on its staff.

Here are some of
their stories.

Emmanouil Brilakis, MD, PhD, FACC, FAHA, FESC, FSCAI

*Director, Center for Complex Coronary Interventions
at the Minneapolis Heart Institute®*

*Interventional cardiologist, Minneapolis Heart Institute®
at Abbott Northwestern Hospital*

*Chairman, Complex Coronary Artery Disease Science Center,
Minneapolis Heart Institute Foundation®*

Emmanouil Brilakis, MD, PhD, FACC, FAHA, FESC, FSCAI, an interventional cardiologist and expert in coronary chronic total occlusions (CTOs), joined the Minneapolis Heart Institute Foundation in 2016. A prolific researcher, Brilakis has authored or co-authored more than 500 manuscripts and the Manual of CTO Interventions, now in its second edition.

Minneapolis Heart Institute Foundation (MHIF) has built its reputation as one of the nation's most distinguished champions of coronary artery disease (CAD) research and treatment. Under the leadership of Brilakis, the Complex Coronary Artery Disease Science Center works to decrease the burden of CAD through research, innovation and education.

Through its partnership with more than 70 cardiologists who see more than 31,000 individual patients at nearly 57,000 clinic visits each year at Abbott Northwestern Hospital and 36 outreach sites, Minneapolis Heart Institute® is uniquely positioned to address the individual and societal challenges of coronary artery disease.

At MHIF, Brilakis leads a large clinical trial group investigating treatment of CTOs, prevention and treatment of saphenous vein graft disease, prevention and management of complications, intracoronary imaging, antiplatelet treatment optimization post-coronary stenting, radiation safety in the cardiac catheterization laboratory and the implementation of novel technologies in health care.

"The Minneapolis Heart Institute® offers a superb, high-volume cardiology practice," said Brilakis. "This is a unique group of talented people, many of whom I have known for a long time in the field of cardiology. It's an outstanding group to work with."



"Our culture at Minneapolis Heart Institute® and MHIF is one of continuous improvement," said Brilakis. "The whole goal of doing clinical research is to make things better, safer and more efficient. Everything we do is all about the patient."

“All of the research we do is directly linked to patient care,” explained Brilakis. “The beauty of our research is that we are able to quickly offer care improvements for patients.”



Committed to improving cardiovascular health through innovative research and education

An independent 501(c)(3) nonprofit, the work of MHIF researchers is made possible through key partnerships including the Minneapolis Heart Institute® at Abbott Northwestern practice and access to complex data sets through national registries and databases.

“All of the research we do is directly linked to patient care,” explained Brilakis. “The beauty of our research is that we are able to quickly offer care improvements for patients.” Through a patient registry supported by a grant from the Abbott Northwestern Hospital Foundation, Brilakis and his team are involved in multiple research studies on complex chronic total occlusions—arteries that are completely blocked.

Along with improving patient care, MHIF researchers are committed to improving education for other cardiologists on new and innovative treatment methods. Several years ago, two educational websites were launched for a global

audience of cardiologists to view various procedures online. One of the sites at ctomanual.org supplements the Manual of Coronary Chronic Total Occlusion Interventions. Another site at pcimanual.org is dedicated to instruction on basic and advanced interventional cardiology techniques. The sites offer cardiologists 170 online cases and have been viewed more than 350,000 times by cardiologists and patients around the world.

Donor support has been critical for funding a new training program in complex coronary interventions—one of just a handful of programs in the United States—and a huge service for training the next generation of physicians specializing in this area of cardiology.

“Our culture at Minneapolis Heart Institute® and MHIF is one of continuous improvement,” said Brilakis. “The whole goal of doing clinical research is to make things better, safer and more efficient. Everything we do is all about the patient.”

Joy Longley, DNP, NPC, CHFNP

United Heart & Vascular Clinic

United Hospital

A nurse practitioner since 1982, Joy Longley, DNP, NPC, CHFNP, joined United Heart & Vascular Clinic in 2000 with a background in social work. She combines this experience and background each day to care for patients—and to support the clinic’s research team as it works to advance medical care and knowledge.

United Heart & Vascular Clinic offers a full range of resources for prevention, early detection, rapid treatment and rehabilitation of heart disease. “My focus here is on chronic care management,” said Longley. “I enjoy working in a clinical research setting because it provides a path to the most innovative care for our patients.”

Longley serves as a sub-investigator for multiple heart failure studies and has been an integral part of the clinic’s MANAGE-HF research—a study using an existing feature on a Boston Scientific pacemaker to closely monitor patient heart failure symptoms. The feature sends alerts when patients may be having symptoms based on factors such as heart sounds, thoracic impedance, respiration, heart rate and activity level. Patients are then treated in response to the alerts to anticipate and prevent worsening heart failure. The study aims to integrate the alert system into standard clinical practice.

“The more we’re able to proactively help patients in the day-to-day management of their disease and use the new medications with good outcomes, the better off our patients will be,” said Longley. “To me, this research is all about improving quality of life through close collaboration with colleagues, families, primary care physicians and constantly ensuring that our patients have the support systems in place for the best outcomes possible.”

The MANAGE-HF study allows clinicians to monitor transmitted reports as frequently as weekly with updated data from the pacemaker on heart failure status changes. “This allows us to intervene proactively to help these patients better manage their heart failure, decrease acute events and hospitalizations and titrate their medications as needed,” said Longley. “Heart failure is a notoriously difficult condition to manage long term and our long-term goal is to use technology to decrease costs and improve quality of life.”

This work requires Longley and other researchers to work closely together with staff to assess patients and make clinical adjustments. “Joy is always responsive to requests from the research team, and she strikes a fantastic balance between ensuring the integrity of the study and always doing what is best for patients,” said Alan Bank, MD.



“The more we’re able to proactively help patients in the day-to-day management of their disease and use the new medications with good outcomes, the better off our patients will be,” said Longley.

“Joy and the entire heart failure team have been vital in this research, which would not be successful without their dedication, enthusiasm and support.”

Longley credits a spirit of collaboration and a proactive approach to United Heart & Vascular Clinic’s research-focused practice. The research team and the clinical staff work closely to identify candidates for research studies, ensuring that each patient has the support needed to effectively manage their condition.

“We follow each patient very closely,” said Longley. “We provide them with information and resources they need. All of this is possible through our patient-centered team approach.”



Roman Melamed, MD

Intensivist, Abbott Northwestern Hospital

When patients are admitted to Abbott Northwestern Hospital in critical condition, they are taken care of by intensivists—board-certified physicians who provide specialty care for critically ill patients.

Each year, the hospital serves more than 200,000 patients and their families. When intensivists are requested to see a patient in the intensive care unit (ICU), they bring their advanced training and experience in caring for and treating patients with life-threatening conditions.

Roman Melamed, MD, has served this patient population since 1996. An intensivist with expertise in hemodynamic monitoring, mechanical ventilation, neurocritical care, pulmonary embolism and other complex critical care issues, Melamed also has an interest in medical education and research.

“Research improves the quality of patient care—it forces us to reassess and advance our practice and creates multidisciplinary team networks,” said Melamed.

“We are not an academic institution with protected time dedicated to research; however, we have high volumes, high acuity and complexity in our patients,” said Melamed. “We are in a unique position to conduct applied research studies as opposed to basic science research. We focus on finding the answers to questions that are important for us as bedside clinicians but aren’t always answered by guidelines or research conducted by academic medical centers. As we seek to improve care, we obtain the highest quality data and statistical analyses and go through a rigorous, labor-intensive and peer-reviewed process.”

Recent Allina Health studies in critical care and hospitalist care have focused on hemodynamic monitoring, pulmonary embolism management, chest ultrasound, therapeutic hypothermia, post-discharge phone call interventions and patterns of social determinants of health. These studies are performed in partnership with the Abbott Northwestern Hospital Care Delivery Research team: Catherine St. Hill, DVM, PhD, principal research scientist; Vincent Agboto, PhD, MS, senior statistician; and Claire Smith, MS, research associate.

“Research improves the quality of patient care—it forces us to reassess and advance our practice and creates multidisciplinary team networks,” said Melamed. “We focus on research that is relevant to clinical practice. Our cooperative spirit is one of the most important pieces of this work.”



Abbott Northwestern’s Intensivist Hospitalist Research Council (left to right): Saavedra-Romero, MD; Ruth Bryant, PhD, RN, CWOCN; Justin Kirven, MD; William Wagner, MD, FACOG, SCCM; Lisa Kirkland, MD; Karen Swenson, PhD; David Beddow, MD.

