



Mayo Alumni

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Florida's New
Multidisciplinary
Simulation Center





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Features

About the Cover

A highlight of the new Multidisciplinary Simulation Center at Mayo Clinic in Florida is a virtual dissection table, which is used to prepare for procedures and training in anatomy. Chair of the Department of Neurosurgery, Robert Wharen Jr, M.D. (S '80, NS '85) (center), says physicians at any point in their careers can benefit from the 3-D visualization the table provides. A patient's images are loaded into the table, and Dr. Wharen, resident Jang Yoon, M.D. (NS '18) (left), and Rabih Tawk, M.D. (NS '10), a consultant in the Department of Neurosurgery, study the vascular malformation in preparation for surgery.

2 Sharpening skills with simulation

Mayo Clinic in Florida debuted a new Multidisciplinary Simulation (SIM) Center in January 2013. Among its features is a sophisticated 3-D virtual dissection table. Whether training is high-tech, low-tech or no tech, the SIM Center helps physicians and other health care professionals master knowledge, technologies and procedures.

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The Center for Individualized Medicine is committed to furthering the strong tradition of personalized medicine at Mayo Clinic. This includes understanding patients at a molecular level to determine disease susceptibility, prevent disease, make better diagnoses, develop more efficient drug therapies and customize treatment plans.

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Research from Mayo Clinic has changed how the medical community evaluates and manages outpatients with *C. difficile* infection. This research has led Mayo Clinic to develop protocols to improve patient outcomes and prevent the spread of the disease. With input from Mayo Clinic in Arizona, Mayo Clinic in Rochester also introduced a Fecal Microbial Transplant Program that is helping to change patients' lives.

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A Letter from the Secretary-Treasurer



Eric Edell, M.D.
*Secretary-Treasurer
Mayo Clinic Alumni
Association*

The cover story of this issue of *Mayo Alumni* centers on simulation training — high tech, low tech and no tech. I've seen the power of simulation education in pulmonary outreach in El Salvador. Using low-fidelity simulators, we've accelerated pulmonary training without providers having to learn on patients. Mayo Clinic excels at innovation in simulation training and changing the education model for health care providers of the future.

We also excel at the burgeoning area of individualized medicine. In the not so distant future, patients will no longer suffer complications due to their unique responses to drugs and diseases. This development in medicine is fascinating, and our Center for Individualized Medicine is doing great things under the leadership of Gianrico Farrugia, M.D.

We provide an update on the Mayo Clinic Care Network, which has grown substantially and added its first international member. Partnering with other institutions allows us to expand the Mayo Clinic Model of Care to patients who otherwise might not have access to specialty care in their local areas. Fellow alumni Mark Laney, M.D., and Scott Millikan, M.D., from Missouri and Montana, respectively, share their experiences as part of the network. This an exciting and necessary development for Mayo Clinic as the health care landscape changes.

A handwritten signature in white ink that reads "Eric Edell MD". The signature is fluid and cursive.

In the next issue

The next issue of *Mayo Alumni* will include these stories:

Destination Medical Center

In response to Mayo Clinic's planned investments and related private investment, the Minnesota legislature committed to significant funding to secure Mayo's position as a destination medical center. This project represents the largest economic development initiative in state history and one of the largest such projects in the United States.

Mayo Clinic's longstanding relationship with Mexico

This bond began almost a century ago when William J. Mayo, M.D., visited Mexico.

Mayo Alumni

German-Speaking Chapter

This 180-member group of alumni from Germany, Austria, Switzerland and the United States held its annual interdisciplinary scientific meeting in June.

Profile of Juan Sarmiento, M.D., incoming president of Mayo Clinic Alumni Association.

Patient education materials

at Mayo Clinic are undergoing a makeover based on evidence-based principles.



The new Anatomage virtual dissection table at Mayo Clinic in Florida allows surgeons to map out procedures and give residents valuable insights. Rabih Tawk, M.D., says the tool gives trainees “experience beyond what their mentors provide.” From left to right: Resident Jang Yoon, M.D., Robert Wharen Jr., M.D., and Dr. Tawk.

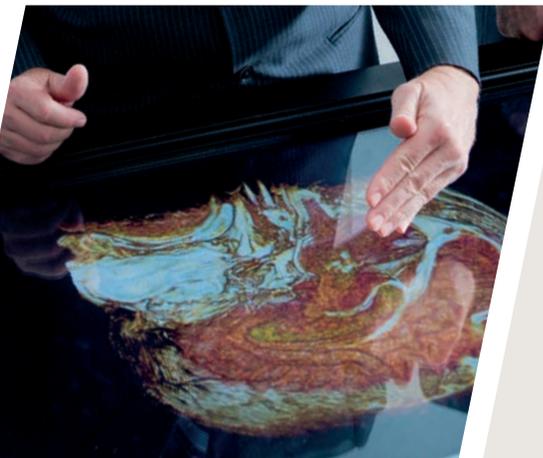


New Multidisciplinary Simulation Center // Mayo Clinic in Florida

SHARPENING SKILLS

with high-tech, handcrafted
and low-tech simulation

Advances in medicine require physicians to master new bodies of knowledge, technologies and procedures at what can seem like an overwhelming pace. When a new surgical technology becomes available, surgeons need to learn it and offer it to patients quickly and safely. Simulation centers, now de rigueur at tertiary care medical centers, help health care professionals learn the latest techniques with no risk to patients.



Assembled with colleagues in the new Multidisciplinary Simulation Center at Mayo Clinic in Florida, Robert Wharen Jr., M.D. (second from right), prepares for a patient's complex neurosurgery using a virtual dissection table. From left to right: Klaus Torp, M.D., Jang Yoon, M.D., Dr. Wharen and Rabih Tawk, M.D.

Like its counterparts at other academic medical centers, the new Multidisciplinary Simulation (SIM) Center at Mayo Clinic in Florida, which opened earlier this year, provides opportunities for providers to fine-tune their skills, improve performance and reduce errors in patient care. Unlike other SIM centers, the new one in Jacksonville has an impressive *pièce de résistance* — a 3-D virtual dissection table found only at a handful of sites in the United States.

The Anatomage virtual dissection table provides realistic 3-D visualization of gross anatomy — skeletal tissues, muscles, organs and soft tissues. With the swipe of a finger, views on the table can be changed, and users can peel off

tissue, remove organs and repeat dissection. The table can incorporate data from CT, MRI and ultrasound scanners, allowing users to simulate medical procedures. So far, it has been used for surgical planning, anatomy training and review, and case study review for resident training.

The task training room where the table is located is open 24 hours a day, seven days a week, for interested learners. To date in 2013, the new SIM Center has been used more than 2,100 hours by 600 users per month compared to 1,300 hours and 460 per month users in 2012.

Mayo Alumni looks at representative training in the busy SIM Center, including how the new virtual dissection table is enhancing education and patient care.

