



# The new face of surgery

UNIVERSITY OF MINNESOTA  
Medical School

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EMILY JENSEN (LEFT), RUTH SHANKLIN JACKSON (MIDDLE)



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## Success is not a solo effort



RICHARD ANDERSON

Today's medicine has made the solo practitioner an endangered species. At our University of Minnesota Medical School, in medical education, research, or clinical care, teams make things happen. Big science requires researchers to work together. And as our physicians practice in teams in hospitals and clinics large and small from urban to rural areas, we also educate our future physicians to be members of health-care teams. Moreover, as the state's only public medical school, we collaborate with many partners to foster a healthier Minnesota.

The concept that no one succeeds alone is illustrated by stories in this *Dean's Report*. For example, 20 percent of our graduating resident orthopedic surgeons are women. Yet in "New Face of Surgery" (page 10), residency program director Ann Van Heest refuses to take entire credit for that robust result: former department head Roby Thompson established the conditions that made this possible. In turn, Thompson says the department's faculty members were key to making this once-male enclave into a department welcoming to all residents, men and women.

"Collaborating Toward a Cure" also shows how connections led to breakthroughs in care for those suffering from a rare and debilitating skin disease (p. 16). And, with the advanced simulation offered by SimPORTAL (p.19), our educators work with learners in new ways to assess competencies.

### WELCOMING STATE INVESTMENT

These lessons about collaboration were reinforced this year by our University's success at gaining state bonding for four new facilities on a developing biomedical campus.

With the support of advocates at the Minnesota State Legislature, our friends in business and life sciences, our University



The Medical Biosciences Building is under construction in the new biomedical research park on the University of Minnesota campus.

With the support of advocates at the Minnesota State Legislature, our friends in business and life sciences, our University President Robert Bruininks and U colleagues, and our stalwart community leaders who see the promise of this Medical School, we have gained a \$220 million state investment in the future of biomedical research.

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From now until 2013, the University will add nearly 400,000 square feet of new translational research space. Knowing that space is planned, we will be better prepared to retain and recruit faculty and staff.

This state investment provides essential support to our areas of research strength in adult and children's health:

- » neuroscience, cognition, brain imaging, and neurodegenerative disease;
- » infectious disease and immunology, HIV/AIDS, and emerging diseases;
- » diabetes and the metabolic syndrome;
- » cardiovascular and pulmonary research and care; and,
- » cancer research, basic, translational, and clinical.

These new buildings will be the core of a new biomedical research campus, providing sophisticated space for faculty members today and in the future. Research infrastructure also is provided by our outstanding Center for Magnetic Resonance Research, the Stem Cell Institute, and other advanced technology resources. We are excited about the promise of this partnership.

### **BUILDING OUR TEAM**

Our Medical School team includes new members, as well as veterans with new assignments.

We are proud of the four department heads hired in the last year.

**Denis Clohisy**, an outstanding clinician, researcher, and teacher who has been our faculty since 1991, agreed to become head of our Department of Orthopaedic Surgery.

The talented **Bevan Yueh** came from the University of Washington to lead our Department of Otolaryngology.

**Joseph Metzger** returned to his native Minnesota from Michigan to move the renamed Department of Integrative Biology and Physiology to a new level.

And **Aaron Friedman**, most recently from Brown University and previously involved in building a children's hospital in Madison, became head of the Department of Pediatrics just before the groundbreaking for a new University of Minnesota Children's Hospital, Fairview.

Other new leaders include vice dean for education **Lindsey Henson**, who arrived on our campus in April after two previous experiences in creating new curriculum. She joins me, Kathleen Watson, and Linda Perkowski, as we continue to pursue our MED 2010 path to transform medical education. Our primary goal is to

move medical education to a competency-based system that advances future physicians as they demonstrate competencies.

**Roberta Sonnino** joined our leadership team in April, as the new associate dean for faculty affairs. She most recently was at Creighton University. And, finally, another outstanding member of our faculty, **Kathleen Brooks**, agreed to take a newly created position as associate dean for primary care. She will lead our renowned Rural Physician Associate Program, founded in 1971, and also work with the University Academic Health Center on effective primary care delivery models that include all members of the health-professional team.

Together, we at the University of Minnesota Medical School are striving for excellence in all that we do.

### **Deborah E. Powell, M.D.**

*Dean of the Medical School*

*Vice President for Clinical Affairs*

*McKnight Presidential Leadership Chair*

*University of Minnesota*

## The heart beat heard 'round the world

In January 2008, scientist Doris Taylor and her team at the University of Minnesota Center for Cardiovascular Repair reported that, after reducing a rodent heart to its cellular framework, they successfully repopulated the heart with new cells. It started beating. “We just took nature’s own building blocks to build a new organ,” said Harald C. Ott, co-investigator of the study and a former research associate in the Center for Cardiovascular Repair, who now is a resident at Massachusetts General Hospital. “When we saw the first contractions we were speechless.” The news quickly spread around the world that the first steps had been taken toward growing a new organ for those in need of transplant. For a video of the Taylor team’s work, go to Taylor’s page on the Stem Cell Institute Web site ([www.stemcell.umn.edu](http://www.stemcell.umn.edu)).



EMILY JENSEN



### Home for innovation in medical devices

Since the invention of the portable heart pacemaker 51 years ago in a University-industry collaboration, Minnesota has been a leader in medical device innovation. In June 2007, the Medical Devices Center was established at the University of Minnesota, and the core facilities were completed in 2008. The Medical Devices Center, jointly sponsored by the University's Institute of Technology and Medical School as part of the Institute for Engineering in Medicine, was specifically built for designing, prototyping, and testing new medical devices.

### CMRR: outstanding imaging equipment

The Center for Magnetic Resonance Research (CMRR) received one of 20 High-End Instrumentation grants from the National Institutes of Health announced in July 2008. The \$2 million grant will fund an ultra-high-field (16.4-Tesla) animal magnetic resonance imaging and spectroscopy system, which is the first of its kind in the United States with such a high magnetic field. "This powerful imaging machine will provide increased spatial resolution for visualizing Alzheimer's plaques in mice, increased spatial specificity to map brain function, and increased biochemical content for understanding the coupling between brain function and energy metabolism," says Michael Garwood, associate director of CMRR. "This instrument will significantly enhance the research of investigators both at the University and Mayo Clinic." Imaging already has been important for investigators in joint University-Mayo research

projects, more than 20 of which have been funded by the Minnesota Partnership for Biotechnology and Medical Genomics.