Eric Nussbaum, MD

National Brain Aneurysm & Tumor Center

Director of the United Hospital Neurovascular and Skull Base Surgery Program

Eric Nussbaum, MD, is a neurosurgeon and national expert in the diagnosis and treatment of brain aneurysms and vascular malformations. He is among a small group of surgeons worldwide who specialize in microsurgery for brain aneurysms.

The director of the Neurovascular Neurosurgery Program at United Hospital, he has performed more than 2,000 complex surgeries to treat brain aneurysms, more than 1,000 operations for skull base tumors and more than 400 delicate brain bypass surgeries.

Nussbaum and his team at the National Brain Aneurysm & Tumor Center provide consultation and surgical care for hundreds of patients each year from across the country and world with brain aneurysms, brain tumors and other complex neurovascular conditions.

"A multidisciplinary and collaborative team approach is critical to ensure that each patient receives the best possible treatment and care," said Nussbaum. "Our team is continuously trying to learn more and do better."

At the National Brain Aneurysm & Tumor Center and United Hospital, patients with neurovascular disorders benefit from the experience of a vascular neurosurgeon, interventional neuroradiologists, stroke neurologists and neurocritical care experts.

When managing brain tumors, the center offers a multidisciplinary approach that includes the joint efforts of skull base neurosurgery, neuro-otology (ENT), neuro-ophthalmology, craniofacial reconstructive/plastic surgery, CyberKnife® neuro radiosurgery, neuropathology and neuro-oncology.

Nussbaum and his neurovascular colleagues at United Hospital—Sandra Hanson, MD; Michael Madison, MD; and Arif Shaik, MD—were recognized as the physician honorees at the United Hospital Foundation's Service to Humanity Gala in September 2018.



"A multidisciplinary and collaborative team approach is critical to ensure that each patient receives the best possible treatment and care," said Nussbaum. "Our team is continuously trying to learn more and do better."



Eric Nussbaum, MD research by the numbers

86 journal articles

48 national and international presentations

64 national poster presentations

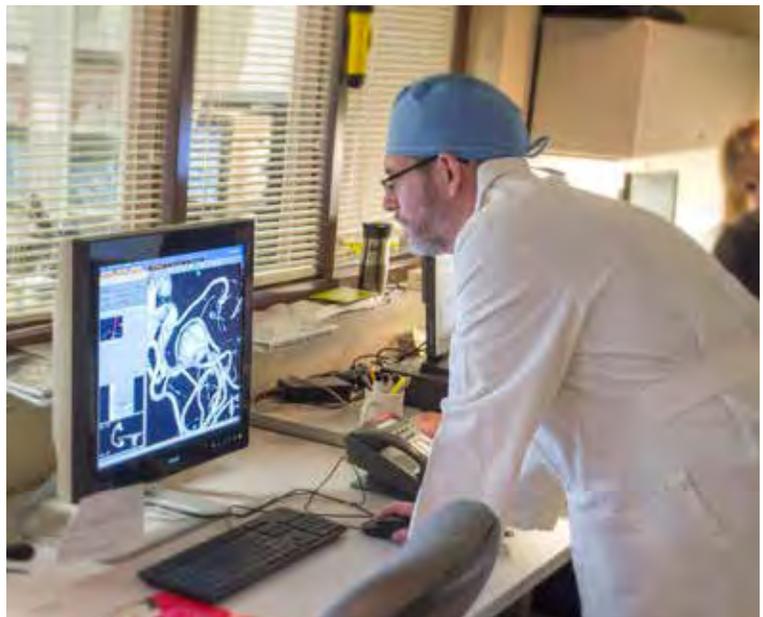
A team approach to research and care

From 2013 to 2018, the neurovascular team at United Hospital had 46 papers published. One study by Eric Nussbaum, MD, and Michael Madison, MD, and other colleagues published in the prestigious *Journal of Neurosurgery* analyzed the microsurgical treatment of unruptured middle cerebral artery aneurysms. This study represents the largest known data set in world literature for 750 patients who underwent surgical repair of unruptured aneurysms from 1997 to 2015.

Leslie A. Nussbaum, MD, PhD, also with the National Brain Aneurysm & Tumor Center, is the only neurosurgeon in the Twin Cities with a dedicated subspecialty of radiosurgery. Her practice as the co-director of the John Nasseff CyberKnife® Center at United Hospital focuses on CyberKnife stereotactic radiosurgery for complex brain and spinal disorders, including benign and malignant brain tumors, metastatic tumors and vascular malformations. She has received multiple coveted awards for brain tumor research at the national level.

Eric Nussbaum, MD, and Leslie Nussbaum, MD, PhD, have developed new devices including aneurysm clips and brain catheters for which they hold United States patents, and they have developed new surgical techniques that have been presented at national neurosurgical meetings and published widely in the medical literature.

“Treating a large number of patients allows us to contribute to the education and training of others—and to advance the field of neurosurgery through ongoing research efforts,” said Nussbaum. “We often tell patients that if we don’t have a good option to treat their problem, we will try to come up with something when nothing else is available.”



Frank Rhame, MD

Infectious Diseases physician, Allina Health Uptown Clinic and Abbott Northwestern Hospital

For four decades Frank Rhame, MD, has served as a researcher in the field of infectious diseases. Initially, his research focused on infection control and by 1985, Rhame's focus turned to HIV-related research. Today, in addition to HIV treatments, Rhame's research involves influenza vaccination, treatment of respiratory syncytial virus (RSV) and methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia.

As a board-certified infectious diseases physician, Rhame's clinical practice specializes in all aspects of infectious diseases, including HIV infections, GLBT health, hepatitis B and C, and travel medicine. At the Allina Health Uptown Clinic and Abbott Northwestern Hospital, Rhame and his partners care for more than 800 HIV-positive patients. His research has offered patients the opportunity to have access to new HIV drug therapies before they are available to the broader public.

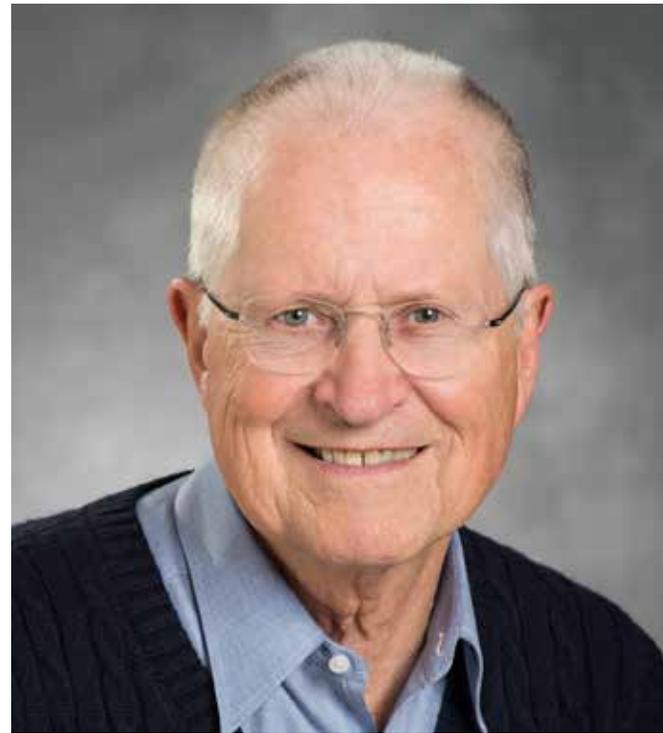
Earlier in his career, Rhame was involved in clinical trials for hepatitis C drugs when they were first available. "Fortunately, the drugs available today are so effective that there isn't much more research to do," said Rhame. "We've made immense progress in treating patients with hepatitis C."

Rhame has also witnessed great progress in the treatment and care for patients with HIV since the mid-1980s. In 1996, things changed dramatically when new medications became available. "Those medications were hard to take, but people didn't die," said Rhame. "Since then, there has been a series of incremental improvements in therapies. They are even more potent and much easier to take. It's remarkable that patients today can live with HIV with a high quality of life by taking a pill a day. Soon it will likely be possible to take only a shot every two months."