NEUROSURGERY // SOPHISTICATED TOOL

Formulating a game plan, sharing it with residents

Robert Wharen Jr., M.D. (S '80, NS '85), and Rabih Tawk, M.D. (NS '10), used the virtual dissection table to prepare for a patient's neurosurgery to treat a deep-seated vascular malformation in the brainstem. The team input the patient's imaging data into the table and simulated the surgical approach. In the operating room, the procedure was efficient and successful.

"The table let us view the patient's anatomy in 3-D and choose the right path and trajectory, including where to make the incision," says Dr. Wharen, chair of the Department of Neurosurgery at Mayo Clinic in Florida. "The patient benefited because we were able to optimize the surgery and minimize risks."

Dr. Tawk, a consultant in the Department of Neurosurgery, says the table's virtual slicing capabilities allowed the surgeons to show the first-year resident which structures and pathways to avoid.

"Surgery is an apprenticeship and, to a degree, you are dependent on your mentor's experience and what he or she tells you to do," says Dr. Tawk. "With tools such as this table, trainees can get experience beyond what their mentors provide. They can see things that are not in direct view and practice and learn at their own pace in a relaxed environment without any detriment to the patient."

Neurosurgery resident, Jang Yoon, M.D. (NS '18), says the table was important to see the critical structures to avoid during surgery as well as the tumor. He has returned to the SIM Center on his own time to use the table for anatomy study. "It's better than any textbook," he says.

Dr. Wharen emphasizes the advantage of training with the table. "Many experienced surgeons have 3-D maps in their heads from years of practice," he says. "The resident in this case got the 3-D view without having those years of experience. Being able to simulate procedures on a patient's anatomy in 3-D is a huge step forward and can benefit anyone at any point in their career."

ANESTHESIA // MINIMAL TOOLS

Preparing for a crisis — lights out in the OR

What would happen in the operating room if the power went out when an anesthetized patient on mechanical ventilation was lying on the table? The Department of Anesthesiology at Mayo Clinic in Florida uses the SIM Center's operating room to train residents for this and other potential crises.

"The new SIM Center was designed to have power to the operating room cut for crisis management training purposes in the event power is lost and backup generators fail," says Klaus Torp, M.D. (I-1 '96, ANES '99, CCM-A '01), associate

medical director for the SIM Center and a consultant in the Department of Anesthesiology.

Residents, unexpectedly faced with complete darkness, have to locate a light source, manually ventilate the patient and monitor vital signs. After power is restored, the group debriefs.

“Simulation training isn’t necessarily high-tech,” says Dr. Torp. “In this case, we’re planning for the absence of technology, including electricity. Simulation training really shines in replicating situations that do not happen often but are important to prepare for.”

James Johnson Jr., Ph.D. (foreground, left) demonstrates enhanced ECMO training to resident Irene Louh, M.D., Ph.D. (I ’12, CMR ’13), in the Multidisciplinary Simulation Center at Mayo Clinic in Florida. Dr. Johnson worked with Conrad Dove (back, left) and Gene Richie (back, right) to add a hemodynamic mannequin to training for improved fidelity.

TRANSPLANT // TOOL ENHANCEMENT

Adding a mannequin to improve the fidelity of training

The Lung Transplant Program trains perfusionists, nurses and respiratory therapists in using new equipment — the portable heart-lung machine Cardiohelp — in the SIM Center.

Mayo Clinic in Rochester already uses this portable heart-lung support system and an ECMO (extracorporeal membrane oxygenation) training module developed by perfusionist Jeffrey Riley and his co-workers. “We shared our experience and tools with our Florida colleagues and moved up their learning curve,” says Riley. “They tailored it to meet their needs and ran with it. When we share information with each other, we all learn and improve.”

The improvement Riley references is the addition of a hemodynamic mannequin to simulation training.





James Johnson Jr., Ph.D., a cardiovascular perfusionist in the Division of Cardiothoracic Surgery at Mayo Clinic in Florida, collaborated with SIM Center Operations Manager Gene Richie and Technical Specialist Conrad Dove to handcraft a circulatory system in the mannequin using tubing.

“The mannequin added the patient to training, which is invaluable,” says Dr. Johnson. “Along with providing instruction in how to use the portable heart-lung support system in normal situations, we created emergencies in which a cannula gets kinked, an alarm indicates high arterial pressure in the patient or air gets in the circuitry. With the mannequin, the learners get hands-on training in how to manipulate the patient’s physiology.”

Riley emphasizes the importance of realistic simulation training. “Whenever we take experienced adult learners who are excellent clinicians out of patient care for training, we want it to be sophisticated and lifelike,” he says. “The mannequin addition that Florida created increases the fidelity of ECMO simulation.”

GI//PROCESSES AFFECTED BY NEW TOOL

Softening the blow of software change

The Division of Gastroenterology and Hepatology used the SIM Center to prepare for the rollout of new medical documentation software. The department’s pre-procedure and GI endoscopic lab areas were replicated in the SIM Center. More than 20 technicians and nurses rotated through a training module to observe how the new software worked, practiced functioning in their roles with the new tool, and provided feedback to refine the implementation of the new technology and process work flow.

The simulation preparation was such a success that the vendor described the department as having the best-trained staff it had ever encountered during a new software implementation.

“New technology can create fear in the work environment. Familiarizing staff members with tools in the SIM Center, before they actually use them, helps to develop confidence and reduce anxiety associated with the change,” says Richie.

New Multidisciplinary Simulation (SIM) Center at Mayo Clinic in Florida

Opened in January 2013 to replace a temporary SIM Center that opened in April 2011

9,600 square feet on the eighth floor of the Stabile Building

Features include:

- Full-scale training rooms that are exact replicas of the areas they represent:
 - Hospital and outpatient exam rooms
 - Emergency room
 - Operating room
 - Intensive care unit
 - Intake desk
 - Nursing stations
- Debriefing room
- Learning center that seats 60 to watch simulations; accommodates community groups for educational programs
- Task training room with high-tech virtual reality trainers and equipment to practice robotic surgery, ultrasound, fluoroscopy and other imaging techniques, laparoscopic surgery, heart catheterization and colonoscopy
- Procedural skills lab for practicing animal and human tissue training using endoscopic instrumentation and a Zeiss microscope
- Mannequins: Three adult, a pediatric and two infant; can simulate breathing, bleeding and crying; drugs and IV fluid can be administered to them
- 41 cameras to record training sessions for review on monitors in debriefing room, learning center and training rooms

Mayo Clinic SIM Center in Rochester

Opened in 2005

Accredited in 2007 by the American College of Surgeons as one of 11 outstanding simulation centers in the United States

Mayo Clinic SIM Center in Arizona

Opened in 2010



CENTER FOR INDIVIDUALIZED MEDICINE

THE PROMISE AND PRACTICE OF PERSONALIZED MEDICINE

Mayo Clinic patients have had individualized care for 150 years. Advances in genomic and clinical science give new meaning to individualized medicine.