### Minnesota's Future Doctors buoyed by gift

An anonymous \$1 million gift to Minnesota's Future Doctors, a joint program of University of Minnesota and Mayo medical schools, will help the fledgling program maintain its momentum. Founded in 2007, Minnesota's Future Doctors seeks to equip high-potential minority, rural, and economically under-resourced students, such as Colombian-born Francisco Maldonado (pictured), with the skills necessary to become successful undergraduate students, in turn making them strong applicants for medical school. When the program is at full capacity in 2009, it will serve 150 students.



"These fantastic young people are the whole package, the type of student we want and need in our medical schools if we are to prepare the next generation of physicians who can relate to the increasingly diverse population in our state," says Director Jo Peterson. The college students spend three summers learning about clinical care and biomedical research, as well as how to apply to medical schools.

### State invests in biomedical research

In spring 2008, the Minnesota State Legislature agreed to provide \$220 million in funding for new biomedical research facilities for the University of Minnesota. An additional \$73 million will be provided by the University. Over the next five years, this investment will add nearly 400,000 square feet of laboratories for 120 new lead investigators and promote interdisciplinary research. The Center for Magnetic Resonance Research will be renovated to accommodate a new 16 Tesla magnet, the largest in the United States. Next in line for the project will be a new cancer research building (slated for completion in early 2012) and a Lillehei building dedicated to studying heart disease. The final building will house researchers in both infectious disease and neuroscience.



### Alm named 2008 Minority Scholar by AMA Foundation

Liz Medina Alm, third-year medical student and mother of two, was one of 11 medical students nationwide chosen to receive the 2008 Minority Scholar Award from the American Medical Association Foundation. Alm is a leader in the local chapter of the Student National Medical Association, an Admissions Ambassador, and mentor to pre-med students. Her goals include improving health care for people of color and people of low socioeconomic status. Prior to entering the Medical School, the South Bronx native worked for the Boston Area Health Education Center. She is our third recipient of this prestigious award: Gareth Forde, M.D., Ph.D. (graduated 2008), and Charles "Chuck" Branch (slated to graduate in 2011) were the two previous University of Minnesota recipients.



## Breaking ground on the U of M Children's Hospital, Fairview

A new University of Minnesota Children's Hospital, Fairview broke ground in June 2008 on the Riverside campus. The new hospital will centralize children's services, consolidating treatments to one location. "University of Minnesota Children's Hospital, Fairview will be the centerpiece not only for the Fairview system but also for the entire region for breakthrough pediatric care," says Fairview President and CEO Mark Eustis. The University of Minnesota Medical School and Fairview Health Services are partners in providing care and promoting education. The 185,000 square-foot hospital will open in 2011.

### Curbing the urge to gamble

A drug commonly used to treat alcohol addiction showed similar effects on curbing gambling addiction. Forty percent of the 49 participants who took the drug and completed the study quit gambling for at least one month. Their urge to gamble also significantly dropped in intensity and frequency. "This is the first time people have a proven medication that can help them get their behavior under control," says psychiatrist Jon Grant, principal investigator of the study. It is estimated that 1 to 3 percent of the population has a gambling problem. While the drug is not a cure, it offers hope to those suffering from the addiction.

### An unexpected link to adult-onset obesity

Pharmacologist Kevin Wickman led a team of researchers who happened upon a link between the gene *Girk4* and adult-onset obesity. Originally setting out to better understand how the brain controls heart function, the researchers found that mice missing the single gene were predisposed to adult-onset obesity. "This is a novel finding that may provide important new insight to the underlying cellular mechanisms that influence obesity," says Catherine Kotz, co-author of the study. She is a scientist at the Minneapolis VA Medical Center. Though it is acknowledged that more research is needed to understand where and how this gene works, researchers are excited about the answers it may hold in why the likelihood of people developing obesity more than doubles between the ages of 20 and 60.



### New research institute opens in Duluth

A new research institute has opened on the University of Minnesota Medical School—Duluth campus. The Duluth Medical Research Institute will help foster collaboration among researchers from multiple biomedical and clinical disciplines at the University, as well as develop groundbreaking programs that can translate from the lab to the clinic. Mustafa al'Absi (pictured), who researches the link between stress and addiction, is the first director of the institute. "We look forward to positive effects on collaboration between the two campuses of the school," says Vice Dean for Research Charles Moldow.





### Masonic Cancer Center gift is largest

In April 2008, the University of Minnesota received its largest gift ever—\$65 million from Minnesota Masonic Charities—to the University of Minnesota Cancer Center. In recognition, it will now be called the Masonic Cancer Center, University of Minnesota. “The Masonic Fraternity is proud to expand its partnership with the Masonic Cancer Center for a cure,” said Raymond G. Christensen, grand master of the state’s nearly 17,000 Masons. Christensen also is a member of the faculty of the Medical School. The \$65 million over 15 years will allow the Masonic Cancer Center to expand its work in translating research to clinical applications for cancer prevention, diagnosis, treatment, as well as expanding studies in cancer survivorship to better understand and address care for people living with cancer. “Our continued partnership with Minnesota Masonic Charities and this extremely generous gift will allow us to take the Masonic Cancer Center to the next level,” said Director Douglas Yee. In photo above, Yee and Deputy Director Phil McGlave unveil the new name as U President Robert Bruininiks looks on from the podium.

### Why treatment isn’t always effective for HIV

Scarring that occurs in the lymph nodes of HIV-infected patients is one reason why antiretroviral therapy can be ineffective. “We discovered that this fibrosis occurs more rapidly and to a greater extent in the portion of the gut—the largest lymphatic tissue in the body—containing the T-cells, compared with other immune tissues,” says principal investigator Timothy Schacker, infectious disease physician. “The fibrosis stops cells from returning to immune tissues, espe-

cially in the gut.” According to Schacker, T-cells cannot repopulate the lymph nodes even when HIV therapy begins. Schacker says these results indicate it’s crucial to start therapy earlier than current guidelines suggest. Beginning in the earliest stages of infection, when the patient only shows preliminary symptoms of HIV, can preserve some elements of the immune system, such as protecting T-cells that fight infection.



### Childhood cancer survivors more likely to develop heart disease

Survivors of childhood and young adult cancers are five to ten times more likely than their healthy brothers and sisters to develop serious heart problems. The problems can develop at an early age and emphasize the need for continuous medical monitoring, says pediatrician Daniel Mulrooney. A Masonic Cancer Center member, Mulrooney led the research team on this study that compared 14,358 survivors enrolled in the Childhood Cancer Survivor Study (CCSS) with 3,899 of their siblings who did not have cancer.