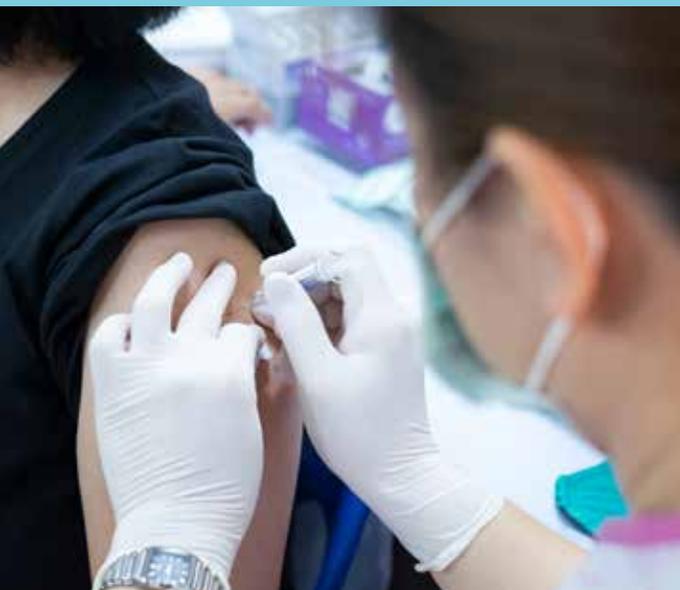
Outreach and education

Rhame makes frequent appearances in the media on topics ranging from the Zika virus to influenza to norovirus to the new Shingrex[®] vaccine for shingles. He also travels extensively to give talks locally and at locations across the globe as far away as Uganda on infectious diseases.

In addition to his clinical practice, research, media outreach and public speaking, Rhame also serves as adjunct associate professor in the Division of Epidemiology and Community Health in the School of Public Health and adjunct professor in the Infectious Diseases Section of the Department of Medicine at the University of Minnesota Medical School in Minneapolis.



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Frank Rhame, MD, media and educational outreach by the numbers

27 media appearances from 2016 to 2018

38 educational talks in 2016

26 educational talks in 2017

28 educational talks in 2018

Working together for the benefit of patients

Rhame and his colleagues partner with other specialties within Allina Health when they see the potential to improve patient care through research. One example is the INVESTED trial (INfluenza Vaccine to Effectively Stop Cardio Thoracic Events and Decompensated Heart Failure)—a collaborative research study of infectious diseases and the Minneapolis Heart Institute® at Abbott Northwestern Hospital.

The five-year, 9,000-person study funded by the National Heart, Lung and Blood Institute of the National Institutes of Health is designed to determine which of two formulations of the flu vaccine—the standard dose or an investigational higher dose—is more effective in reducing deaths and heart- and lung-related admissions to the hospital in patients with heart disease.

Cardiologists and nurses at the Minneapolis Heart Institute® have teamed up with principal investigator Rhame and his research coordinators to partner on the trial. The site has been recognized as one of the top patient recruitment sites in the United States and Canada. “This kind of activity depends on the quality of the research coordinators, and we have been blessed with incredibly talented people in these roles,” said Rhame.



Allina Health Infectious Diseases Research team (left to right): Sarah Hauglie, CMA, research assistant; Frank Rhame, MD, infectious diseases physician, Allina Health Uptown Clinic and Abbott Northwestern Hospital; Adrienne Baranauskas, BS, RN, senior research nurse; Jessie Whelan, BA, MN, RN, clinical research nurse.

John Trusheim, MD

*Neuro-oncologist and medical director,
Abbott Northwestern Hospital's Givens Brain Tumor Center*

*Medical director of neuro-oncology,
Virginia Piper Cancer Institute*

John Trusheim, MD, and his team at Abbott Northwestern Hospital's Givens Brain Tumor Center are on a mission to provide world-class coordinated care for patients with brain cancer.

"Our focus is not only on the best possible treatments but also to provide support for each patient," said Trusheim. "Quality of life is so important for brain tumor patients, and we are here to care for the whole person."



Promising treatments on the horizon

With a strong focus on clinical research, Trusheim and his team offer patients access to trials and studies that will lead to new treatment options. Immunotherapies—cancer treatments that work by engaging the patient's own immune system to attack the tumor—have shown great promise in a growing number of cancers.

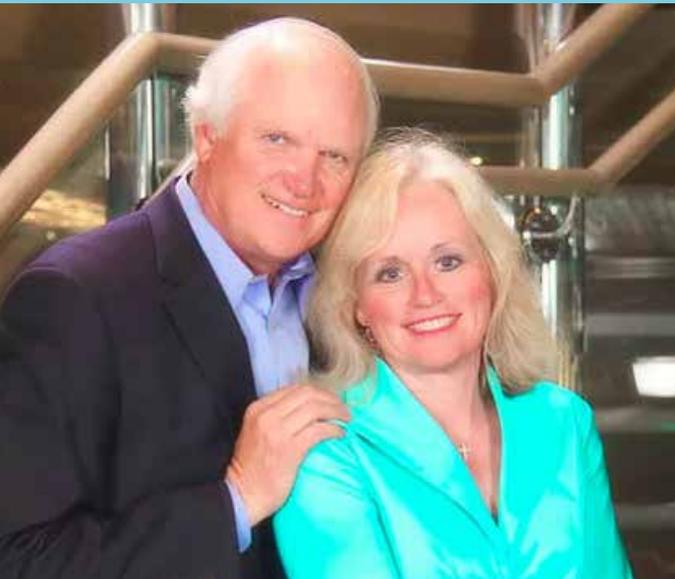
Researchers are now studying immunotherapy to determine its effectiveness in treating brain cancers, including glioblastoma—the most common type of malignant brain cancer in adults. "We see great promise in immunotherapy and gene-based therapy," said Trusheim. "While a tumor may fall into a certain classification, under the hood they are certainly not identical."

A vaccine could help to significantly extend the lives of people diagnosed with a glioblastoma, based on trials that Abbott Northwestern Hospital researchers took part in. Results from the multicenter clinical trial of a personalized vaccine that targeted

"Our focus is not only on the best possible treatments but also to provide support for each patient," said Trusheim. "Quality of life is so important for brain tumor patients, and we are here to care for the whole person."



Attendees of a neuro-oncology grand rounds session at Abbott Northwestern Hospital in 2018



Michael and Linda Givens

Accelerating, expanding and elevating care and research

With the help of many generous friends and sponsors of the Mind Over Matter Golf Tournament, the Givens donation established the Givens Brain Tumor Center at Abbott Northwestern Hospital. The Givens family also named the Brain Tumor Center as the beneficiary of the annual charitable golf tournament, founded in memory of Michael Givens. "This gift has allowed us to change the paradigm of brain tumor care to provide much more proactive care for all of our patients as well as expanding our research opportunities," said John Trusheim, MD.

"We offer patients options to treat a very challenging disease and are committed to finding the best treatments and support for all patients who come through our doors," said Trusheim. "We're excited about the future."

primary glioblastoma indicated improved overall survival rates for such patients. A phase III clinical trial included patients at more than 80 sites in four countries and interim blinded results were published in 2018 in the *Journal of Translational Medicine*.

"The results from this study were promising, as the overall population in the trial lived longer than we would typically see with current standard of care," said Trusheim who served as a principal investigator. "In general, thirty percent of the patients have lived much longer than we would expect."

Abbott Northwestern's Givens Brain Tumor Center recruited one of the largest groups of patients in the trial. The personalized vaccine used was individualized to each patient. After surgery to remove as much of the tumor as possible, a small amount of tumor tissue was processed to extract tumor specific proteins and then exposed to the same patient's own immune cells, called dendritic cells. Exposure to the tumor proteins essentially trained the dendritic cells to seek out and destroy tumor cells. These trained dendritic cells were returned to the patient as a vaccine injected in the arm. The patients were randomized to receive standard therapy plus the personalized vaccine or standard therapy plus a placebo.

Artificial intelligence to assist patients and caregivers

Researchers at the Givens Brain Tumor Center are poised to team up with a technology company to use Artificial Intelligence to provide home monitoring support for patients and caregivers through the use of Cognitive Behavioral Therapy. "This allows participants to gain access and support through the use of this well-established technique while at home and to participate in a group setting without travel," said Trusheim. In addition, the team is actively pursuing projects on the use of artificial intelligence to help with remote monitoring of patients through speech and movement assessment.

"We offer patients options to treat a very challenging disease and are committed to finding the best treatments and support for all patients who come through our doors," said Trusheim. "We're excited about the future."

Michaela Tsai, MD

Medical director, Virginia Piper Cancer Institute
Oncology Research Program

Martha Bacon Stimpson Endowed Chair in Breast Oncology,
Piper Breast Center

Since 2012, Michaela Tsai, MD, has led the Virginia Piper Cancer Institute's robust Oncology Research Program. A Harvard Medical School graduate who completed her residency and a fellowship in hematology, oncology and stem cell transplant at the University of Minnesota, Tsai was drawn to the Institute for its commitment to research to advance care and offer patients the latest and most promising treatment options available.

"If you have a passion for patient care and want to participate in research, Virginia Piper Cancer Institute offers a great hybrid way to do that," said Tsai.

