

MEDICAL

INSTITUTE FOR PUBLIC HEALTH AND MEDICINE AT NORTHWESTERN MEDICINE CENTER FOR ENGINEERING AND HEALTH



MEDICAL

- Health Care
- Doctor
- Hospital
- Pharmacist
- Nurse
- Dentist
- First Aid
- Surgeon
- Emergency

CENTER FOR ENGINEERING AND HEALTH ENGINEERING THE HEALTHCARE SYSTEM OF THE FUTURE

Imagine if we took advantage of all the amazing talent within Northwestern's healthcare and engineering campuses to tackle today's healthcare problems with tomorrow's technologies and thinking. Imagine the combined skills and knowledge of the brightest physicians, researchers, and engineers assembled across multiple environments being able to work on projects in a truly unified and synergistic way!

Providing smart, connected, cost effective, and safe healthcare, while meeting the next generational needs of transparency, personalization, equity, and reliability is a substantially unmet challenge facing the nation. This is further compounded due to an aging population and the complexity of care required. The National Institute of Medicine, the National Agency for Healthcare Research and Quality, the National Academy of Engineering, and the National Science Foundation have recently highlighted the need for using engineering approaches to meet this challenge in our healthcare system. It is estimated that hundreds of thousands of lives and hundreds of billions of dollars can be saved every year if we can thoughtfully develop this knowledge-based, connected health system of the future.

We also live in a time of great opportunity, in which electronic medical records, wireless and mobile devices, technologies with sensing capabilities, multimedia, integrated information systems, national databases, and systems engineering methodologies

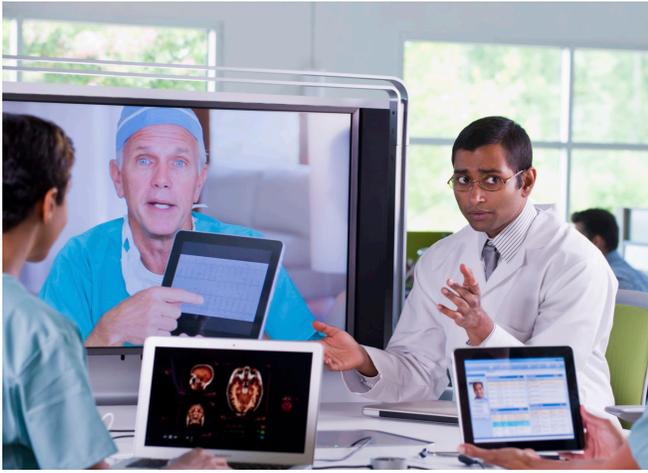
are all expanding daily. However, their meaningful utilization and integration into clinical care present unique challenges due to the size and breadth of data captured (text, clinical, spatiotemporal, genetic, and multi-media data); and the scale of multi-user human centered systems in contexts ranging from home, clinics, hospitals, and public spaces.

Our **Center for Engineering and Health**, within the Institute for Public Health and Medicine, has started to align and empower the talent at Northwestern Medicine to help transform our national health delivery system. The Center is a unique endeavor, building on the spirit of One Northwestern. It is engaged in creating a next generation healthcare research, education, and technology innovation ecosystem that builds on the relevant strengths and knowledge base from major engineering disciplines (e.g. Computer Science, Electrical Engineering, Industrial Engineering, Information Systems, Operations Research and Management Sciences, and Mechanical Engineering) in collaboration with the health scientists and clinicians across the Northwestern campus (including Primary Care Medicine, Emergency Medicine, Hospital Medicine, Preventive Medicine, Oncology, Surgery, Psychiatry, Medical Informatics, and others). Together, their goal is to address major deficiencies in current health delivery organizations, while developing a better system for the future.



"Let us imagine together a new world of healthcare. A person walks through an arch, much like what happens at the airport today. The entire body scan is performed with no radiation effect. The results are automatically processed and evaluated with the historical profile. A future health state prediction is generated, and, in case of impending danger, the person is contacted by the primary care physician who prescribes further evaluations and interventions with no time wasted. Also imagine an older person, whose vitals are monitored 24x7 wirelessly, and either before or within a few minutes the emergency care arrives to help prolong this person's life, and yet the system remains affordable. Wouldn't such a world be wonderful? A new generation of research and education is required to make such a transformative change, and take advantage of the presented opportunity."