“Our study showed that survivors were on average 27 years of age when they started developing heart problems usually seen in older adults,” Mulrooney says. “We found survivors had a 10 times greater risk for arteriosclerosis or hardening of the coronary arteries; 5.7 times higher risk of congestive heart failure; 4.9 times higher risk for myocardial infarction or heart attack; 6.3 times higher risk for pericardial disease; and, 4.8 times greater risk for valvular disease.” Mulrooney and other University of Minnesota researchers collaborated with colleagues from the Fred Hutchinson Cancer Research Center, Seattle; the University of Texas M.D. Anderson Cancer Center, Houston; Roswell Park Cancer Center, Buffalo; Memorial Sloan-Kettering Cancer Center, New York; St. Jude Children’s Hospital, Memphis; and Emory University, Atlanta.

### Top 10 in family medicine, again

In 2008, the University of Minnesota Medical School again received the Top Ten Award from the American Academy of Family Physicians. This award is given to the 10 U.S. medical schools with the largest percentage of their annual graduates matching in family medicine. An important contributor to the award is the two-year program on the Medical School’s Duluth campus, which has a mission of educating physicians for rural and American Indian communities. Those nearly 60 students who begin on the Duluth campus primarily select family medicine residency programs.

# The new face of surgery

Women who want to be surgeons find welcome and role models at the Medical School.

BY ALLISON CAMPBELL JENSEN

Questions arise when women choose surgery.

**Out in the world, they actually have heard these questions from patients, colleagues, and advisors:**

“So when is the doctor coming in?”

“Who did you sleep with to get that paper published?”

“You know, don’t you, that not a lot of women go into cardiovascular surgery?”

**Among their peers and inside themselves, they may ask:**

Can one balance the demanding work life of a surgeon with a family life?

Will one be valued as a colleague, with the same status and salary?

Would surgery change women or women change surgery?

But ask woman surgeons at Minnesota the question “Why surgery?” and they answer, with slight variations, the same way. They are passionate about their profession. They love learning new skills. They find surgery absorbing, exciting, and fulfilling. As surgeons or surgical subspecialists, they cannot imagine themselves doing anything else.

Cardiovascular surgeon Rosemary Kelly talks about her very personal and privileged relationship with patients. “It’s an intimate, brief interlude with someone’s life that can change everything.” Holly Boyer was an unsuspecting University of Minnesota medical student when she entered an otolaryngology rotation. She says she immediately knew: “This is exactly what I want to do.” She enjoyed the hands-on nature of the care. She also felt she fit in with a congenial group of colleagues who love their work.

Kelly, Boyer, and their women colleagues in surgery at Minnesota would like to see their numbers grow. Once rare, women surgeons have been increasing in numbers nationwide for a decade and now make up about 30 percent of general surgery residents. Yet that figure still appears low when compared to the fact that for some years women have made up at least half of medical school classes. Still, the University of Minnesota Medical School

has been an accepting and, at times, particularly nurturing environment for women choosing careers in surgery.

When she came to Minnesota as a surgery intern in 1987, Ann Van Heest found the faculty “very supportive.” At one time interested in sports medicine, as she continued in her training at Minnesota, she decided to become a hand surgeon. She was one of the first women residency program directors in orthopedic surgery in the country. She adds: “Nationwide, there are only 11 full professors in orthopedic surgery and two are here—myself and Dr. Elizabeth Arendt. That is a tribute to the University of Minnesota.”

She says, with a note of pride, that while the national statistics show about 11 percent of orthopedic surgery residents are women, for the last decade 20 percent of University of Minnesota orthopedic surgery graduates are women. She didn’t do it on her own, however. “Roby Thompson was chair and I would credit him with being a very fair and excellent role model,” says Van Heest. “He was very interested in helping women succeed—and he didn’t lower the standards.”

Looking back at his years as head (1979-1995), Thompson, now vice dean for clinical affairs, says excitement was generated among students as the specialty was changing with biomechan-



Neurosurgeon Aviva Abosch is one of the authors of a white paper requested by the American Association of Neurological Surgeons that advocates greater recruitment of women into neurosurgery.

ics and other advances, along with a new focus on restoring function and improving quality of life. In addition, he and his faculty fostered a welcome and open environment for all students. He found that if faculty and leadership treat women medical students with respect, they will be attracted to the program. “Once you get it started, it acts as a sort of magnet,” he adds.

Vannhu Nguyen, who in summer 2008 entered the first year of her urologic surgery internship at Minnesota, says it was her first choice. Part of the attraction is the diversity, livability, and outdoors-loving nature of the Twin Cities of Minneapolis and St. Paul. Another is Minnesota’s great surgical heritage. “At my interview, I felt a lot of warmth,” she adds. “The attending surgeons really care about the residents and want to teach residents to be great physicians.”

There is support from leadership as well, as demonstrated by the Medical School’s June 2008 continuing medical education conference, Women in Surgery, organized by Kelly. More than 60 surgeons, fellows, residents, and medical students from the University of Minnesota, Mayo Clinic, and community hospitals gathered to hear from surgeons and experts on career planning, leadership strategies, finding balance, effective mentoring, and appropriate compensation. The keynote address by Pauline Chen (author of *Final Exam*), who trained as a transplant surgeon, covered issues of identity, goals, and choices for women surgeons. And Medical School Dean Deborah Powell described how she experienced discrimination based on her gender while applying for residency. Today, the situation is improving, she says. Moreover, women are tough and resilient. “If we’re told no, we find other and better ways to do things.”

### **ONCE RARE, NOW INCREASING**

In 1998, anthropologist Joan Cassell noted: “Surgery is a sequestered practice, and most of us encounter surgeons at work only when we are naked, horizontal, and unconscious. Women surgeons, who are even scarcer than their male colleagues, are a fascinating group: focused, talented, intelligent, tenacious.” One example is Sara Shumway, now vice chief in the Medical School’s Division of Cardiothoracic Surgery.

Cardiothoracic surgeons Sara Shumway (left) and Rose Kelly before a plaque commemorating C. Walton Lillehei.

After graduating in 1979 from Vanderbilt School of Medicine, Shumway went on to train in general surgery at Vanderbilt and in cardiothoracic surgery at Johns Hopkins; in-between, she had one year in the laboratory. “The surgery training was much less humane [than it is now],” she says. During general surgery, residents were on call every other night and “they treated everyone equally poorly.” Spending time in the lab allowed her one year of a more normal life, she says.