With 57 research studies open at the Virginia Piper Cancer Institute in 2018, the opportunities for patients to participate in innovative clinical trials rivals that of academic medical centers—and positions the Institute as a clinical research referral center for the region. In addition, researchers at the Institute conduct internal research to develop and test methods to enhance care, manage side effects of cancer and improve the effectiveness of cancer diagnostics and treatments. They also contribute to advancing oncology care through public forums, presentations at scientific and lay conferences and publishing study



"If you have a passion for patient care and want to participate in research, Virginia Piper Cancer Institute offers a great hybrid way to do that," said Tsai.



Virginia Piper Cancer Institute Research team (back row, left to right): Karen Swenson, PhD; Michaela Tsai, MD; Janet Krueger, RN; Jennifer Hite, RN; Holly Desma, RT; Jacquelyn Underhill, RN; Laura Bosshardt, RN; Kathryn Gruetzman, RN; Lori Green, RN; (front row, left to right): Laura Rockwell, RN; Stephanie Erickson, RN; Kelsey Froemming, CCRC; Erin Turpin, CCRC; Lynne Schroeder, RN. Not pictured: Elaine Bell, RN.



Michaela Tsai, MD, holds the Martha Bacon Stimpson Endowed Chair in Breast Oncology at the Piper Breast Center. The endowed chair was made possible by a generous \$1.5 million leadership gift from Martha Bacon Stimpson—a longtime supporter of the Virginia Piper Cancer Institute, breast cancer survivor and the mother of the past-chairwoman of the Abbott Northwestern Hospital Foundation board Muffy MacMillan. Members of the community matched the gift dollar-for-dollar in 2008 to establish the endowed chair to ensure dedicated breast cancer research time.

results in professional journals. In 2018, the Institute’s researchers had 12 peer-reviewed manuscripts published or in press and several others in development.

Collaboration is key

Patients benefit from the Virginia Piper Cancer Institute’s research collaboration both within Allina Health and externally. Within Allina Health, the Institute successfully collaborated with the Courage Kenny Research Institute to complete an Engelsma Family Foundation and Abbott Northwestern Hospital Foundation funded “Purpose Project: Reclaiming life purpose after breast cancer” study.

Externally, ongoing collaborative research projects are underway with investigators at Mayo Clinic, University of Minnesota, Georgetown University and the Pancreatic Cancer Research Team.

Dedicated research time through philanthropy

Tsai serves as the Martha Bacon Stimpson Chair in Breast Oncology for the Piper Breast Center, which makes her dedicated research time possible as she continues her work as a practicing medical oncologist. She sees great promise on the horizon for molecular-targeted therapies in cancer treatments—combining the advances made in immunotherapy with more specific molecular-targeted options and less toxic therapies.

“For every new cancer drug we have available, each had its origin in a clinical trial,” said Tsai. “We can treat and cure many cancers, but not all. Through our research, we offer patients access to new, promising treatments when they may have exhausted all conventional options.” For many patients, this makes it possible to receive cancer treatments near home rather than traveling to a research site across the country. And it allows patients to be with their families or to continue to work while undergoing treatments.

“Above all, the health and well-being of patients is my first concern,” said Tsai. “I believe in the essential balance between the intellectual and the emotional, the scientific and the spiritual, and incorporate these elements into daily practice.”



Research to improve patient care

Patients who inspire research

Orthopedic research usually focuses on new implant designs, patient outcomes with specific procedures or complications with procedures and devices. Sometimes, however, the research question finds the researcher.

Orthopedic surgeon Daniel Buss, MD, has been treating rotator cuff tears for more than 30 years. During that time he has seen many trends and treatments come and go. Approximately 20 years ago, Buss encountered a family of five young brothers who all ended up having surgery over a short period of time.



The Beuning brothers (left to right): Bernie, Paul, Mike, Joe and Urban Beuning have collectively undergone 15 shoulder surgeries.

The Beuning brothers grew up on a dairy farm in central Minnesota and were active, as you would anticipate with five brothers living on a farm. As the brothers grew older, they discovered their own occupations as a farmer, bricklayer, truck driver, assembly worker and physician assistant. Despite the wide-range of demand on the shoulders within their respective occupations, all five brothers eventually began to have shoulder problems.

Collectively, the brothers have undergone 15 surgeries, each brother having at least one procedure performed on one or both shoulders for rotator cuff irritation or tears. According to epidemiological studies, only 15 percent of rotator cuff tears occur in patients between the ages of 30 and 49. Additionally, approximately a quarter of patients have problems with both shoulders when the diagnosis is related to rotator cuff tears or issues. When a group of five brothers under 45 years of age showed up in the office with rotator cuff tears, some questions begin to stir.

Using existing patient records, Buss and his research collaborators evaluated the frequency of young patients developing problems on both shoulders if the first shoulder manifested problems under the age of 45. Over a 13-year period, the investigators identified 74 patients who had shoulder surgery for a rotator cuff tear under the age of 45. Interestingly, this group of patients developed shoulder symptoms on the opposite shoulder 85 percent of the time. While patients will sometimes have shoulder symptoms related to a traumatic incident, fewer than 10 percent of these patients had a trauma to the shoulder that resulted in shoulder pain.

After considering the findings, Buss felt a subsequent study of young patients with rotator cuff tears would be warranted. The new study includes evaluation of patient histories, medication use and other risk factors commonly reported to contribute to rotator cuff tendon problems. This study is ongoing and will seek to further evaluate a family connection with rotator cuff tears in patients sustaining tears at a young age. If able to identify considerable risk to opposite shoulders or a possible genetic connection, it may be possible to alert patients of increased risk factors for these conditions.

The orthopedic surgeons at Allina Health are grateful for the opportunity to care for a variety of patients and are constantly on the lookout for ways to improve patient care through research efforts. As demonstrated through the Beuning brothers, patient stories can motivate providers to seek answers to questions that may otherwise be overlooked.



Daniel Buss, MD, Sports & Orthopaedic Specialists, specializes in disorders of the shoulder and elbow, and sports medicine; he is the author of numerous papers and book chapters and served as the team physician for the Minnesota Twins from 1990 to 2012.

The orthopedic surgeons at Allina Health are grateful for the opportunity to care for a variety of patients and are constantly on the lookout for ways to improve patient care through research efforts.

Jamie's story

For parents expecting a baby, excitement and uncertainty are a normal part of the journey. For new parents Jamie and David, however, they never imagined the situation they would face.

When Jamie was 31 weeks pregnant with their son Carson, they learned that not only did she need to give birth via C-section nine weeks early, but simultaneously undergo open heart surgery to replace a heart valve to save her life.

"I think we both just went into shock, because what do you do when someone tells you that?" said Jamie. "You never expect that when you're 27."

It began in late January 2018 when Jamie suddenly came down with fever, chills and body aches. It was the middle of flu season, and working as a physician assistant at a clinic, she was exposed to a lot of things and initially suspected the flu. She was prescribed antibiotics for possible pneumonia, and her symptoms improved for a while. But then her fever came back, along with intermittent palpitations, a feeling that her heart was racing and shortness of breath.

"We ended up in the emergency room on a Saturday afternoon and were admitted that night," said Jamie. "I remember on the hospital ride to St. Cloud, telling David, 'Oh, this is the ramp we'll park in when we come back in two months to have a baby.' But things went completely different."

Through testing, Jamie and David learned that Jamie had a congenital heart condition that made her susceptible to a cardiac infection. She had developed endocarditis, which is an infection in the heart valve. While the infection can sometimes be treated with antibiotics, Jamie's aortic heart valve had been destroyed, and she required an immediate valve replacement.



New parents Jamie and David with their son, Carson

Jamie said she and David were "taken aback by the diagnosis" because she wasn't aware of any history of heart problems or any predispositions for the endocarditis. "Then when we found out that I urgently needed not only open heart surgery, but that our son was going to be born two months early, that was really concerning."

Thankfully, Jamie and her unborn baby found themselves in excellent hands with the teams at Abbott Northwestern Hospital, including the cardiologists at Minneapolis Heart Institute® where she was referred due to the complexity of her case. Going into surgery, there were three teams present: the maternal-fetal critical care team, the open-heart surgery team and the neonatology team.

"I was an expectant mom; my first worry was for him and having to be born nine weeks early," said Jamie. "But I think initially, what gave us a lot of hope was when we just got to Abbott Northwestern and were greeted by a large team of specialists, and they were all great and very empathetic for our condition. We had confidence going in. And so really, my concern was for Carson, I wasn't really thinking about what could go wrong with me. So, just the team gave us the biggest hope."

The surgery was not without complications. At the time of the baby's delivery, Jamie had a complete cardiac arrest. Her heart did not respond to electronic defibrillation, so for 58 minutes, doctors and nurses performed CPR while Benjamin Sun, MD, Minneapolis Heart Institute Foundation® researcher, put her on a heart-lung bypass machine (ECMO).