Today, with genomic sequencing and molecular analysis, Mayo Clinic researchers and physicians can use a patient's unique genetic code to more effectively diagnose, treat, predict and, in a growing number of instances, prevent disease.

Understanding each patient at a molecular level through a genomic blueprint, determining disease

susceptibility, intervening earlier to prevent disease, making better diagnoses, developing more efficient drug therapies, customizing treatment plans — these sum up the mission of the newly created Mayo Clinic Center for Individualized Medicine.

The new look of individualized medicine

Gianrico Farrugia, M.D. (I '91, GI '94), director of the Center for Individualized Medicine and a consultant in the Division of Gastroenterology and Hepatology

at Mayo Clinic in Rochester, says the center was established to continue the strong tradition of individualized medicine at Mayo Clinic. "Eventually, individualized medicine at the genomic and other 'omic' levels such as epigenomics and proteomics will be a routine part of medical care, and that information will reside in patients' medical records and travel with them," he says. "It will be part of the information we use in acute care and disease prevention to help patients live better and longer. This is the promise of individualized medicine."

“ It will be part of the information we use in acute care and disease prevention to help patients live better and longer.

This is the promise of individualized medicine.”

– Gianrico Farrugia, M.D.

The Center for Individualized Medicine is concentrating translational efforts on five areas:

1 PHARMACOGENOMICS — Studies how variations in genes affect response to medications, helping to predict drug efficacy, guide dosing and improve patient safety

Director: Richard Weinshilboum, M.D. (PHAR '72), Division of Nephrology and Hypertension, Mayo Clinic in Rochester

2 CLINOMICS — Moves discoveries from the lab to patient care with practical, cost-effective genomic tests

Co-Director: Eric Wieben, Ph.D. (BIOC '83), Department of Biochemistry and Molecular Biology, Mayo Clinic in Rochester

Co-Director: Konstantinos Lazaridis, M.D. (I '96, GI '00), Division of Gastroenterology and Hepatology, Mayo Clinic in Rochester

Co-Director: Matthew Ferber, Ph.D. (MBIO '03, CMG '05), Department of Laboratory Medicine and Pathology, Division of Laboratory Genetics, Mayo Clinic in Rochester

3 BIOMARKER DISCOVERY — Discovers molecular markers in blood and tissue and imaging markers for more precise disease diagnosis and treatment

Co-Director: John Cheville, M.D. (SGPA '95), Division of Anatomic Pathology, Department of Laboratory Medicine and Pathology, Mayo Clinic in Rochester

Co-Director: George Vasmatzis, Ph.D. (HSR '99), Department of Molecular Medicine, Mayo Clinic in Rochester

4 EPIGENOMICS — Explores the effect of environmental factors on gene expression

Director: Tamas Ordog, M.D. (PHYS '06), Department of Physiology and Biomedical Engineering, Mayo Clinic in Rochester

5 MICROBIOME — Explores the bacteria that co-inhabit our bodies to identify novel ways to improve wellness and detect, diagnose, understand and treat disease

Director: Heidi Nelson, M.D. (CRS '88, S '89), Division of Colon and Rectal Surgery, Mayo Clinic in Rochester



Director of the Center for Individualized Medicine:
Gianrico Farrugia, M.D.

Dr. Farrugia says the integration of genomics into practice is very real. “We are rapidly moving information we used to consider to be research into clinical care. While individualized medicine is rapidly evolving and often regarded as next-generation medicine, we can do and are doing things to affect the daily care of patients,” he says. “This includes incorporating a patient’s genetic information into routine patient care in terms of how drugs are metabolized and which ones will be effective for the individual. We also have clinical trials underway in which we know the precise makeup of the cancer and the patient so we can tailor therapy.”

The current clinical applications

The clinical application of the work of the Center for Individualized Medicine manifests in the Individualized Medicine Clinic. Currently, patient care provided in this clinic includes:

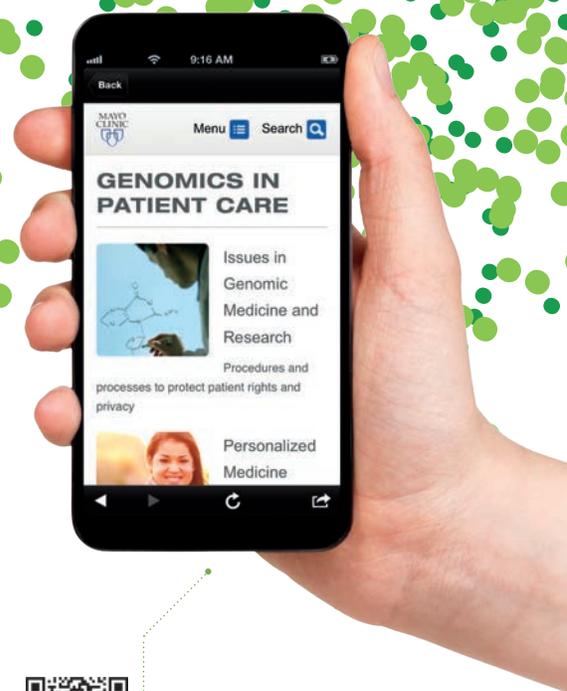
- **Advanced cancers** — Patients whose cancer continues to progress after standard treatments fail. Whole-exome sequencing of normal and tumor DNA checks for changes or alterations that new therapies might target.
- **Rare or undiagnosed diseases believed to have genetic causes (Diagnostic Odysseys)** — Patients who have rare or orphan diseases

or those with early- and childhood-onset syndromes with unknown causes. Whole-exome sequencing checks for genetic variations to help diagnose these diseases, and possibly identify variants that are vulnerable to drugs and new therapies.

The collective

The Mayo Clinic team involved in using genomics to improve health requires a union of forces, including physicians who see patients with a particular disease; genomic scientists who investigate its molecular basis; pathologists who study the tissue at a genomic level; epidemiologists who study its effect on populations; genetic counselors who work with patients to explain the implications of the information; bioinformaticians who process, analyze and interpret genomics sequencing data; bioethics representatives who address ethical, legal, social and policy implications of genomic medicine; and laboratory professionals and other technical experts. This team’s work is supported by a robust infrastructure to use, store and protect genomic information.

Dr. Farrugia encapsulates what differentiates Mayo Clinic in individualized medicine. “It’s required of Mayo Clinic, due to our mission of putting the needs of the patient first,



www.mayo.edu/cim-genomics/

to bring the latest and best ideas into a translational environment,” he says. “We fine-tuned the tailoring of patient care with the introduction of the unified medical record, we introduced advanced imaging techniques to the rest of the country and now we need to lead in introducing genomic medicine to everyday patient care. It is the right thing to do. Today and beyond, we’re committed to synthesizing the thinking of the best minds in individualized medicine to continue the steadfast tradition of Mayo Clinic.”