In 1988, Shumway came to Minnesota and initially was the only woman faculty member in the Department of Surgery. In the ensuing years, while advancing in her own academic career, she has mentored or advised a great many women and men, from medical students through fellows. She enjoys doing it. “I feel very fortunate,” says Shumway. “I always had a built-in mentor in my father,” the late Norman Shumway, a renowned heart surgeon at Stanford University who trained at the University of Minnesota.

In 2007, Shumway and some of her colleagues in surgery founded the Olga Jonasson Society, named for the first woman to head a surgery department at a co-educational medical school, in 1987. They are establishing a national network of mentors for women considering careers in surgery.

These are interesting times for mentoring men and women in surgery, says David Rothenberger, a colon and rectal surgeon who also is deputy chief of the surgery department at Minnesota. “As a mentor, I have to understand what they want to accomplish. If surgery is their chosen path, I have to tell them the expectations.” They may not be able to do it all—or not all at once. He adds: “Men are changing, too. They’re up front about saying they have a family commitment.”

Mentoring and role models can come from men or women. After the death of a role model, otolaryngology department head George Adams, Boyer considered moving from academic medicine into private practice. The new department head, Bevan Yueh, however, now is mentoring her in carrying out clinical research and she’s glad for the assistance. “When I came out of residency, I thought I could do it on my own.” She once again is excited about her career; “I’m stepping up to my full potential.” She also enjoys conferring with Kelly, as one of her panel of mentors.



At times, more senior women can be especially helpful. Neurosurgeon Aviva Abosch cites several good role models: “My parents, my undergraduate professors, and, during my surgery training, a woman who trained here [at Minnesota], Nancy Ascher. ... She was gender-blind, which I think is admirable. She expected excellence.”

Still, when a hospital patient assumed Ascher was a nurse and asked her to take care of a mundane task, she did, and then proceeded to talk with him about how she had transplanted his new liver the day before. She showed, Abosch says, that “you can get bent out of shape over these sorts of things—or not and move on with it.” Generally, Abosch has not been bothered by gender issues but “the first time I ran into it [discrimination] was after my training. It took my breath away.”

Abosch has a son, 3, and a daughter, 2; she says that whenever she is not at work, she is with her family. Still, she says, “I have a lot of help.” Along with a part-time nanny, her husband has put his career on hold to be involved with the children day to day.

Boyer notes that “some of my male colleagues don’t have to

worry about hiring a really good nanny.” With two children, 7 and 8, Boyer says her nanny is her “right-hand person.” While she values her family highly, she also appreciates their support in turn. Just like when the children have important homework assignments, when she has to focus on something to reach her goals, they are understanding, too.

Still, as University of Minnesota-trained orthopedist Lael Luedtke said at the Women in Surgery conference, each woman surgeon has to consider “How are you going to allocate the resource of *you*?”

Writing about deterrents to women entering surgery in a 2006 *Archives of Surgery* article, physician Debra A. Gargiulo and her co-authors concluded that women are not more likely than men to be “deterred by lifestyle, workload issues, or lack of role models. However, the perceived surgical personality and surgical culture is a sex-specific deterrence to a career in surgery for women.”

Is there a surgical personality? No, says Cynthia Herrington, a cardiovascular surgeon who served on faculty at Minnesota for

nine years before recently leaving for Los Angeles. “I don’t think all surgeons have the same personality type,” she says. “The way we practice is very similar.” Herrington points out that active, physical participation is required of surgeons; “it’s very different from a clinic.”

Yet urologic surgery resident Nguyen says there is something different. “It’s a special type of woman who chooses to go into surgery,” she says.

“These aren’t women who sat in the back and were part of the pack of medical students. They did things, they did great research.”

Weighing in on the culture of surgery in *Women and Medicine*, a 2006 Macy conference proceedings, is Julie Freischlag, one of the few women heads of surgery in the country, at Johns Hopkins. She says: “Surgery’s not really a touchy-feely group. You have to prove yourself.”

## QUESTIONS REMAIN

The first woman physician to be certified as a surgeon was Barbara Stimson, in 1940. Women were only gradually accepted into the demanding field and the pioneers faced discrimination both subtle and blatant.

In 1973, Roberta E. Sonnino started medical school. After earning her M.D., she was an intern and resident for a few years at Minnesota. She became a pediatric surgeon at a time when women surgeons were quite rare. While Sonnino says she did not suffer the years of horrific harassment that neurosurgeon Frances Conley describes in *Walking Out on the Boys*, she did take her share of knocks during the period when women were only gradually being accepted as surgeons. But she didn’t always recognize them right away. “It took me years to figure out why I always had call on holidays,” she says now, shaking her head.

Then, while on faculty at another school, a serious incident arose, which is described in *This Side of Doctoring*. Sonnino was opposed for promotion and tenure “on ludicrous grounds, used as a cover for professional jealousy and gender discrimination.” In the end, she triumphed, but the psychic cost was great.

Now recently returned to the University of Minnesota as associate dean for faculty affairs, Sonnino wants to spare women in academic medicine that sort of ordeal. In this time of transition, in which some unintentional and some intentional discrimination still exists, she advocates women becoming organized to help each other and to promote their careers. Among other

things, she will use her new position to devote time and effort to building a formal Women in Medicine group at the Medical School. “We do need to have a venue for women to come together and share experiences,” Sonnino says, “and learn leadership skills on an ongoing basis.”

Life-long learning for women surgeons certainly extends beyond the operating room. Boyer was surprised to learn from a 2004 study by otolaryngologist Jennifer Grandis that she and her women colleagues, even after factoring in experience, hours worked, and type of practice, earned 15 to 20 percent less than men. “I was oblivious to it,” she says, but now will pay attention to the issue.

For her part, Kelly says she has been given opportunities because she is a woman in a changing era during which academic medicine increasingly values women. “I think it’s great,” she says, with a laugh. Herbert Ward, chief of the division of cardiovascular surgery, is convinced Kelly is a leader. He urged her to organize the Women in Surgery conference, and expects her to continue to advance. He adds, half-joking: “As long as we don’t work her to death—that’s a risk.”

Kelly would like to avoid that risk, too. Along with Shumway and other colleagues, she advocates among women surgeons something that is accepted by their ob-gyn and internal medicine colleagues: job sharing. Job sharing could reduce the burden of being on call, ease maternity leaves, and promote needed sabbaticals for women in surgery seeking time for research or other pursuits.