"It was a very quiet 58 minutes," said William Wagner, MD, a maternal-fetal critical care medicine specialist with Minnesota Perinatal Physicians. "But everybody knew... we knew ... we had just delivered this baby for them. And we said, 'You know what?' We're not going to let this happen."

Jamie remained on the heart-lung bypass machine and unresponsive for hours after surgery, but she eventually stabilized and was told her baby was okay. To help her heart recover, Jamie was sedated and remained on the heart-lung machine for two days. On Valentine's Day, she was extubated and woke up to see David come in with a little blue bear to tell her they had a boy, along with a picture of Carson. When Carson was five days old, Jamie was finally stable enough to be brought in a wheelchair to the Neonatal Intensive Care Unit at Children's Hospital, which is connected to Abbott Northwestern, to finally meet him.

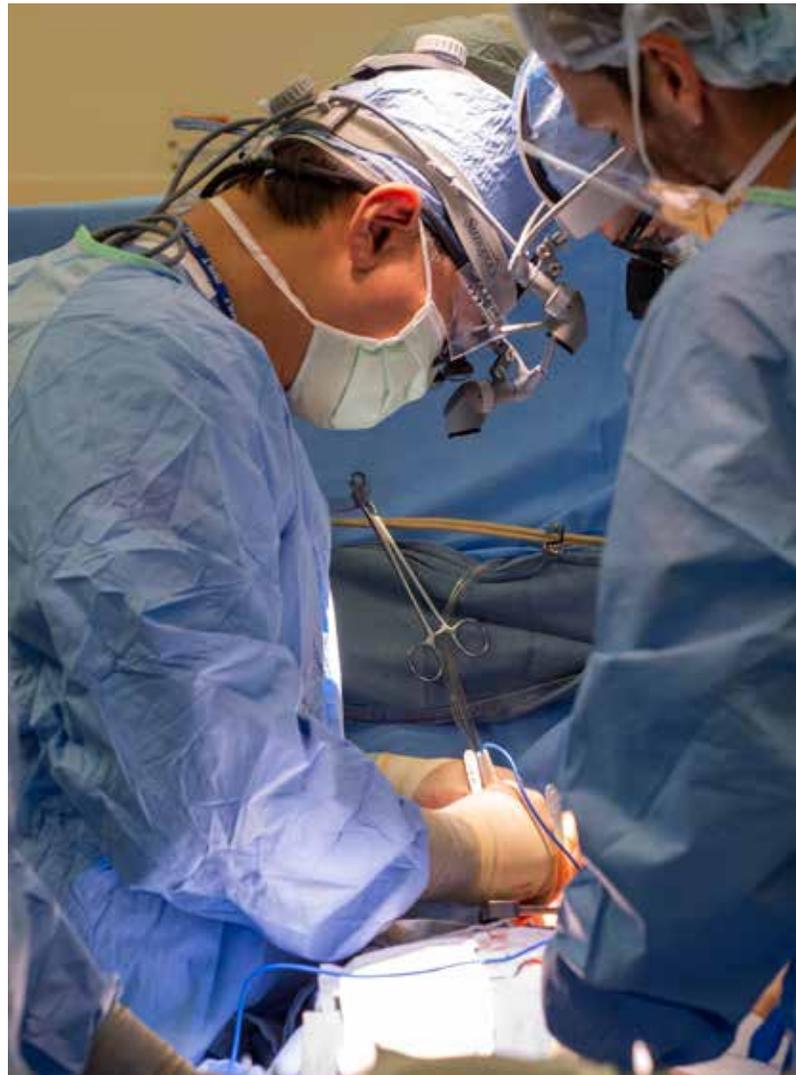
"All babies are a miracle, but he's our special miracle," said Jamie. "He had his own complications, so he was strong from the beginning too."

"Ten years ago, Jamie would have been a statistic — a very sad statistic," said Sun. "Research helped us understand what tools we needed. Research educates us on how to approach these problems, and then we can be better."

"Having utilized research myself, I now have such a greater appreciation for it," said Jamie. "Without the funding for that kind of research that they're doing, people like me wouldn't be here to tell this story. I wouldn't be here to be a mom to Carson. If I had been at a different facility that didn't have the resources of ECMO, things could've turned out completely different."

She continued, "Dr. Wagner was the one who brought Carson into the world and Dr. Sun, he saved my life. I don't know how you thank somebody for that. And I think my husband and my son would say thank you, too. I just can't say enough that this research is worth supporting because of the lives that can be affected and saved."

"Ten years ago, Jamie would have been a statistic — a very sad statistic," said Sun. "Research helped us understand what tools we needed. Research educates us on how to approach these problems, and then we can be better."



Benjamin Sun, MD, is an advanced heart failure and transplant cardiologist at the Minneapolis Heart Institute® at Abbott Northwestern and serves as chief of cardiothoracic surgery. Sun is also a researcher with the Minneapolis Heart Institute® Foundation with research interests in complex aortic and mitral valve surgery, heart transplantation, aortic root and aortic arch surgery, mechanical support, and artificial heart and congestive heart failure surgery.

Tim's story

In October 2018 Timothy Wilson was admitted to Abbot Northwestern Hospital's Intensive Care Unit (ICU) after learning that he had experienced a pulmonary embolism (PE).

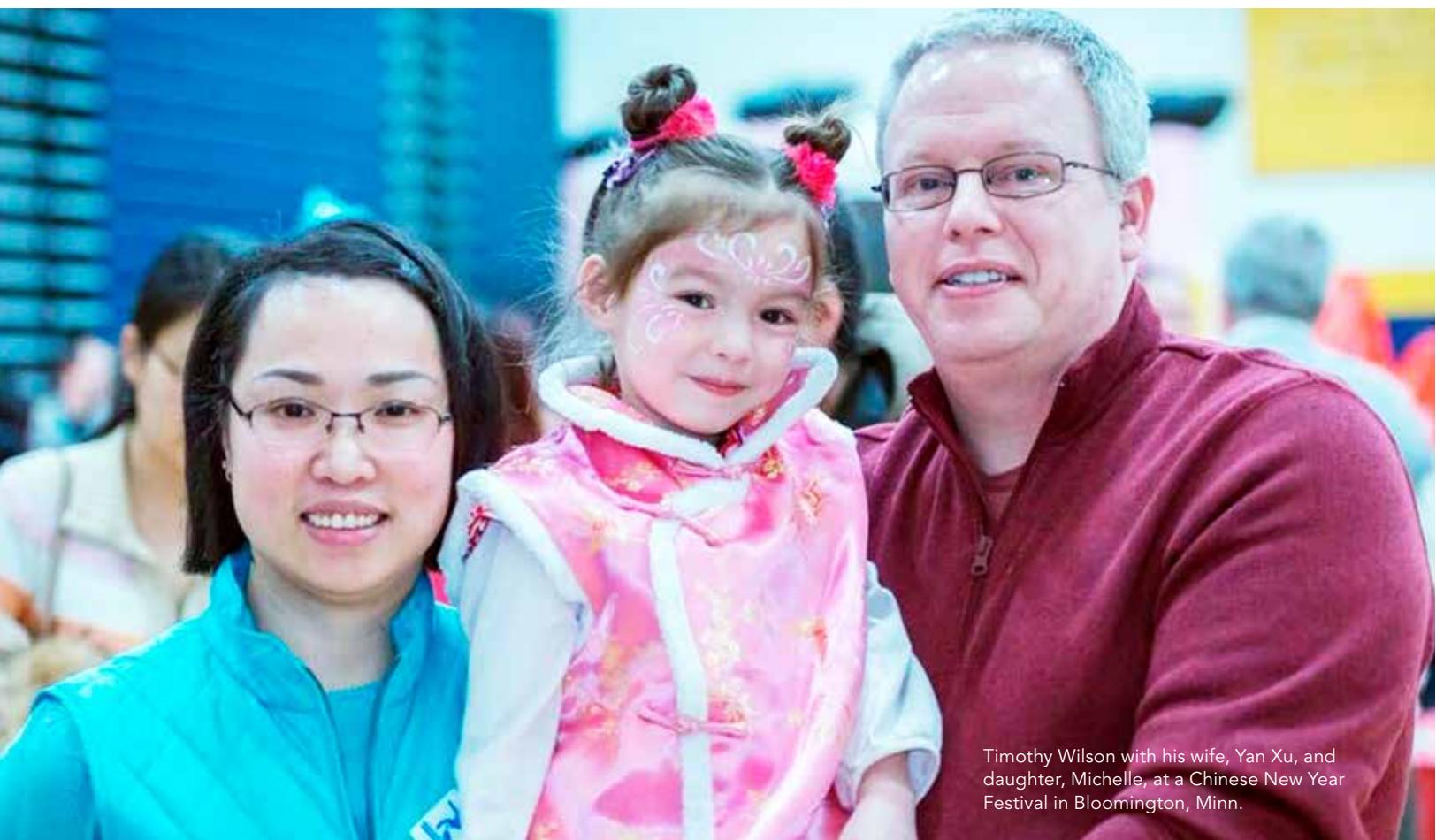
A potentially life-threatening event, a PE occurs when a blood clot lodges in one of the arteries connecting the heart to the lungs. Wilson was frightened because a friend had died from a PE and he was unsure about what to expect for his outcome. He chose Abbott Northwestern after his urgent care medical team told him Abbott Northwestern was a premier hospital to manage PE patients.