“Today and beyond, we’re committed to synthesizing the thinking of the best minds in individualized medicine to continue the steadfast tradition of Mayo Clinic.”

– Gianrico Farrugia, M.D.



DENIS KEEGAN, 29, CINCINNATI

Genetic mutation revelation helps with life planning

Disease: Glomerulopathy with fibronectin deposits; affects fewer than 1 in a million people; only 16 families reported in medical literature; no genetic tests confirm diagnosis; no pharmaceutical treatments.

Family connection: Father also has the disease and had a kidney transplant.

Diagnostic Odyssey: Whole-exome sequencing at Mayo Clinic in Florida for Keegan, father and unaffected

brother revealed mutation of FN1 gene which encodes for fibronectin, a protein essential in organ support structures and blood clotting.

Next steps: Keegan will need a kidney transplant, likely before age 40; he and his wife are working with genetic counselors and fertility specialists to decide whether to fertilize eggs and have them screened for FN1 mutation preimplantation.

Center for Individualized Medicine Leadership



Director: Gianrico Farrugia, M.D., Division of Gastroenterology and Hepatology, Mayo Clinic in Rochester



Director, Business Development: Jeremy Friese, M.D. (MMS '01, PRES '02, R-D '06), Department of Radiology, Mayo Clinic in Rochester

Associate Director in Minnesota, Co-Director, Clinomics Program: Konstantinos Lazaridis, M.D., Division of Gastroenterology and Hepatology



Administrator: Scott Beck, Mayo Clinic in Rochester

Assistant Director in Arizona: Yonas Geda, M.D. (P '99, P-CON '00, CLRS '06), Department of Psychiatry and Psychology



Associate Director in Florida: Alexander Parker, Ph.D. (HSR '00), Department of Urology

Associate Director in Arizona: Richard Caselli, M.D. (N '87), Department of Neurology



Assistant Director in Florida: Asher Alban Chanan Khan, M.D. (HEMO '11), Chair, Division of Hematology/Oncology

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**Sharing
Mayo Clinic's
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From Arizona to North Dakota and New Hampshire to Puerto Rico in the United States — and now Mexico — patients from 20 medical organizations have access to what many regard as the finest subspecialty medical care in the world without ever having to leave home. These more than 6 million patients may never need that kind of medical firepower but, if they have a complex medical need, their local providers have entrée to this expertise through membership in the Mayo Clinic Care Network.



What is the Mayo Clinic Care Network?

Established in 2011, the Mayo Clinic Care Network represents a collaboration between Mayo Clinic and like-minded health care organizations. The shared vision is that, by working together, physicians can improve the delivery of health care to patients and communities through high-quality, data-driven, evidence-based medical care. Membership in the network gives providers increased resources at the point of care and access to Mayo Clinic knowledge and expertise.

Tools to help network members include:

- **eConsults** — Input on specific patient care questions from Mayo specialists.
- **AskMayoExpert** — An online point-of-care tool designed and used by Mayo Clinic physicians for clear, concise disease management, care guidelines, treatment recommendations and reference materials for a variety of medical conditions.

- **Health care consulting** — Access to Mayo Clinic’s best practices and experience on matters such as quality, safety, patient satisfaction and professionalism.

Member experiences

Heartland Health in St. Joseph, Mo., joined the Mayo Clinic Care Network in May 2012. The integrated health delivery system, which primarily serves northwestern Missouri and the northern Kansas City metropolitan area, includes Heartland Regional Medical Center, Heartland Clinic and Mosaic Life Care.

“By consulting with Mayo Clinic, Heartland Health has been able to improve care and outcomes for our patients who otherwise would have had to travel for second opinions,” says Mark Laney, M.D. (PDN ’89), president and CEO of Heartland Health and president of the Mayo Clinic Alumni Association from 2009 to 2011. “When patients have complex surgical needs or diagnostic dilemmas, we have recommended they go in person to Mayo Clinic for care.”

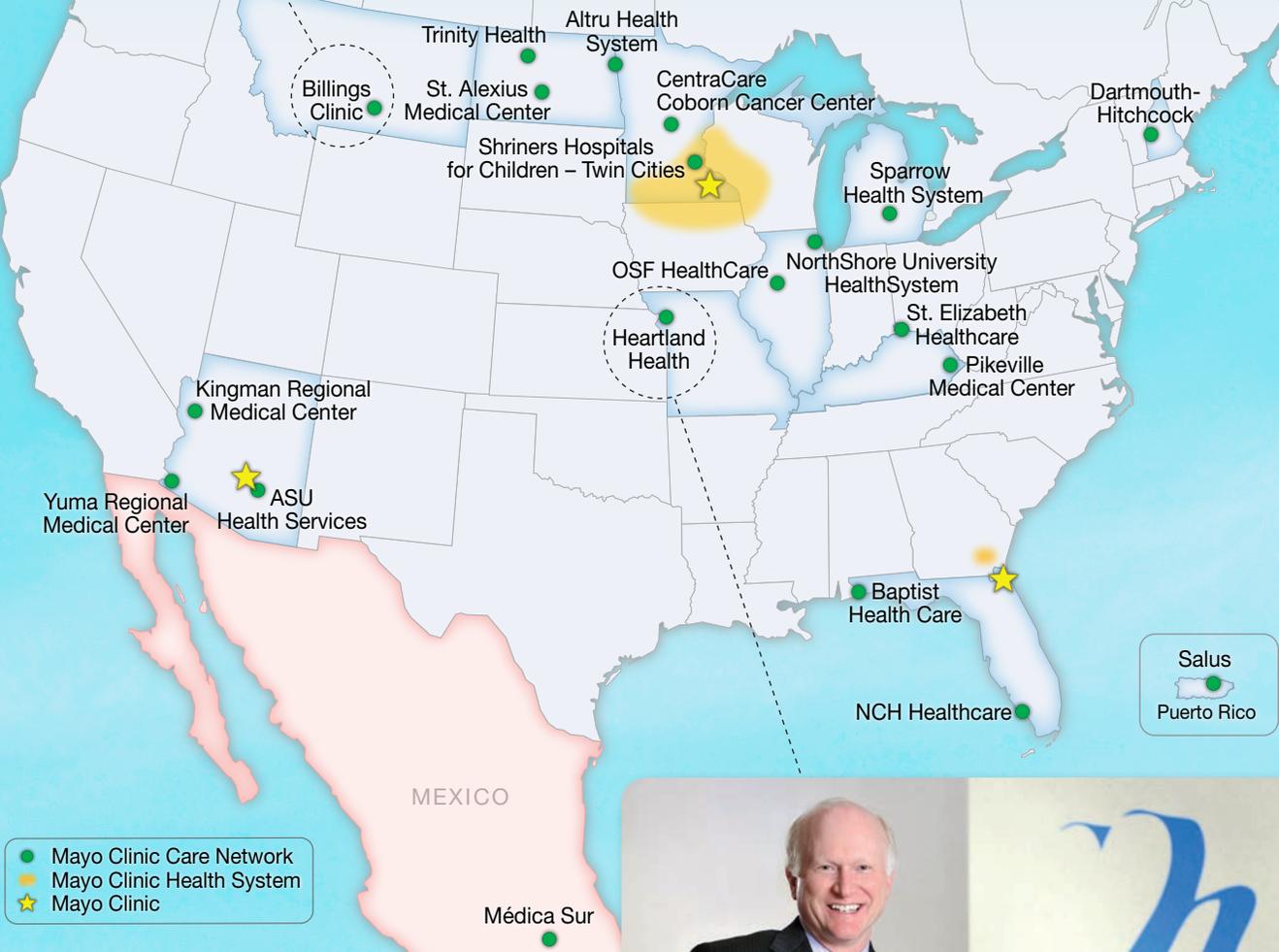
Dr. Laney cites the example of a patient with a tumor at the base of her skull. Her Heartland Health team shared images and medical information with Mayo Clinic through a secure network, and the patient traveled to Rochester for Gamma Knife surgery. Mayo Clinic kept the patient’s referring physicians informed about her care, and the patient is receiving her follow-up care at Heartland.