Job sharing and the 80-hour work week for residents might make the field of surgery more attractive. Yet more changes are needed, particularly in subspecialties. Only about 10 percent of neurosurgery residents are women—a figure that has been flat for a number of years—and less than 6 percent of practicing neurosurgeons are women.

With Deborah Benzil as the lead author, Abosch was one of a dozen authors of a recent white paper on workforce recruitment issues requested by the American Association of Neurological Surgeons. The white paper advocates greater recruitment of women into the field of neurosurgery. “The Future of Neurosurgery” cites medical career consultant Janet Bickel and her co-authors on the non-existence of a “‘glass ceiling’—that is, a deliberate and active barrier.” Instead they describe a “closely related phenomenon of the ‘glass house,’ in which women who do progress in male-predominant arenas represent such a rarity

that they are subject to great scrutiny and substantial isolation.”

Among the measures they advocate to improve recruitment and retention of women neurosurgeons in academic medicine are: fostering faculty diversity; providing professional development for faculty; critically assessing institutional practices; enhancing efforts to attract and recruit women; and, financially supporting programs to reassess and address these issues. And, because medical students have very little formal exposure to the field, neurosurgeons need to find ways to persuade them of its attractiveness. In addition, the authors note, based on outdated information, well-meaning advisors may steer women medical students away from neurosurgery. Still, they add: “There must also be a ‘zero-tolerance’ culture within neurosurgical departments toward harassment, unfairness, and inequity of any kind.”

If the field could attract more women neurosurgeons, says Abosch, neurosurgery and patients who need neurosurgery would benefit. “Men and women approach patients differently,” she says. “Differently doesn’t mean bad: diversity in approach is a strength.”

And men could benefit, too, from changes in surgery. Olga Jonasson, who passed away in 2006, wrote a 2002 piece published online called “Leaders in American Surgery: Where are the women?” She noted that the stereotype of a surgeon was of a man devoted to work with very little time for other interests, including family, professional, and community life. “The model of the exhausted but fulfilled surgeon may not be as satisfying as it once was portrayed. This is not to say that women surgeons are less dedicated, hard-working, or responsible than their male colleagues, but that they are different in how they strike a balance,” Jonasson wrote. “Lifestyle issues may now be as important to men as to women in surgery, and the climate in which all surgeons must practice will benefit from the perspective of balance that women uniquely bring.”

Shumway, who has been at the University of Minnesota for 20 years, says she is noticing more and more women medical students, residents, and attendings in surgery. “That’s just great.” Increasing the number of women in surgery, she says, will make surgery as a discipline and a career more humane.

Beyond gender considerations and above all, says Van Heest, performance should be the decisive factor for residents and physicians. “Even in the last five years, we’ve made advances,” she says. “My goal is to have gender be a non-issue.”

# Renowned **Nun Study** Returns

Sisters working with scientists offer insight into neurodegenerative brain disorders.

BY NICHOLAS HANSON

There's a popular saying among the sisters who have participated in the world renowned, and quite simply dubbed, Nun Study.

*“We are educators in life, but we are educators in death, too.”*

As strange as it may sound, these nuns are indeed posthumously contributing to the cause of science.

About 700 nuns from the United States provinces of the School Sisters of Notre Dame have contributed their bodies to science—more specifically, their brains—for the two-decade study that has netted key insights and answers to the puzzles of Alzheimer's, Parkinson's, and other neurodegenerative brain disorders that commonly impact the elderly.

David Snowdon, the longtime Nun Study investigator, originally began the extensive research with the Mankato Province while at the University of Minnesota, but moved it with him to University of Kentucky when he landed a job there in 1986. Now, after all these years, Snowdon is making a move into part-time work, and the study will be returning to its home base in Minnesota.

That's not to say there wasn't stiff competition to land the gold-mine body of work. Top-notch medical research institutions Johns Hopkins and University of Kentucky were fiercely competing for the mammoth project as well.

While investigators from those institutions will collaborate with the Nun Study, the proposal from the University of Minnesota was too good to turn down regarding the future of the study, said Sister Catherine Bertrand, leader of the Mankato Province.

“The fact that it originated here is significant,” she says. “But really it was the whole approach that the University of Minnesota is taking with this that had more to do with the decision. The fact that it really is going to be an interdisciplinary approach is very appealing. It's like a campuswide project.”

True to her words, researchers from numerous departments of the University of Minnesota Medical School and elsewhere in the University will be involved in the Nun Study. It involves Myron Gross of laboratory medicine and pathology, who has been involved with the study for more than a decade; Ann Masten of the Institute of Child Development; Karen Santa Cruz of laboratory medicine and pathology; psychiatrist Kelvin Lim; Michael Garwood of the Center for Magnetic Resonance Research; and Tim Church of the Masonic Cancer Center's prevention and etiology program.

“It is truly amazing. We spent a day up at the University of Minnesota visiting some of the people and centers that will be used,” Bertrand says. “The facility itself and the research dollars that are available to keep this study moving forward are amazing.”



RUTH SHANKLIN JACKSON

Nun Study participant Sister Mary Damian Ewald enjoys the company of a slumbering pygmy goat.

“Having the high caliber of professionals of those we met was most impressive,” she says. “I am not always accustomed to seeing that kind of collaboration and the honest desire to work together with the common good in mind.”

## HISTORY

In the beginning, Snowdon was overwhelmed with a wealth of information from the nearly 700 nuns. Much of it stemmed



Companion Nurse Sister Pauline Eischens looks on as Nun Study participant Sister Celeste Glovka, right, and Sister Honora Elsen brush up their vocabulary with a word game.

from journals they diligently recorded throughout the years. To distill the information and make it useful, he had to meticulously study personal and medical histories, test nuns for cognitive function, and, with colleagues, dissect brains after they died.

But the arduous process fielded unprecedented results.

And the homogeneous lifestyle of the nuns proved to be perfect for the study, says Leo Furcht, head of the Department of Laboratory Medicine and Pathology.

Furcht, working with Harry Orr, who leads the new Institute of Translational Neuroscience, will lead and coordinate the group when the study returns to the University of Minnesota.

“It’s been excellent as far as looking at the development of neurodegenerative diseases in a stable population,” Furcht says. “Most of these sisters live similar lifestyles for the duration of their lives.”

Many of Snowdon’s original findings from the Nun Study link lifestyle factors to brain disorders. His findings also show that that a history of stroke and head trauma can boost a person’s chance of developing Alzheimer’s, while a college education and an active intellectual life can protect a person from the effects of the disease.

