CENTER FOR CARDIOVASCULAR INNOVATION AT NORTHWESTERN MEDICINE
ATRIAL FIBRILLATION PROGRAM
At Northwestern Medicine, the Atrial Fibrillation Program within our Center for Cardiovascular Innovation is on a path to lead advances that will dramatically improve the diagnosis and treatment of the 6 million Americans living with atrial fibrillation.

What is Atrial Fibrillation?
Atrial fibrillation (AF) involves the rapid and chaotic beating of the top chambers of the heart, called the atria. As a result, the atria of the heart quiver, reducing blood flow within the atrium and from the heart itself. Patients with AF may experience palpitations, shortness of breath, or decreased exercise capacity, though many patients are entirely without symptoms or feel only a minority of their episodes. Regardless of the presence or absence of symptoms, this reduced blood flow may lead to blood clots in the atrium that can travel from the heart to other organs, including the brain. In fact, atrial fibrillation is responsible for about a quarter of all strokes and also increases the risk of heart failure, dementia, and death.

On average, adults have a one in four chance of developing atrial fibrillation, and the odds increase as one ages. Therefore, it is not surprising that AF is the most common heart rhythm disorder in adults. Additionally, by 2050, the population of people age 65 and over is expected to double (U.S. Census Bureau, 2014); this statistic gives the mission of the Atrial Fibrillation Program even greater urgency.

Our Research: Leading the Way
Despite medical advances in the 21st century, major gaps still exist in the prevention, diagnosis, and treatment of AF. In leading the Atrial Fibrillation Program, Dr. Rod Passman has assembled a multidisciplinary team to foster new ideas and collaborations across Northwestern Medicine. Our specialists in arrhythmias, clinical research, basic science, imaging, engineering, and epidemiology are developing approaches that will leverage existing technologies and new paradigms to improve the diagnosis of and therapy for atrial fibrillation.

At the Northwestern Atrial Fibrillation Program, we are addressing the following knowledge gaps and opportunities:

**Prevention**
Stroke and heart failure are frequently the first signs of AF. Identifying high-risk individuals before the arrhythmia develops may allow for closer surveillance and interventions aimed at limiting the development and consequences of the arrhythmia. We are evaluating advanced imaging and monitoring techniques to find those likely to develop AF in the future in order to evaluate preventive strategies in high-risk individuals.

**Diagnosis**
Historically, AF has been categorized based on the duration of the arrhythmia episodes, the presence of other stroke risk factors, and whether or not the patient experiences symptoms during the episodes. We believe that this simplistic approach overlooks changes within the heart itself that can be used to predict AF occurrence and related adverse outcomes with greater accuracy.

Our targeted approach to improving the diagnosis of AF and identifying those at risk includes the following projects:
- Cardiac magnetic resonance imaging (MRI) techniques that evaluate blood flow in the atrium and scar tissue in the atrial walls;
- Advanced echocardiographic techniques evaluating the strain on the atrial muscle;
- Sophisticated electrocardiographic techniques that provide precise measures of the atrial rate and organized electrical activity during AF, as well as predict the response to treatment; and
- Advanced mapping techniques to find the site(s) responsible for AF that may serve as targets for ablation.

“Atrial fibrillation (AF) is a serious public health epidemic that is growing in magnitude. Through our Atrial Fibrillation Program, we are spearheading advances that will dramatically improve the diagnosis and treatment of the 6 million Americans living with AF.”

Rod Passman, MD, Director of the Atrial Fibrillation Program
Treatment

**Rhythm control:** For patients with symptomatic AF, therapies aimed at controlling the rhythm of the heart are often adopted. Unfortunately, these medical therapies work only about half of the time and many patients ultimately require invasive ablation procedures with slightly higher, but still imperfect, success rates. We are working on novel strategies to control the rhythm of the heart that include:

- Gene therapy to target the promoters of AF;
- Signal processing of electrocardiograms to help target ablation sites; and
- Evaluation of new ablation technologies including cryoablation and rotor mapping.

**Stroke prevention:** The presence of AF is associated with a 500% increase in stroke risk. Blood thinners significantly reduce the risk of stroke, but they increase the risk of bleeding. Our physicians are leveraging advances in cardiac imaging, anticoagulant drugs, and miniaturized monitors placed under the skin to identify those patients who will benefit most from these drugs. These efforts include:

- The use of 4-dimensional MRI and echocardiographic strain patterns to better assess an individual’s risk of clot formation in the atrium and to determine which patients most benefit from blood thinners to reduce their risk of stroke;
- A randomized trial comparing continuous blood thinners with “targeted” blood thinners guided by tiny injectable subcutaneous monitors that can sense AF;
- The use of subcutaneous monitors to look for AF in patients who already have had a stroke; and
- Ligation or occlusion of the portions of the heart where blood clots form.