“It was made clear to us from the start that the purpose of the network is to optimize the care we provide locally,” says Dr. Laney. “Clinically integrating with a premier health system while maintaining our local independence is one of the most important strategic things we will do to survive and thrive in the future. As part of the Mayo Clinic Care Network, we can collaborate on tumor boards and clinical research, and provide our patients with seamless access to cutting-edge therapies and technologies and expertise.”



J. Scott Millikan, M.D.

Mayo Clinic Care Network



Mark Laney, M.D.

The relationship has proven to be more than we could have hoped for and, I think, the network is one of the most exciting things Mayo is doing.”

Dr. Laney is particularly excited about the opportunity to become involved in clinical trials and take advantage of Mayo Clinic’s advances in individualized and regenerative medicine. “The richness of being part of the Mayo Clinic Care Network goes far beyond eConsults and the ability to access Mayo care guidelines,” he says. “We’re thrilled to be part of it.”

Billings Clinic in Montana is new to the Mayo Clinic Care Network in 2013. The physician-led multispecialty clinic and hospital serve Montana, northern Wyoming and the western Dakotas.

J. Scott Millikan, M.D. (TS ’86), chair of the Department of Cardiovascular Surgery and the Billings Clinic Board of Directors, says he is enthusiastic about his colleagues at Billings Clinic developing relationships with their counterparts at Mayo Clinic. “I’ve enjoyed a 27-year relationship with Mayo, and now our physicians who didn’t train there can get to know their specialty peers and collaborate on behalf of our patients,” he says. “This partnership will improve continuity of care for area patients,

who will continue to receive primary care in the plains of Montana and specialty care at Billings Clinic — newly enhanced with easily accessible Mayo Clinic expertise — and referral to Mayo Clinic when necessary.”

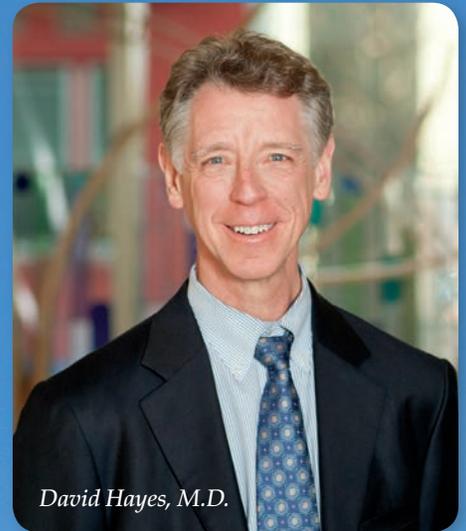
Dr. Millikan says Billings Clinic, which has 18 Mayo Clinic alumni among its 244 physicians, looks forward to the exchange of ideas and information among Mayo Clinic Care Network member organizations that share common issues and to opportunities for continuing medical education through video conferencing with Mayo Clinic.

“We’re honored to be part of the network with the world leader in health care delivery and with other like-minded organizations, and see this as a fertile relationship with great potential,” says Dr. Millikan.

The big picture

The number of physicians represented in the Mayo Clinic Care Network member organizations already equals the physician total at Mayo Clinic in Rochester. Plans are to add five to 10 organizations to the network, including international members, by year’s end.

John Noseworthy, M.D. (N ’90), president and CEO of Mayo Clinic, is thinking big: He aims to bring



David Hayes, M.D.

Mayo Clinic’s expertise to 200 million people around the world by 2020 in various ways. “The Mayo Clinic Care Network is an important part of the mix of how we will deliver knowledge to patients today and in the years ahead,” says Dr. Noseworthy.

David Hayes, M.D. (I ’79, CV ’82), medical director of the Mayo Clinic Care Network and a consultant in the Division of Cardiovascular Diseases at Mayo Clinic in Rochester, says the network helps Mayo Clinic remain relevant and top of mind with compatible organizations that have gone through a comprehensive due-diligence process. “We supplement the care physicians provide so their patients do not have to travel except when absolutely necessary, which improves patient satisfaction and helps to decrease out-migration for network organizations,” he says. “Ultimately, the network gives us flexibility as health care undergoes great change. Ensuring patients get the right care in the right place at the right time is our aim.”

“We supplement the care physicians provide so their patients do not have to travel except when absolutely necessary, which improves patient satisfaction and helps to decrease out-migration for network organizations.”

– David Hayes, M.D., Medical Director, Mayo Clinic Care Network

Clostridium difficile infection

Cutting-edge research adds to medical knowledge, changes practice

New research from Mayo Clinic has altered how the medical community evaluates and manages outpatients with diarrhea.



“Five to 10 years ago, *Clostridium difficile* (*C. difficile*) infection was not often suspected when evaluating diarrhea outside of hospitalized elderly patients,” says Darrell Pardi, M.D. (GI '96, GI '98, CTSA '09), a consultant in the Division of Gastroenterology and Hepatology at Mayo Clinic in Rochester. “Because of this community-based research, we are more aware that the infection occurs in outpatients and that it can become serious. We’ve developed protocols to improve patient outcomes and prevent the spread of the disease.”

Sahil Khanna, M.B.B.S. (I '11, CI '12, CTSA '12, GI '14), a clinician investigator and clinical fellow in the Division of Gastroenterology and Hepatology at Mayo Clinic in Rochester, led the landmark population-based study to assess incidence, risk factors and outcomes in both community- and hospital-acquired *C. difficile* infection. The majority of existing medical literature centered on hospital-based infection.