He even found that subtle, seemingly undetectable signs of degenerative brain disorders can develop early in life. After ana-

lyzing journals from sisters soon after they joined the convent, he discovered that those with more detailed entries and positive emotions lived longer, more functional lives.

“It’s a very important study,” Furcht says. “Many exciting discoveries have been made.”

## ABOUT THE SISTERS

The School Sisters of Notre Dame Mankato province is perched on top of Good Counsel Hill—a picturesque serene woodland marked with vegetable gardens, walking paths, and budding flowers. It’s just high enough above the Minnesota River basin to allow a near birds-eye-view of downtown Mankato, Minn. It’s the original home base of the Nun Study.

Most of the sisters who live at Good Counsel return only after a life of mission work—teaching, empowering poor women and children, and serving their religion across the world. While one may jump to the conclusion that nuns simply come here to die, nothing could be farther from the truth.

It’s a bustling place of activity.

Even by the time the sisters retire (many of them well into their 80s) and return to a convent like Good Counsel, they remain in extraordinarily good shape. They volunteer in the community, direct a learning center for young children and English-language-learning students, they go for brisk walks, participate in arts and crafts, share garden plots with hundreds of gardeners, and attend mass daily.

It reinforces Snowdon’s finding that lifestyle does play a role in maintaining healthy cognitive functioning.

And the nuns are happy to be a part of the study, Bertrand says.

“Our mission is transformative education—we try to do all we can to help anyone come to the fullness of their potential,” she said. “It’s usually those who are poor—especially women and youth—but in terms of health issues if we can in some way play a part of that, we’re fulfilling our mission, too.”

In the Mankato Province of the School Sisters of Notre Dame Mankato, only seven sisters are left from the original study. They range in age from 92 to 101.

“This study is very important to us, and our sisters who participate are proud of the fact that they’re able to make a contribution in this way,” Bertrand says. “They may not live to see a cure for Alzheimer’s or Parkinson’s, but if in some small way they can help

someone else down the road, that’s what they want to be about.”

Perhaps the study may be becoming another important dimension to the School Sisters of Notre Dame’s life mission.

## WHAT THE FUTURE HOLDS

Now that the Nun Study is set to return to the University of Minnesota Medical School, there’s plenty of new research in store.

One of the first objectives will be transporting all of the research data from Kentucky to Minnesota. The cumbersome, yet necessary task must be completed before research can resume. More than 500 brains have been donated to date from Nun Study.

Furcht says he’d like to begin digitizing all of the images of the brains and microscopic slides and make them accessible via the Web to anyone who is interested.

“Our goal is to have the material accessible to everybody,” Furcht says. “It should be a great educational tool.”

Perhaps the most important angle the University has in store is the beginning of a Nun Study II with a brand new cohort of sisters. New technologies such as powerful magnetic resonance imaging machines and more extensive knowledge of the brain should lead to even more medical discoveries.

Furcht also aims to get pediatricians involved to better understand the notion that early childhood influences can be involved with neurodegenerative disorders later in life and help to better understand the healthy aging brain.

The goal is to have the Nun Study research in full swing by winter 2008-09.

And Bertrand is enthusiastic about the future of the study, and believes that it is in good hands.

“When the study began 22 years ago, it was with the understanding that this would be about a relationship—and not just about being research subjects. This was true of the partnership of the School Sisters of Notre Dame and the University of Kentucky, and we anticipate that this will be the case with the University of Minnesota as well.”

“This has incredible potential for the future and for us as educators,” she says. “We are committed to this.”

Perhaps Sister Celeste Glovka, one of the seven remaining nuns from the original nun study, phrases the School Sisters of Notre Dame sentiments about the research best.

“I think if my brain can be of service after I die,” she says, “that is beautiful.”

# Collaborating Toward a Cure

A determined mother sparked connections that led to a new treatment for a rare disease.

BY RICHARD BRODERICK

“It was a sort of traumatic event,” is how pediatrician John Wagner describes that first meeting with Theresa Liao and her son Jacob, who suffers from a rare, always terminal genetic disorder called recessive dystrophic epidermolysis bullosa, or RDEB.

“This mother comes to me and says, ‘Save my child,’ in front of all these people,” recalls Wagner, who also is director of the Division of Hematology, Oncology, and Blood and Marrow Transplantation and director of clinical research of the Stem Cell Institute. “Both she and the child were crying—it was enough to shock me for a moment.

“But then it stayed with me, and I wondered: Would it be possible to use stem cell and BMT transplantation to create a useful therapy for this?”

Traumatic is an apt term to apply to RDEB, which affects about one out of every 500,000 babies. Children suffering from the disorder lack the ability to produce collagen VII, a structural

protein that anchors the skin and the lining of the gastrointestinal canal to the body. Lacking this anchor, the skin and stomach lining tear and blister easily, leading to bleeding and unhealed lesions. Over time, the fingers of most RDEB patients fuse. In the end, those patients who do not die from malnutrition or infection succumb to squamous cell carcinoma.

“The question is not if, but when, a child with RDEB is going to die,” observes Maria Hordinsky, head of the Department of Dermatology at the University of Minnesota Medical School. “What’s more, the quality of life issues facing these kids and their families are very challenging because ongoing blister development, infections, and scarring, particularly of their hands and feet.... The traditional way of managing this disease has been to find the right types of dressings to protect the skin, protecting patients from trauma, and providing optimal nutrition.”

The encounter four years ago at the New York Blood Center was the culmination of a long search by Theresa Liao and her husband to find something, anything, that might cure RDEB.

She and husband Roger have four children. Their oldest child, Noah, was born in 1999, with no trace of the disorder. The couple had no idea that they carried the genes for RDEB until their second son, Jacob, was born four years later, and it became im-

mediately apparent that there was something amiss.

Theresa Liao consulted with experts at EB centers around the country but was told there was nothing to do for Jake but to keep him as comfortable as possible until his inevitable demise. Unwilling to accept this verdict and encouraged by news about advances in stem cell research, the couple decided to bank the umbilical cord of their third child, Julian, who was born two years after Jake. Pre-screening had shown that he was free of the disease himself, while genetic testing indicated that his bone marrow was a close, but not perfect match, for Jake’s.

It turned out to be wise decision. Their fourth son, Nate, was born three years after Jake, and although pre-testing showed that Nate was affected by RDEB, genetic testing also revealed that his bone marrow was a 100 percent match for Julian’s.

“We were looking at systemic options [for treatment] and I asked the folks at the [New York] Blood Center for the names of the top-three BMT centers in the country,” Theresa says. “The University of Minnesota was number one.”