Sanjay Mehrotra, PhD, Director of the Center for Engineering and Health and professor of industrial engineering and management sciences at the McCormick School of Engineering



By bringing together engineers, health researchers, physicians, and other healthcare providers, the collaborations facilitated through the Center for Engineering and Health allow multidisciplinary teams to develop practical state-of-the-art solutions that factor in the subtleties of real life health systems early in the research and development stage. It simultaneously exposes health science researchers and physicians to the latest in technological development and analytical tools that could help address challenges in their clinical domain. Collaborations among the Center team members are resulting in: designing and effectively integrating mobile and wireless devices and care delivery systems;



leveraging and developing multimedia science for healthcare; learning from the fusion of text, imaging, sensor, and genetic data; analyzing national health policies; and creating decision support and management tools to optimize care delivery and resources. Researchers within the Center for Engineering and Health are addressing a wide range of care delivery issues, including emergency care process improvement, radiation treatment, cardiac risk assessment, diabetes management, depression treatment, hospital workflow optimization, home care delivery, context-aware wearable devices, disaster management, and surgical training simulations.

High-Impact Engineering and Health Projects and Thrust Areas:

Our Center faculty members are already making significant contributions to the research base. Funding from the National Science Foundation and National Institutes of Health has aided in our efforts to date, and we know that philanthropic investments will provide opportunities to fuel new ideas and foster more results. Our research and education to date:

Smart, Mobile, and Connected Health:

- mHealth for Behavior Intervention
- Improving Medical Adherence through Devices
- Non-Invasive Clinical Monitoring
- Sensors and Epidermal Electronics

Engineering Optimized Care Delivery and Workflows:

- Efficient and Safe Flow in Emergency Department
- Smart and Safe Hospital Units
- Optimal Cancer Treatment
- Intelligent and Safe Homecare on Demand
- Mass Participation Event Management

Data-Driven Predictions, Decisions, and Policies:

- Predictive Modeling
- Risk Assessment
- Decision Analytics
- Health Policy Analytics
- Infectious Disease and Epidemic Control

Technology-Driven Health Education and Training:

- Resident Education Planning
- Surgical Resident Skill Training
- Public Health Skill Training
- Undergraduate and Graduate Training

Center for Engineering and Health Leadership

The Center for Engineering and Health is jointly led by Northwestern's McCormick School of Engineering and Applied Science and Northwestern Medicine. The Center is directed with distinction by Dr. Sanjay Mehrotra, professor in the Department of Industrial Engineering and Management Sciences at the McCormick School of Engineering. Dr. David Mohr, professor of preventive medicine at the Feinberg School of Medicine, serves as deputy director. Our goal is to develop a nationally

recognized source of innovation and talent in the field of mobile health technologies, engineering, and analytics for affordable, equitable, and state-of-the-art healthcare delivery. Our Center leaders, Drs. Mehrotra and Mohr, have led their respective professional societies as chairs and vice presidents while organizing major national conferences. They both have been awarded significant funding for their research.

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 are seeking to impact the health of humankind through Northwestern Medicine. We aspire to be the destination of choice for people seeking quality healthcare; for those who provide, support and advance care through leading-edge treatments and breakthrough discoveries; and for people who share our passion for educating future physicians and scientists. Our commitment to transform healthcare and to be among the nation's top academic medical centers will be accomplished through innovation and excellence.

Our new Institute for Public Health and Medicine is comprised of world-class centers that serve as a nexus for innovation, collaboration, and growth in research. The Center for Engineering and Health is an integral part of the Institute. Through both the Center and the Institute, we are working to innovate and introduce public health solutions to address the biggest health challenges of our time. At Northwestern, we recognize that without dramatic changes in our approach to public health and healthcare delivery, we will confront surging, unsustainable costs and an inability to meet the healthcare needs of our citizens. We see this urgent need as a tremendous opportunity to provide leadership and a new direction to improve the health of our nation and world.