The study focused on the population of Olmsted County, Minn., from 1991 to 2005 and extracted data from the Rochester Epidemiology Project, a central diagnostic index with records from all patient encounters, laboratory evaluation, prescriptions, surgical procedures, autopsy examinations and death certificates from county residents since 1908.

“Our findings showed that the burden of this diarrheal disease in outpatients had been significantly underestimated.”

— Sahil Khanna, M.B.B.S.

Sahil Khanna, M.B.B.S. (right), says his mentor Darrell Pardi, M.D. (left), never says no to a reasonable idea. That approach led Dr. Khanna to initiate research that led to significant changes in how Mayo Clinic and the larger medical community evaluate and manage Clostridium difficile infection.



The findings indicated that community-acquired cases accounted for 41 percent of *C. difficile* infection cases.

“We knew *C. difficile* was occurring in the community, but we were surprised by how much,” says Dr. Khanna. “Our findings showed that the burden of this diarrheal disease in outpatients had been significantly underestimated.”

This and other cutting-edge studies from Mayo Clinic on *C. difficile* have contributed to knowledge and practice in ways that include:

- Alerting clinicians about different patient characteristics and outcomes for community-acquired infection, including being younger, being female, having fewer comorbidities, being less likely to have been exposed to antibiotics and being less likely to have severe infection.
- Documenting a significant increase in *C. difficile* infection among children after 2001, with more than three-fourths of pediatric cases

contracted in the community rather than in the hospital.

- Justifying more aggressive therapy and monitoring, particularly for severe cases.
- Predicting the need for hospitalization. “We found that a substantial proportion of patients with community-acquired *C. difficile* infection required hospitalization,” says Dr. Khanna.

Translating research to transform practice

Dr. Khanna describes his first *C. difficile* research project as serendipitous. “Dr. Pardi had the epidemiology project in mind, and I was lucky enough to get it. The more I learned, the more I became interested,” says Dr. Khanna. “The support I’ve had at Mayo Clinic for this area of interest, I doubt I’d find anywhere else.”

Research initiated by Dr. Khanna has led to changes at Mayo Clinic, including:

- Eliminating unnecessary testing. With research in hand to prove the accuracy of polymerase chain reaction (PCR) assays — sensitivity

“Mayo Clinic in Arizona was generous in sharing data and protocols, and we modified them for our program, which had its first patient in August 2012.” — Sahil Khanna, M.B.B.S.

of more than 90 percent — Mayo Clinic adopted a single PCR result, without need for repetitive stool screening, as the norm. This change has cost-saving implications for Mayo Clinic and, Dr. Khanna estimates, could lead to a substantial decrease in health care expenditures if adopted nationally.

- Directing providers to care recommendations. When a Mayo Clinic inpatient or outpatient has a positive laboratory test for *C. difficile* infection, the provider receives a high-priority email message with a link to a care process model, or treatment guideline, via the online resource AskMayoExpert.

The care process model advises treating severe *C. difficile* infection with oral vancomycin as the first line of treatment. Less severe infections should be treated with metronidazole. The model also guides the provider in implementing inpatient modified contact

precautions as soon as *C. difficile* is suspected and for the duration of the patient’s hospitalization when the diagnosis is confirmed.

“It is insufficient to treat patients with severe infection with oral metronidazole,” says Dr. Khanna. “Treatment of *C. difficile* infection according to recommended guidelines based on disease severity and patient characteristics could improve outcomes.”

This is the first attempt at an institutionwide standardization of treatment practices for *C. difficile* infection. Mayo Clinic is tracking usage of the care process model and assessing whether adherence to a standard practice guideline improves outcomes in severe *C. difficile* infection.

- Establishing a specialty clinic. This spring, Drs. Pardi and Khanna established a *C. difficile* Clinic within the Division of Gastroenterology and Hepatology, offering patients coordinated care and access to clinical trials.
- Establishing a Fecal Microbial Transplant Program. Mayo Clinic in Arizona has had a successful Fecal Microbial Transplant Program since 2011 — the brainchild of John DiBaise, M.D. (GI ’05), a consultant in the Division of Gastroenterology and Hepatology, and Robert Orenstein, D.O. (INFD ’02), chair of the Division of Infectious Diseases and a consultant in the Transplant Center. Dr. Khanna led the charge to develop a program in Rochester.

“Dr. Pardi never says no to a reasonable idea. When I proposed collecting the data to justify a fecal transplant program in Rochester, he gave me the go-ahead,” says Dr. Khanna. “Mayo Clinic in Arizona was generous in sharing data and protocols, and we modified them for our program, which had its first patient in August 2012.”

Mayo Clinic in Rochester has performed fecal transplant in 50 patients to treat severe, recurrent cases of *C. difficile* infection, with a success rate of more than 90 percent. In April, Mark Bartlett, M.D. (PD ’12), a consultant in the Division of



Robert Orenstein, D.O. (left), and John DiBaise, M.D. (right), of Mayo Clinic in Arizona, introduced a Fecal Microbial Transplant Program in 2011 and shared their data and protocols with Mayo Clinic in Rochester.

Gastroenterology and Hepatology at Mayo Clinic in Rochester, performed Mayo's first pediatric fecal transplant. Mayo Clinic in Arizona has performed 45 transplants and has a 90 percent cure rate. Mayo Clinic in Florida is now developing a program.

Studying the microbiome to advance knowledge and treatment

Additionally, Mayo Clinic established a Microbiome Program, housed within the Center for Individualized Medicine (page 10). Researchers involved in the program at Mayo Clinic in Rochester and Mayo Clinic in Arizona are studying the role of microbes in various diseases, including *C. difficile* infection, and comparing the composition of gut microbial communities in people with and without gastrointestinal and other disorders. The aim is to better understand how shifts in microbial populations cause disease and determine whether restoring homeostasis can improve health.

The data are starting to show that there are ways to remedy the harmful effects from changes in gut microbes. The Fecal Microbial Transplant Program is one way to correct disturbances, with life-altering patient outcomes.

"Perhaps in a decade, we will have developed tailored probiotics to restore a healthy gut microbiome in individuals with *C. difficile* infection and other gastrointestinal disorders," says Dr. Khanna. "I look forward to the day when we'll have simple, easily accessible treatments for patients who struggle with diseases that significantly hinder quality of life."

Housekeeping protocol reduces hospital-acquired *C. difficile*

Clostridium difficile (*C. difficile*) is the most common hospital-acquired infection and is associated with longer hospital stays, surgical complications, colectomies, death and added costs to the health care system.

Research conducted by Mayo Clinic in Rochester showed that a housekeeping protocol reduces the acquisition of *C. difficile* infection among hospitalized patients.

The process involves consistent daily cleaning of high-touch surfaces with a spore-killing bleach disinfectant wipe for all patients on units with high endemic rates of *C. difficile* infection.