His physician in the ICU was Roman Melamed, MD, who leads Abbott Northwestern's PE Management Program. "PE is common and can be associated with adverse outcomes," said Melamed. "Treatment decisions depend on the severity of presentation and the complication risk of various treatments."

"Knowing that Dr. Melamed was the one doing PE research made me feel that I was in the right hands. I felt calmer and more relaxed knowing about who was caring for me," said Wilson.

To assist physicians in managing the most complex cases, a PE Treatment Algorithm and a PE Response Team were implemented at Abbott Northwestern over the past several years. This structured, multidisciplinary approach to complex clinical issues helps clinicians to select optimal treatment strategies, and also provides a sense of security and predictability for patients.

Abbott Northwestern's critical care research program is currently conducting a retrospective analysis of PE treatment strategies and patient outcomes. The study results will help to improve patient outcomes by providing important feedback information to the clinical teams. Wilson can attest to the value of this research and his successful outcome. He returned home to his family and is expected to recover well.



Timothy Wilson with his wife, Yan Xu, and daughter, Michelle, at a Chinese New Year Festival in Bloomington, Minn.

Medical education at Allina Health

Training the next generation of health care professionals

Each year, Allina Health offers training to 70 medical residents in family practice, internal medicine and podiatry. In addition, Allina Health hospitals serve as teaching facilities to other residency and fellowship programs for 177 medical residents and fellows each year.

The **Abbott Northwestern Hospital Internal Medicine Residency program**, in its 53rd year of training internists and subspecialists, trains approximately 30 residents annually. Residents and faculty provide outpatient care within the Abbott Northwestern General Medicine Associates (ANGMA) clinic in Minneapolis and at the Abbott Northwestern Center for Outpatient Care in Edina. “The residents rotate extensively at Abbott Northwestern, and also at a variety of outpatient clinics across the Twin Cities,” said David Tierney, MD, FACP, program director, Abbott Northwestern Hospital Internal Medicine Residency. In addition, residents and fellows from other programs in Minnesota complete rotations at Abbott Northwestern. In 2018, 99 residents and fellows from 25 different programs served in the hospital.

United Hospital operates the **United Family Practice Residency program**, which is accredited for 19 residents who serve at United and United Family Medicine Clinic. The state of Minnesota recently approved funding to increase the size of the program to help meet the population needs for primary care physicians. Residents in the program may rotate to Mercy Hospital, Mercy Hospital – Unity campus, Abbott Northwestern, Children’s Minnesota and Hennepin Healthcare. The residents may also rotate to 36 other clinic sites including Allina Health Clinics.

Mercy Hospital operates a **Podiatry Residency program**. There were three residents in the program during the calendar year 2018. The podiatry residents may rotate to other Allina Health hospitals and other sites such as nursing homes and clinics. Mercy Hospital also serves as a teaching facility. In 2018 there were 27 residents from University of Minnesota residency programs serving at Mercy Hospital.



David Tierney, MD, FACP, holding an ultrasound tablet at a patient’s bedside with residents from Abbott Northwestern Hospital’s Internal Medicine Residency program.

Student summer research internship programs

In 2018, 26 student interns participated in summer research internship programs in areas listed below. Each research area administers its summer research intern program. The Minneapolis Heart Institute Foundation® offers one of the most prestigious and proven research internship opportunities available to undergraduate pre-medical students and those studying in other health care disciplines. From 2002 to 2018, 196 students graduated from the MHIF Research Internship Program. More than 95 percent of the MHIF Research Internship Program graduates have pursued a career in health care, with 48 percent of graduates now practicing physicians and 20 percent enrolled in medical school.

2018 student interns

- 3 Virginia Piper Cancer Institute
- 13 Minneapolis Heart Institute Foundation
- 5 Orthopedics
- 2 Courage Kenny Rehabilitation Institute/Neuroscience
- 1 United Heart & Vascular Clinic
- 1 Research Operations
- 1 Clinical Research Informatics and Analytics

Research by the numbers

CANCER

Virginia Piper Cancer Institute

Active studies	57
Active enrollment	227
Publications	12
Media and other presentations	5
Academic presentations and abstracts	8
Grants awarded	1
Active investigators	23

CARDIOVASCULAR

Minneapolis Heart Institute Foundation®

Active studies	192
Active enrollment	495
Publications	192
Academic presentations and abstracts	159
Active investigators	52

Metropolitan Heart & Vascular Institute

Active studies	23
Active enrollment	185
Publications	5
Academic presentations and abstracts	16
Active investigators	20

United Heart & Vascular Clinic

Active studies	28
Active enrollment	25
Publications	2
Academic presentations and abstracts	5
Grants awarded	2
Active investigators	12

CARE DELIVERY

Critical Care and Hospitalists

Active studies	16
Active enrollment	265
Publications	4
Media and other presentations	3
Academic presentations and abstracts	7
Grants awarded	6
Active investigators	43

Emergency Services

Active studies	12
Publications	4
Media and other presentations	4
Academic presentations and abstracts	4
Active investigators	6

Mother Baby

Active studies	9
Active enrollment	2,328
Media and other presentations	6
Academic presentations and abstracts	6
Grants awarded	2
Active investigators	29

Heart of New Ulm/ Cardiovascular Diseases

Active studies	13
Active enrollment	2,310
Publications	3
Media and other presentations	13
Academic presentations and abstracts	14
Active investigators	7

Other care delivery research studies

Active studies	5
Active enrollment	4
Publications	2
Grants awarded	1
Active investigators	4



INFECTIOUS DISEASES

Active studies	9
Active enrollment	1,407
Media and other presentations	8
Academic presentations and abstracts	27
Active investigators	2

NEUROSCIENCE

Active studies	43
Active enrollment	61
Publications	21
Media and other presentations	5
Academic presentations and abstracts	22
Grants awarded	2
Active investigators	20

NURSING

Active studies	6
Active enrollment	180
Publications	5
Media and other presentations	1
Academic presentations and abstracts	33
Grants awarded	6
Active investigators	22

ORTHOPEDIC

Sports & Orthopaedic Specialists

Active studies	13
Active enrollment	70
Publications	3
Media and other presentations	20
Academic presentations and abstracts	59
Active investigators	6

REHABILITATION

Courage Kenny Rehabilitation Institute

Active studies	26
Active enrollment	297
Publications	15
Academic presentations and abstracts	5
Grants awarded	25
Active investigators	4

SPINE

Twin Cities Spine Center

Active studies	10
Active enrollment	1
Publications	7
Media and other presentations	3
Academic presentations and abstracts	6
Active investigators	11

Allina Health Research by the numbers

630
active studies

371
abstracts and presentations

281
publications

45
grants awarded

7,855
patients enrolled

261
active investigators



Collaboration

Through collaboration,
Allina Health Research
investments are
multiplied

Here are examples of Allina Health
collaborative research achievements
with the potential to improve care
and save lives.

Allina Health Emergency Medical Services research benefits patients and providers

Allina Health Emergency Medical Services (EMS) is the largest EMS employer in Minnesota and one of the region's largest ambulance and medical transport services.

Lori Boland, MPH, principal research scientist with Allina Health EMS, is a clinical epidemiologist who collaborates with emergency medicine physicians and pre-hospital clinicians in support of investigator-initiated research.

Boland's primary research interests include pre-hospital management of sudden cardiac arrest, CPR quality and EMS provider well-being. Two years ago, Boland transitioned to a dedicated research role embedded within the Allina Health EMS team.

"We try to live by the mantra, 'It's only worth researching if it offers an opportunity to improve patient care or provider well-being'. Some of our research and measurement activities have focused on bread-and-butter care like studying whether

our STEMI patients are getting aspirin when they should be," said Boland. "But we also try to focus on issues with contemporary relevance, for example, understanding EMS's role in access to opioids. A few years ago, we changed our pain management protocol in an effort to be more judicious about how we're distributing narcotics in the field. Then we did a before and after look at what happened after we changed the

"I think the EMS community itself is pretty hungry for research and to innovate and explore new ideas," said Boland. "You have to do research and really study what works and what doesn't."