That’s when the Liaos, who live about an hour from New York City, heard that Wagner was coming to town. “I knew he had about a half-hour window of time,” she says. “I came with Jake, and he listened.”





Roger and Theresa Liao with sons, from left, Noah, Julian, Nate, and Jake, summer 2007.

Wagner’s New York appearance was one of two fortuitous events that led him and a team of researchers at the Medical School to begin an urgent hunt for an RDEB cure. Shortly after meeting with Theresa Liao, he delivered a talk in Colorado.

“Afterwards at dinner I was telling people about my experience meeting the Liaos and talking about the difficult decision I was facing over whether to proceed with a stem cell transplant when there was no proof that it would work,” he says. One of his listeners, the head of stem cell research at Yale, advised against pursuing the idea. Fortunately, there was someone else listening.

“Sitting right next to me was the world’s leading expert on EB,” Wagner says. She was Angela Christiano, the head of the Columbia research team that identified the EB gene. Unlike the expert from Yale, she supported the idea of trying stem cell therapy.

Just as important, she told Wagner about a strain of mice that had been bred to develop EB.

“Once I realized there was an animal model of EB and that the person I was talking to had discovered the gene that causes the disease, we literally started working out a research program on a napkin,” Wagner says, the excitement generated by that serendipitous moment still apparent in his voice.

Wagner returned to the University with the outlines of an experiment involving in utero transplantation of stem cells into the genetically altered mice. He opted for an in utero approach because the average life span of the EB mice is a mere two weeks. “So whatever was going to happen had to happen very quickly,” he explains.

But back in Minnesota, he and his colleagues faced another

hurdle—lack of funding. Most money available to study RDEB is directed to the handful of centers that specialize in the disease. “We had lots of federal funding for research [at the University] but none for EB or, for that matter, any skin disorder,” he explains.

When she learned of the funding dilemma, Theresa Liao went into action once more. While Wagner worked with Jakub Tolar, pediatrics professor and researcher with the BMT unit, to fashion an experimental trial using the EB-affected mice, she went out and raised money on her own.

“She would send us checks to help move the research forward,” Wagner says. “While the checks helped, it was not nearly enough to keep the project going.” In time, the work received funding from the Children’s Cancer Research Fund substantial enough to underwrite of the bulk of the research.

At first, that research seemed to be going nowhere, with experiments using different kinds of stem cells and whole bone marrow transplants failing to extend the lives of the affected mice. Then came the breakthrough—the discovery of a small population of stem cells collected from bone marrow that seemed to hold promise, extending the lives of 15 percent of the treated mice out to 80 days.

“These mice not only survived, which was itself very dramatic,” says Tolar, “but we were able to look into the skin in the vicinity of where the stem cells landed and see normal collagen VII being produced.”

Later, Tolar’s team turned an electron microscope on to collagen VII, the protein largely responsible for building the anchoring fibrils in the skin, to gain a better understanding of how the protein operates in the body. “These fibrils function like Velcro,” he says. “Basically, they adhere the layers of skin together, which is why someone lacking the protein develops blisters so easily.”

With proof on hand that transplantation might offer a viable treatment for RDEB, Wagner went about constructing a clinical trial for which he gained final approval in June 2007. The following month, he saw Nate Liao for the first time; because he and his brother Julian were a perfect match, the University of Minnesota team decided the risk of failure were lower for him than for Jake, and he should be the first to undergo the experimental procedure.

That took place at the University of Minnesota Medical Center, Fairview in November 2007. Today, not quite a year after the groundbreaking procedure, Nate is thriving.

“He is doing very well. He’s off all therapies, and he’s eating solid food, eating and drinking, and playing longer and longer each time without bandages,” reports Wagner. “He still forms some blisters, but with each biopsy we see an improvement in the formation of collagen VII. Obviously, only time will tell whether he is completely cured.”

Meanwhile, his older brother Jake received his transplant May 30 from an unrelated cord donor, thus complicating the course of his recovery. Jake received a second unrelated umbilical cord blood transplant on July 15, and his family and doctors are hopeful that this transplant will engraft and give him hope for a cure. Still, so far so good; his own bone marrow—which had to be suppressed in order to receive the transplanted stem cells—is growing back, and his lesions and blisters are also improving.

“Once I realized there was an animal model of EB and that the person I was talking to had discovered the gene that causes the disease, we literally started working out a research program on a napkin.” —John Wagner

Almost from the moment that word got out that there was a medical team somewhere willing to attempt an experimental treatment—and even before the happy news of Nate’s apparent recovery was released to the press—the University of Minnesota BMT unit has been besieged with referrals from around the world; more than 350 to date, a sign of desperation of other parents like the Liaos.

“We are not turning anyone away,” says Wagner, “although of course we can’t do everyone at the same time.

“It’s very difficult because families want treatment for their children—*now*.”

Taking on that caseload is going to present a challenge almost as daunting as the development of the experimental treatment. “When I think about those 350 patients, I feel excitement about the ability to offer a new approach as well as concern about the

person power needed,” says Hordinsky. “But it has prompted us all to begin to develop a sense of what kind of team we will need to respond.”

That team, she points out, will be responsible for a wide range of responsibilities.

“Because this is all a brand-new approach that we are essentially creating as we go along, there’s a significant amount of information that is going to have to be documented both in the research and the clinical arenas,” she observes. “All of this needs to be translated into language that can be understood by dermatologists, as well as the research community working on transplantation.”

The Liao breakthrough also means the University of Minnesota Medical School is posed to become the leading training center for RDEB research and clinical care.

“There’s no question about it,” she says. “Multiple communities are going to benefit from what we are doing here. It’s a terrific opportunity for us to be on the leading curve of research and

clinical care. This could be a model for other innovative treatments not just in dermatology but elsewhere.”

At the same time, Nate Liao’s medical team makes clear that it’s far too early to talk about a definitive RDEB “cure.”

“I am very cautious,” says Tolar. “Nate has had dramatic improvements in the quality of his skin, but he still has lesions.”

For one, Tolar emphasizes that the results of his experiments defied conventional wisdom about transplantation. It had been assumed that correction of structural proteins would not work with cellular therapy because such protein is not expected to diffuse itself from one site throughout the entire body.

“The more unexpected the findings,” he says, “the higher the bar to proof – and the outcome we achieved was very unexpected.” There will, he says, have to be far more research—and far more clinical testing—of the therapy before it can be proclaimed



EMILY JENSEN

Top: Nate Liao plays in his hospital bed a few weeks after receiving his transplant, in November 2007. Bottom: A healthier Nate, seven months after transplant, in May 2008

a definitive cure for RDEB.