During the study period from 2008 to 2010, Mayo Clinic in Rochester reduced hospital-acquired *C. difficile* infection rates in two high-incidence units by 85 percent. The cleaning protocol was then implemented enterprisewide.



**JERRY GRANT, 35,
MUNFORD, TENN.**

Fecal microbial transplant success

Jerry Grant, 35, had fecal microbial transplant at Mayo Clinic in Arizona in 2011. His wife, Kristina, was the fecal matter donor. He'd battled *Clostridium difficile* infection for more than two years.

"I had nonstop diarrhea and couldn't sit down due to pain. I thought I was going to die," he says. Grant had to give up his career as a chef in a fine dining restaurant.

Within two days of the transplant, Grant felt better. The father of two who lives in Munford, Tenn., has reclaimed his love of cooking and opened a mobile restaurant.

Mayo Clinic Alumni Association 68th Meeting

“The Global Reach of Mayo Clinic — Alumni Around the World” | Sept. 26–28, 2013 | Rochester, Minn.

Scientific Program Co-Chairs

Peter C. Amadio, M.D. (OR '83), Department of Orthopedic Surgery
Dawn Davis, M.D. (PD '03, DERM '06), Department of Dermatology

General Chair

John Noseworthy, M.D. (N '90), president and chief executive officer, Mayo Clinic

This biennial meeting inaugurates the Mayo Clinic Sesquicentennial, celebrating 150 years since William Worrall Mayo, M.D., started the practice that evolved into Mayo Clinic.

Welcome Reception

Step back to the days of Henry Plummer, M.D., during the welcome reception in the main floor lobby of the Plummer Building on the evening of Sept. 26. Throughout the evening guests have the opportunity to visit historic spaces in this iconic structure.

President's Gala

International connections are the focal point of the President's Gala on the evening of Sept. 27, recreating a typical transatlantic travel experience from the era of the Mayo brothers and featuring performances by talented Mayo Clinic alumni. During the evening, Humanitarian and Professional Achievement Award recipients Paul Spray, M.D. (OR '50), and William Oliver, M.D. (ANES '87), will be honored, and association leadership will transfer from Eric Grigsby, M.D. (S '86, ANES '88), to incoming President Juan Sarmiento, M.D. (SR '96, PRES '98, S '00, S-GI '02).

General Session Highlights

General sessions on Sept. 27 will highlight news and insights on medical advances at Mayo Clinic and how these advances are transforming care around the globe.

Keynote Presentation: The Mayo Effect

Marilyn Carlson Nelson, former chair and CEO, Carlson; chair, Mayo Clinic Board of Trustees

Unifying Practice and Research: How Mayo Clinic's Translational Centers Are Breaking Barriers in Medicine

- *Gianrico Farrugia, M.D. (I '91, GI '94), director, Center for Individualized Medicine, Division of Gastroenterology and Hepatology; and Aleksandar Sekulic, M.D., Ph.D. (IMM '99, DERM '00, I-1 '01, CI '03, DERM '06), Department of Dermatology*
- *Andre Terzic, M.D., Ph.D. (CV '92), director, Center for Regenerative Diseases, Division of Cardiovascular Diseases; and Rafael Sierra, M.D. (OR '05), Department of Orthopedic Surgery*
- *Veronique Roger, M.D. (CV '88, CV '92), director, Center for the Science of Health Care Delivery, Division of Cardiovascular Diseases*

Global Child Health

Philip Fischer, M.D. (PD '99), Department of Pediatric and Adolescent Medicine

Doctors Mayo Society Lifetime Achievement Lecture and 2013 Award Presentation

Robert Waller, M.D. (I '67, OPH '70), former Mayo Clinic CEO

Tweet This: How Mayo Clinic Became A Leader in Social Media and How Social Media Benefits Patients

Farris Timimi, M.D. (CV '97), medical director, Center for Social Media, Division of Cardiovascular Diseases

The Raymond D. Pruitt Lectureship

Terrence Cascino, M.D. (N '80), Department of Neurology

Specialty Sessions

The afternoon of Sept. 27 is dedicated to specialty sessions including Cardiovascular Diseases, Carman Society, Craniofacial Practice, Emergency Medicine, Infectious Diseases, Medical Genetics and Laboratory Genetics, Oral & Maxillofacial Surgery, Plummer Society, Priestley Society and a special session on the Destination Medical Center project.

Mayo Medical School All-Class Reunion — 40th Anniversary Celebration

Celebrate and reconnect with other graduates on the evening of Sept. 28 in Landau Atrium, Gonda Building.



INFORMATION / REGISTRATION | www.alumniconnections.com/olc/pub/mayo | 507-284-2317 | mayaolumni@mayo.edu

Mayo Update

Name change for Mayo Clinic's Rochester hospitals

Mayo Clinic's Saint Marys Hospital and Methodist Hospital in Rochester will transition to a single licensed hospital effective Jan. 1, 2014. The new operating name for the hospitals will be Mayo Clinic Hospital – Rochester.

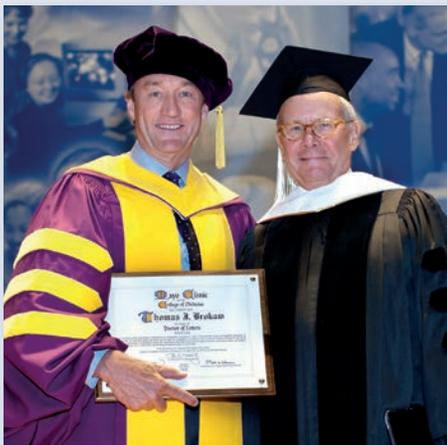
The change is being made to better reflect Mayo Clinic's integrated hospital practice, ensure accurate reporting of data and reinforce the ability to prove the value of Mayo Clinic care.

Mayo Clinic currently has a single integrated hospital practice divided between two hospital licenses and two legal entities. Regulations require separate reporting of quality, financial and operating data for the two hospitals. Mayo Clinic is recognized for outstanding patient care by many national assessment organizations, but separate reporting by each hospital has increasingly resulted in an incomplete and incorrect picture of Mayo Clinic's care. Reporting as one hospital will ensure that regulatory agencies, payers and patients have accurate information about Mayo Clinic.

"Patients seek information from government and nongovernment entities to obtain important quality and financial data," says John Noseworthy, M.D. (N '90), president and CEO of Mayo Clinic. "By continuing the integration we began in 1986, we can help patients get a more complete, accurate picture of the care we provide at Mayo Clinic."

The change, approved by the Academy of Our Lady of Lourdes (Sisters of Saint Francis), means that Saint Marys Hospital will no longer be designated as a Catholic health care institution in the Catholic Health Care Directory.

"From their respective beginnings, Saint Marys Hospital, the Sisters of Saint Francis, Methodist Hospital and Mayo Clinic have enjoyed a partnership founded on trust, mutual respect and commitment to meeting the needs of each patient," says Dr. Noseworthy. "Mayo Clinic cherishes and will remain steadfast to that commitment."