Lori Boland (second from left), principal research scientist for Allina Health EMS, and additional members of the Allina Health EMS research team in 2018: Jonathan Kamrud, program manager, EMS analytics; Andrew Stevens, MD, associate medical director; Charlie Lick, MD, medical director; and Jessica Jeruzal, research associate.



protocol. We found that we have been able to achieve a 46 percent reduction in the pre-hospital use of opioids across our system without any appreciable difference in patient-reported pain scores.”

Two emergency medicine physicians, Charlie Lick, MD, and Andrew Stevens, MD, provide medical direction for EMS and support the EMS research agenda. They provide leadership in determining research priorities, contribute to the publication and presentation of research findings, and play a key role in initiating and fostering external partnerships.

In 2018, Allina Health EMS had three papers published or accepted on provider well-being covering the topics of burnout and exposure to critical incidents, EMS provider perspectives on pediatric calls and social support outside of the workplace. “There’s no question that sometimes our providers are exposed to situations that could contribute to the development of PTSD,” said Boland. “Allina Health EMS has really started to focus on how we can best support our providers and their well-being. We have conducted focus groups, reviewed the literature and are committed to addressing this as an agency.” Allina Health EMS has two chaplains on staff to support providers and field staff in their roles.

“I think the EMS community itself is pretty hungry for research and to innovate and explore new ideas,” said Boland. “You have to do research and really study what works and what doesn’t.”

Allina Health EMS 2018 vitals

- Serves more than **100** Minnesota communities and **1.2** million residents.
- Employs **610** paramedics, emergency medical technicians (EMTs), dispatchers, special transportation drivers, maintenance, administration and support personnel.
- Provides services including priority medical dispatch, 911 pre-arrival instructions, emergency and non-emergency ambulance response, the Greater Minnesota Ride program and wheelchair transport.

315,422

Allina Health EMS dispatch center calls answered

121,839

total 911 and Basic Life Support responses

40,704

callers received pre-arrival instructions from dispatchers

4,618,457

miles driven

Allina Health Laboratories: Supporting research and improving care through complex testing and analysis



Research at Allina Health is supported by the tests and studies performed by more than 700 laboratory scientists and professionals, including 37 pathologists from Hospital Pathology Associates.

Each year, Allina Health Laboratory professionals perform more than 8.4 million medical laboratory tests and examine more than 80,000 patient tissue specimens. Along with the clinical care testing and reporting, they perform or assist in basic, translational and clinical research projects, such as:

- authoring scientific publications and presentations
- streamlining the collection of biospecimens for clinical studies and research trials
- providing patient specimens for the Institutional Review Board-approved clinical trials.

As stewards of each patient's biospecimens for clinical care, lab professionals ensure that all federal diagnosis and care mandates are met. Lab specimens are sent at the patient's

request for further studies, including the patient's participation in clinical trials and studies. Co-chaired by Milton Datta, MD, and Schuyler Sanderson, MD, with administrative support from Heather Grussing, the Allina Health Biospecimen Review Committee governs this critical process.

A separate and expanding process supports procuring, processing and submitting specimens in the form of fresh tissues, blood samples, serum samples, bone marrow samples and clinical laboratory tests for clinical trials and research studies. "This often involves coordination with additional clinical teams in surgery, interventional radiology and oncology," said pathologist Milton Datta, MD, co-chair of the Allina Health Biospecimen Review Committee. "In the Laboratory this includes participation by trained cytotechnologists and pathologists, who provide real-time assessments of biopsy tissue specimens to ensure the material collected is sufficient and appropriate for the clinical study. In particular, with the expansion of molecular testing and studies, this area of research procurement has been an increasing function of Pathology and the Laboratory."

Collaborative research with Allina Health physicians

Pathologists with Hospital Pathology Associates and the Allina Health Laboratory collaborate with Allina Health physicians on research and quality improvement studies including the Virginia Piper Cancer Institute, Piper Breast Center, Minnesota Gastroenterology and Allina Health Neuroscience research.



VIRGINIA PIPER CANCER INSTITUTE

In conjunction with the Piper Breast Center, pathologist Tami Lillemoe, MD, has been performing ongoing studies aimed at improving outcomes and care for patients with breast cancer. These studies include the examination of sentinel lymph node biopsies

in bilateral mastectomy patients, the need for re-excision of breast tissue in patients undergoing lumpectomy for breast cancer and pre-cancerous changes, and the number of lymph nodes removed from patients with breast cancer surgery and their subsequent complication rates.

MINNESOTA GASTROENTEROLOGY

In collaboration with gastroenterologists, Kenneth Batts, MD, Hospital Pathology Associates, is studying how to optimize colon polyp removal to reduce complications. The study results have helped to improve the procedure and have been published to improve care.

INTEGRATED NEUROSCIENCE RESEARCH

Pathologist William McDonald, MD, who serves on the College of American Pathologists Committee on Diffuse Gliomas, has collaborated with neuroscience researchers on a number of studies to improve care for challenging conditions such as pituitary adenomas, glioblastomas and rare nervous system lesions including skull base malformations and tumors.

In 2018, McDonald was a co-author of three neuroscience papers including two with lead authors Leslie Nussbaum, MD, PhD, and Eric Nussbaum, MD, neurosurgeons with the National Brain Aneurysm & Tumor Center.

McDonald is the principal investigator of “Emerging resistance mechanisms in glioblastoma: Comparing whole exome sequences of initial tumor resection and re-excisions

following standard chemo- and radiation therapy,” a project with investigators from the Broad Institute and IBM. This study uses next-generation sequencing provided by Broad and bioinformatics provided by both Broad and IBM to track the evolution of resistance in clinically well-characterized high-grade gliomas that underwent initial resection and subsequent re-excision in Allina Health facilities. Neuro-oncologist John Trusheim, MD, and neuroscientist Nilanjana Banerji, MS, PhD, are co-investigators on the study.

Allina Health Cytogenetics research in the molecular age

With the expansion of molecular and cytogenetic knowledge and testing, clinicians are able to better classify, understand and treat various cancers. The Allina Health Cytogenetics Laboratory under the direction of Carlos Tirado, MD, and Hospital Pathology Associates pathologists John Reinartz, MD, and Kevin Stieglbauer, MD, and Cytogenetics staff have been active in publishing their findings for the benefit of the clinical and research community. In 2018, this included 19 publications and presentations on the finding of rare cytogenetic changes in chronic lymphocytic leukemia, molecular changes in non-small cell lung carcinomas and the identification of transient myelodysplastic syndrome changes in patients with Trisomy 21/Down syndrome.

A focus on research and data analysis

Through the Hospital Pathology Associates Quality Program, Schuyler Sanderson, MD, examines the rates of positive surgical margins on all cancer resections performed at Allina Health hospitals. In addition, he studies the number of lymph nodes removed during cancer resections, a measure of the quality of dissection techniques. Both of these studies will set a baseline to help Allina Health evaluate the efficacy of surgical techniques and appropriate follow-up care that patients may need in their cancer care journey.

Improving Clinical Laboratory techniques to optimize patient care

Led by Stan McCormick, MD, team members in the Allina Health Flow Cytometry Laboratory perform ongoing research on new markers to identify tumor cells, along with the application of advanced statistical algorithms for the analysis of patient samples to better identify malignancies. These critical studies are supported by the United Hospital Foundation through scientific grants that allow for this important work to be completed, as well as the subsequent presentation and publication.

Pharmacy

At Allina Health, Pharmacy staff support a variety of research teams including Oncology, Minneapolis Heart Institute Foundation, Neuroscience, Twin Cities Spine Center, Infectious Diseases and others.

Research studies include industry-sponsored studies, investigator-initiated studies, MMCORC trials (Oncology) and US Oncology trials. In 2018, the Virginia Piper Cancer Institute reported more than 700 participants in oncology-related trials (approximately 25 percent in treatment trials) at Abbott Northwestern, Mercy and Unity hospitals. This resulted in more than 100 investigational doses dispensed from inpatient Allina Health pharmacies.

The Allina Health Heart Hospital Pharmacy partnered with multiple research departments at Abbott Northwestern in 2018 to fill oral investigational medications. This work supported studies for HIV, neurology and cardiology. The Pharmacy staff members label products to meet all requirements from the Board of Pharmacy, maintain inventory, meet with study monitors and complete required documentation.