THROUGH NORTHWESTERN MEDICINE, WE ARE CREATING A NATIONAL EPICENTER FOR HEALTHCARE, EDUCATION, RESEARCH, COMMUNITY SERVICE, AND ADVOCACY.

NORTHWESTERN MEDICINE

Northwestern Memorial HealthCare and Northwestern University Feinberg School of Medicine comprise Northwestern Medicine. Together, we aspire to be the destination of choice for people seeking quality healthcare. Our commitment to transform healthcare and to be among the nation’s top academic medical centers can only be accomplished through innovation and excellence as displayed by the Atrial Fibrillation Program within the Center for Cardiovascular Innovation.

At Northwestern, we recognize that every positive contribution we make to the field of atrial fibrillation is made possible by donors who entrust us with their philanthropic support. We invite interested friends to join us in advancing the groundbreaking efforts of our Atrial Fibrillation Program through gifts of outright support and endowment that propel our research programs and activities.

- AF is responsible for 26 billion dollars a year in healthcare costs (AHA statistics 2015).
Atrial Fibrillation Program - Research Group

AF is a serious public health epidemic that is growing in magnitude. **However, if treated properly, AF need not be debilitating or life-threatening.** The following dedicated Atrial Fibrillation Program members are changing the future for those with atrial fibrillation by creating more effective diagnosis and treatment options.

Rod Passman, MD, MSCE, FAHA, FHRS, is a professor in the Departments of Medicine and Preventive Medicine at Feinberg. Dr. Passman serves as director of the Atrial Fibrillation Program. He is a clinical cardiac electrophysiologist with strong interests in the epidemiology of AF, ablation treatments of AF, and the use of advanced monitoring techniques for AF detection and targeted anticoagulation.

Rishi Arora, MD, is an associate professor of medicine and director of Experimental Cardiac Electrophysiology at Feinberg. Dr. Arora is a clinical cardiac electrophysiologist who has led the experimental efforts exploring gene-based therapies to prevent substrate formation in animal models of AF.

Richard Bernstein, MD, PhD, is a professor of neurology at Feinberg and director of the Stroke Program at Northwestern Memorial hospital.

David Green, MD, PhD, is a professor emeritus in the Department of Medicine at Feinberg. Dr. Green is a hematologist with active research interests in coagulation and has led many important studies evaluating coagulation in several diseases.

Philip Greenland, MD, is the Harry W. Dingman Professor of Cardiology and a professor in the Department of Preventive Medicine at Feinberg. Dr. Greenland is a cardiologist and an internationally recognized researcher in cardiovascular epidemiology.

Bradley Knight, MD, FAHA, FHRS, is the Chester C. and Deborah M. Cooley Distinguished Professor of Cardiology and director of Cardiac Electrophysiology at Northwestern Memorial Hospital.

Daniel Lee, MD, MSc, FACC, is an assistant professor of medicine and radiology at Feinberg. Dr. Lee is a cardiologist specializing in MRI and has led many multi-institutional studies. He serves as co-director of Cardiovascular Magnetic Resonance Imaging and director of the Northwestern University Cardiovascular Imaging Core Laboratory within the Feinberg Cardiovascular Research Institute.

Donald Lloyd-Jones, MD, ScM, is the Eileen M. Foell Professor of Heart Research and chair of the Department of Preventive Medicine at Feinberg. Dr. Lloyd-Jones is a cardiologist and an accomplished epidemiologist. He has been an innovator of the prediction of lifetime risk of cardiovascular disease.

Michael Markl, PhD, is the Lester B. and Frances T. Knight Professor of Cardiology and a professor in the Department of Radiology at Feinberg and within the Department of Biomedical Engineering at Northwestern University. Dr. Markl is a medical physicist and director of Cardiovascular MRI Research. He has led innovative advances in imaging blood flow in the heart and blood vessels.

Jason Ng, PhD, is an associate professor in the Department of Medicine at Feinberg. Dr. Ng is an electrical engineer and an innovator in signal processing techniques to assess electrical activity in the heart.

Sanjiv Shah, MD, is an associate professor in the Department of Medicine at Feinberg. Dr. Shah is a cardiologist specializing in echocardiography and has led many multi-institutional studies.

To learn more about our programs, please visit:
http://www.medicine.northwestern.edu/divisions/cardiology/research/cardiovascular-innovation.html

To support the Atrial Fibrillation Program, please speak with your physician or contact:

Kathleen Praznowski
Senior Associate Director
Development & Alumni Relations
Northwestern University Feinberg School of Medicine
Phone: 312-503-0762
Email: kathleen.praznowski@northwestern.edu