Tom Brokaw (right), pictured with President and CEO John Noseworthy, M.D., received the first-ever Mayo Clinic honorary degree.

Tom Brokaw receives first Mayo Clinic honorary degree

During the joint commencement ceremony for the graduating classes of Mayo Graduate School and Mayo Medical School on May 18, Tom Brokaw received the first-ever Mayo Clinic honorary degree — the Doctor of Letters (Hon.D.Litt) — in recognition of his career as a distinguished journalist and best-selling author, contributions to the preservation of history through the arts, and dedication to public service and exemplary service to Mayo Clinic.

Brokaw, a member of the Mayo Clinic Board of Trustees, also delivered the commencement address

that focused on renewing the doctor-patient relationship, knowing what you pay for and "Life, Liberty and the Pursuit of Healthy."

John Noseworthy, M.D. (N '90), president and CEO of Mayo Clinic, says: "We've established honorary degrees to recognize and honor those who display outstanding commitment to Mayo Clinic, the nation and world. Tom Brokaw exemplifies all that Mayo Clinic and this award stand for. We are honored to recognize him for his many contributions to our organization and humanity."

Awards

Donald C. Balfour Mayo Clinic Alumni Association Award for Meritorious Research 2013 Recipient

Sahil Khanna, M.B.B.S.
(I '11, CI '12, CTSA '12, GI '14)

Clinician Investigator and Clinical Fellow, Division of Gastroenterology and Hepatology, Assistant Professor of Medicine, Mayo Clinic Rochester

Major scientific contributions:

Advancing the knowledge about epidemiology, laboratory testing, treatment principles, prediction models for outcomes and quality improvement of *Clostridium difficile* infection and immunopathogenesis of inflammatory bowel diseases; leading the Fecal Microbial Transplant Program at Mayo Clinic in Rochester; and studying the stool microbiome in patients with *C. difficile* infection.

The annual Balfour Award, named in honor of Donald C. Balfour, M.D., recognizes research by a resident of Mayo School of Graduate Medical Education whose primary training is in a clinical field.

See page 18 for more information about Dr. Khanna's research.

Sahil Khanna, M.B.B.S. (left), and Clifford D.L. Folmes, Ph.D. (right), received the 2013 Balfour and Kendall awards for meritorious research, respectively.

Edward C. Kendall Mayo Clinic Alumni Association Award for Meritorious Research 2013 Recipient

Clifford D.L. Folmes, Ph.D.
(CV '12, CV '13)

Senior Research Fellow, Division of Cardiovascular Diseases, Department of Medicine, Mayo Clinic Rochester

Major scientific contributions:

Demonstrated how metabolism affects stem cell fate — specifically, through nuclear reprogramming, adult tissue is reset back to a pluripotent state, inducing a metabolic switch from somatic oxidative metabolism to glycolysis, and that this metabolic transition is required for the nuclear reprogramming process.

The annual Kendall Award, named in honor of Edward C. Kendall, Ph.D., recognizes outstanding research conducted by an individual whose primary appointment is in research.



Board of Trustees news

At its quarterly meeting in May, the Mayo Clinic Board of Trustees welcomed a new member:

- **Charlie Tomm, president and CEO**
The Brumos Companies

Obituaries

Rogelio Avila, M.D. (R-D '59), died June 11, 2012.

Marvin Calmenson, M.D. (S '46), died Jan. 12, 2013.

H. Royden Jones, M.D. (I '65, N '72), died June 4, 2013.

Albert Keates, M.D. (ANES '50), died April 5, 2013.

Frank Kroboth Jr., M.D. (S '55, S '56), died June 11, 2013.

Francis Manlove, M.D. (I '45), died March 24, 2013.

Harold Margulies, M.D. (I '49), died April 3, 2013.

Richard Marnach, M.D. (I '86, ANES '88), died May 3, 2013.

Melvin Meyer, M.D. (POPT '68), died Dec. 13, 2012.

Gordon Moore II, M.D., (I '64, P '67), died May 21, 2013.

Barry Oberstein, M.D. (I '66), died April 15, 2013.

Fergus Pope, M.D. (PD '69), died April 19, 2013.

Eastwood Turlington, D.D.S. (OMB '61), died April 20, 2013.

Donald Vivian, M.D. (S '54), died June 26, 2013.

Complete obituaries and the Update section, with alumni and staff news, are available on the Mayo Clinic Alumni Association website, alumniconnections.com/olc/pub/MAYO/.

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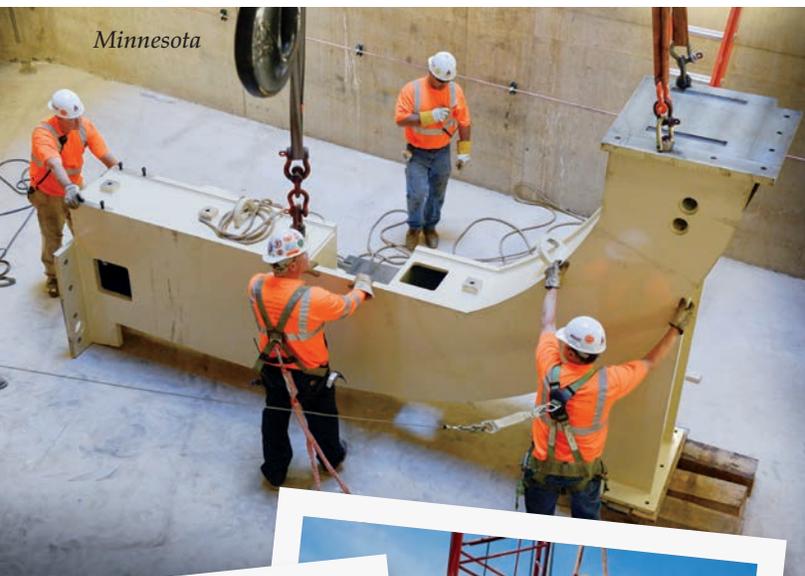
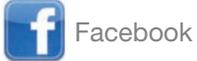
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Proton Beam programs progress

In June, the first of four 125-ton gantries for the Mayo Clinic Proton Beam Therapy Program in Rochester was installed. The 18 pieces of the gantry were assembled once in place in the Richard O. Jacobson Building at the corner of Second Street N.W. and First Avenue N.W. The concrete base for the gantries involved the largest continuous concrete pour in Rochester history — 5,400 yards delivered by 540 cement trucks. The Rochester Proton Beam Therapy Program is expected to begin treating patients by mid-2015, with the program at Mayo Clinic in Arizona to follow a year later. The last construction beam of the Mayo Clinic Cancer Center in Arizona, which sits atop the proton beam therapy facility, was put in place at the end of June.