Research infrastructure and support

Allina Health Research is organized under a single umbrella to achieve:



expanded visibility and connection to Allina Health strategic initiatives



organizational alignment and portfolio support through infrastructure buildout



streamlined processes for operational excellence and efficiencies



increased opportunities to leverage existing and new capabilities for research support



strengthened partnerships with the Medical and Research leadership teams.

Allina Health Research:

- shows integrity and respect by approving ethical research and ensuring it is conducted in the right way
- creates trust and shows compassion to subjects by making sure research teams are properly trained to conduct research and protection of subjects is the first priority
- supports stewardship by striving for excellence in human research protections.

Allina Health Research is supported by the following teams:

- **Clinical Research Informatics & Analytics (CRIA)**

The mission of the CRIA team is to apply the science of information management to enable the effective and efficient execution of clinical research, including clinical trials, observational studies and outcomes research.

- **Human Research Protection Program**

The mission of Allina Health's Human Research Protection Program (HRPP), and its Institutional Review Board (IRB), is to protect the rights and welfare of subjects involved in human research overseen by this organization. This includes human subjects research involving Allina Health employees, facilities, patients or data.

- **Research Compliance**

The goal of the Allina Health Research Compliance Program is to ensure that all research conducted by Allina Health and/or within Allina Health facilities complies with applicable laws, regulations, guidelines, and Allina Health policies and procedures. The program consists of many compliance areas: conflicts of interest, human subjects' protection program, research privacy, research billing, research misconduct, export controls and biosafety.

- **Research Operations**

The mission of Research Operations is to enable and support quality research at Allina Health by negotiating and managing contracts and collaborative agreements, while ensuring accurate budgeting, fair pricing and billing compliance.



In 2018, the team focused on the following four priorities:

- creating a culture in which talent can thrive
- promoting organizational alignment
- increasing visibility
- optimizing organization performance and efficiencies.

Key 2018 accomplishments

Clinical Research Informatics & Analytics

75 
data supports
 with more than
400 data extracts

38 
 LHSNet – National
 Patient-Centered Clinical
 Research Network
 (PCORnet) queries

**Senior
 statistician**
 joined the team in
 December 2018

Research Operations

 **19%**
 Federal award
 monitoring increase

 **Federal
 IDC rate
 negotiated**
 increased from
39% to 46%

**Grants
 program
 coordinator** 
 joined the team



Updated multiple
 policies and
 procedures including
 the implementation
 of a new federal
 effort certification
 procedure

 
247
**agreements
 reviewed**
 an increase of
40% over a
 two-year period

 **External legal
 spend reduced
 by more than**
90% 

 **Reduced timeline to
 completed contract by**
18%



Back row (left to right): Kelsey Jackson, Chris Brown, Katie Schwister, Megan Tipps, Mike Fulcher
 Front row (left to right): Minda Liu, Linda Shay, Nikki Hart, Michelle Harbin, Kayla Stiernagle

New Research team members in 2018

Allina Health welcomed the following employees to the Research team in 2018.

Katie Sjostrom, MS, LAT, ATC
 research associate
 Sports & Orthopaedic Specialists

Minda Liu, BA
 intern, Neuroscience Research

Kayla Stiernagle, BS, MPH
 research project coordinator
 Neurovascular Research

Megan Tipps, PhD
 research scientist, Neuroscience Research

Kelsey Jackson, RN, BSN
 research nurse, Neuroscience Research

Linda Shay, BA
 research billing compliance specialist
 Research Operations

Brooke Braman, BS
 research scientist, United Heart
 & Vascular Clinic Research

Chris Brown, BA
 research scientist
 United Heart & Vascular Clinic Research

Mike Fulcher, BA
 grants program coordinator
 Research Grants & Finance

Michelle Harbin, MS
 clinical student
 United Heart & Vascular Clinic Research

Katie Schwister, BS
 clinical research coordinator
 United Heart & Vascular Clinic Research

Nikki Hart, BA, BSN
 research nurse, Neuroscience Research

Hong Zhong, MS
 research analyst intermediate
 Clinical Research Informatics & Analytics

Vino Raj, MD, MBA
 director, Clinical Research Informatics
 & Analytics

Research gives back

In 2018, Allina Health Research staff volunteered for hundreds of hours at local community nonprofit organizations.



Allina Health and the Greater Plains Collaborative

In 2018, Allina Health became a member of the Greater Plains Collaborative (GPC)—a network of 12 leading medical centers and health systems committed to a shared vision of improving health care delivery through ongoing learning, adoption of evidence-based practices and active research dissemination.

“Our key strategic goal in our Clinical Research Informatics & Analytics team is to build a world-class clinical research informatics and technology infrastructure through the implementation of systems, tools, and the provision of data extracting and reporting services,” said Vino Raj, MD, MBA, director of Clinical Research Informatics & Analytics, Allina Health Research. “As part of the Greater Plains Collaborative, we are building on our Allina Health Research infrastructure to collaborate effectively and efficiently with other institutions.”



The GPC builds on strong research programs at its sites, existing community engagement and informatics infrastructures and data warehouses, extensive expertise with electronic health record systems and terminology standardization, and strong working relationships between investigators and health system information technology departments. The GPC network brings together a diverse population of more than 16 million patients across 1,300 miles covering eight states with a combined area of 679,159 square miles.

The importance of philanthropy to Allina Health Research

Together, we make it possible

Philanthropy enables Allina Health to conduct groundbreaking research, recruit and retain brilliant scientists and continue to make exciting advances in patient care.

Through the support of generous donors, the following Allina Health foundations fund critically important research.

Abbott Northwestern Hospital Foundation

In 2018, Abbott Northwestern Hospital Foundation funded new grants for research totaling \$1,144,458.

“There are many ways to support research at Abbott Northwestern Hospital. Generous donors make gifts personally, convene family and friends to raise funds, remember Abbott Northwestern Hospital in their wills through planned giving, and support research for a specific area. Donors can be advocates and ambassadors by sharing their Abbott Northwestern story with others. Another important way to support research is to enroll in a study if asked. As a leading-edge research center, a philanthropic gift to support research is one way to pay tribute to caregivers, honor a loved one and to inspire others in our community.”

Richard Meyer, president, Abbott Northwestern Hospital Foundation

Significant progress and accomplishments were attained in 2018 on 57 Abbott Northwestern Hospital Foundation-funded grant awards including 52 active initiatives. These initiatives include program areas and departments throughout Abbott Northwestern Hospital.

In 2018, Abbott Northwestern Hospital Foundation grantees gave 67 national conference presentations or submitted abstracts for presentations in 2019. They published six manuscripts in professional and scientific journals, and have another seven manuscripts in process, under review or in press.

To learn more about supporting research at Abbott Northwestern Hospital, contact Richard Meyer at 612-863-4126 or richard.meyer@allina.com.

Courage Kenny Foundation

In 2018, the Courage Kenny Foundation provided support for research operations in the amount of \$867,000 and funded a study on neuromuscular electrical stimulation and respiratory training for individuals with chronic spinal cord injury in the amount of \$59,500.

In addition, the Courage Kenny Foundation continued its funding for 11 research projects in progress. Examples include a longitudinal study of the effect of sports and recreation participation for young children with physical disabilities and a physical therapy-based exercise protocol for cancer patients in the Allina Health Courage Kenny Rehabilitation Institute's program.

To learn more about supporting research at Courage Kenny Rehabilitation Institute, contact Stephen Bariteau at 612-775-2589 or stephen.bariteau@allina.com.



United Hospital Foundation

In 2018, more than 125 research studies took place at United Hospital. Research grants supported by United Hospital Foundation in 2018 included:

- \$60,000 for United Heart & Vascular Clinic cardiac resynchronization therapy – Alan Bank, MD
- \$36,125 for lung ultrasound study –Jonathan Dickman, MD
- \$3,700 for flow cytometry data analysis that will enable the development of clinically useful assays for patients with hematologic malignancies –Stan McCormick, MD
- \$14,330 for clinical research support for Vascular & Skull Base Neurosurgery – Eric Nussbaum, MD
- \$30,000 for United Family Medicine geriatric assessment
- \$235,600 for Jesse E. Edwards registry of cardiovascular disease.

To learn more about supporting research at United Hospital, contact David Byrd at 651-241-8022 or david.byrd@allina.com.

Minneapolis Heart Institute Foundation®

An independent 501(c)(3), the Minneapolis Heart Institute Foundation (MHIF) aims to create a world without heart and vascular disease. Its efforts are focused on improving the cardiovascular health of individuals and communities through innovative research and education. This bold vision fuels efforts to investigate new protocols and treatments designed to save lives.

To learn more about supporting MHIF research, visit mplsheart.org or call 612-863-3833.









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