But as far as Theresa Liao is concerned, whatever the long-term prognosis for her two boys, the verdict about the University of Minnesota is already in. “There’s no question in my mind why [the BMT team] is number one in the country and the world,” she says.

“Being here and seeing the work that is being done and the commitment of someone like John Wagner, that ranking is completely understandable.”

# Real Progress in a Virtual World

The training in the SimPORTAL may be virtual, but the superior results are a reality.

BY ERIN PETERSON

Rehearse, review, and repeat until ready for reality. That is the promise of simulation technology, from programs that allow students to watch surgeries in 3-D on 50-inch monitors to manikins that react in realistic ways to students' prodding. Simulation is providing a new dimension to learning for medical students and residents.

The year-old SimPORTAL training center at the University of Minnesota offers a range of simulation technology that's proving popular and effective with students and residents. "It's a place where people not only develop clinical skills, but also wisdom and judgment," says Rob Sweet, director for simulation programs for the Academic Health Center. "Learners can explore different scenarios in a way that they can't when they're in a clinical environment."

The SimPORTAL also is a key tool in the Medical School's

MED 2010 initiative. With MED 2010's focus on achieving measurable competencies, the SimPORTAL offers new ways to assess and improve students' performance. Research suggests that the technology will help them become more effective, competent doctors.

## TOP TECHNOLOGY

SimPORTAL is an acronym for Simulation PeriOperative Resource for Training and Learning. It's one of three major simulation centers within the University of Minnesota Academic Health Center and is the primary simulation learning space for the Medical School. It includes but is not limited to four skills suites: anesthesia and critical care, emergency medicine and trauma, percutaneous access, and surgical.

In addition, students can strap on 3-D glasses to watch videos of everything from a gastric bypass surgery to a hysterectomy. Cameras positioned both outside and inside the body give a 360-degree view of the process. The videos, which are developed from actual surgeries, provide more than just a visual jolt, says Sweet. "We suspect [the 3-D surgery videos] will facilitate anatomic understanding of relationships between structures for students," he says. "It will allow them to put what they learned in their anatomy course into clinical context."

Audio-visual connections between the University and more than 30 operating rooms even allow students to watch live surgeries in 3-D. Procedures that might typically be seen only by the surgeon on the job can be shown to an entire classroom, and that third dimension helps students see if there's a millimeter—or a centimeter—of space between the knife and a nerve. "And that's a measurement that can make a huge difference," says Troy Reihsen, the SimPORTAL's program manager.

Sweet's research team CREST (or Center for Research and Simulation Technologies) also is developing new virtual reality simulators and an array of 3-D models, such as the bony pelvis and related muscles and organs. The models allow students to explore relationships among structures in the body.

Other technology ranges from task trainers to whole-body trainers. In the surgical suite, for example, learners use tools connected to computers to practice their fine motor skills. They learn the subtle movements of grasping and stretching, and the computer monitors even the tiniest slips. Students must do each task perfectly before they can move on to the next stage. If they're struggling, learners can even send screen shots to their professor, who can take a closer look at a student's technique and offer a critique. "Programs like these give learners a chance to see what they're doing wrong and what they need to work on," says

Reihsen. “Novices can come in and work on their skills until they meet expert standards.”

Whole-body trainers offer even more possibilities. A high-fidelity human patient simulator in the anesthesia and critical care suite offers among the most realistic training opportunities. The “patient” breathes, cries, vomits, and sweats. Students can check its pulse and put in a chest tube. The patient even reacts to medications the same way that a human would. The suite itself is set up to look as realistic as possible, with the same equipment and layout that would be expected in a typical operating room.

A group of four medical students enrolled in their Emergency Medicine rotation huddle around “Kevin,” a 50-year-old man who has arrived in the emergency room feeling short of breath. One student gives him oxygen, measures his blood pressure, and checks his vitals. The others ask him questions: What has he been doing? Is he feeling any other pain?

“Kevin” is run by residents sitting behind glass just a few steps away, who control the manikin’s vital signs and responses to the questions that students ask.

Kevin says he’s got a cramp in his calf, and that he got off a flight from San Antonio just a few hours ago. The students believe he may be suffering from deep-vein thrombosis, but they aren’t sure. They tick off possible next steps: EKG, chest X-ray, CT scan, ultrasound of the heart.

That’s when second-year resident Tara O’Connell steps

in, cutting the group off like a director during a play rehearsal. O’Connell asks the students about details they might have missed. Later, she says people who work with a “patient” like Kevin get invested in their work in a way that isn’t possible with a lecture or a textbook. “Students are talking about what to do and what decisions to make,” she says. “Sometimes a scenario doesn’t change in the way they’re expecting...so it leads them to a different algorithm.”

In the control center, students also can debrief and watch videos of the work they’ve done. Learners review to see what went right—and wrong. Reihsen says that students spend about three times as much time hashing out their experiences as actually doing them. “Debriefing is one of the most important things that we do here,” he says. “Talking about what happened helps them truly understand the experience.”

As a result, students can learn many of the technical skills they need as doctors without working on an actual patient, says Lindsey Henson, vice dean for education. “We can accelerate students’ learning in a safe environment. With a real person, you could have a catastrophic outcome if you don’t know what to do, but with a computer, the worst that can happen is that you have to reboot it.”

While the technology isn’t cheap—a high-fidelity simulator can cost more than \$100,000—it can pay off very quickly, as time in the operating room can cost more than \$100 a minute. “If learners practice here, it’s more cost-effective,” says Reihsen. “But more important, it’s much better, both morally and ethically, to be training on something like this, rather than a real person.”

### PRACTICE MAKES PERFECT

The old medical education adage “see one, do one, teach one” is likely to seem astonishing to students learning in the simulation age. It’s not acceptable to simply learn a skill—simulation allows people to perfect it.

“You want to make sure that students are making good medical decisions, but you also want to make sure they’re working together well.” —Karyn Baum

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In the control center, students also can debrief and watch vid-

Learning a skill to an exceptionally high level of proficiency hasn’t always been easy. Not all students learn at the same rate yet they often follow a program in lockstep. For fast learners, it can be exasperating; for those who need just a bit more time, it can seem overwhelming. The competency-based MED 2010 initiative will help address that issue, and the SimPORTAL will help. “The SimPORTAL is a place where learners can work at their own pace,” says Sweet. A technique that one student might master in a few attempts might take another several dozen tries. Learners have

access to the SimPORTAL anytime to hone their skills.

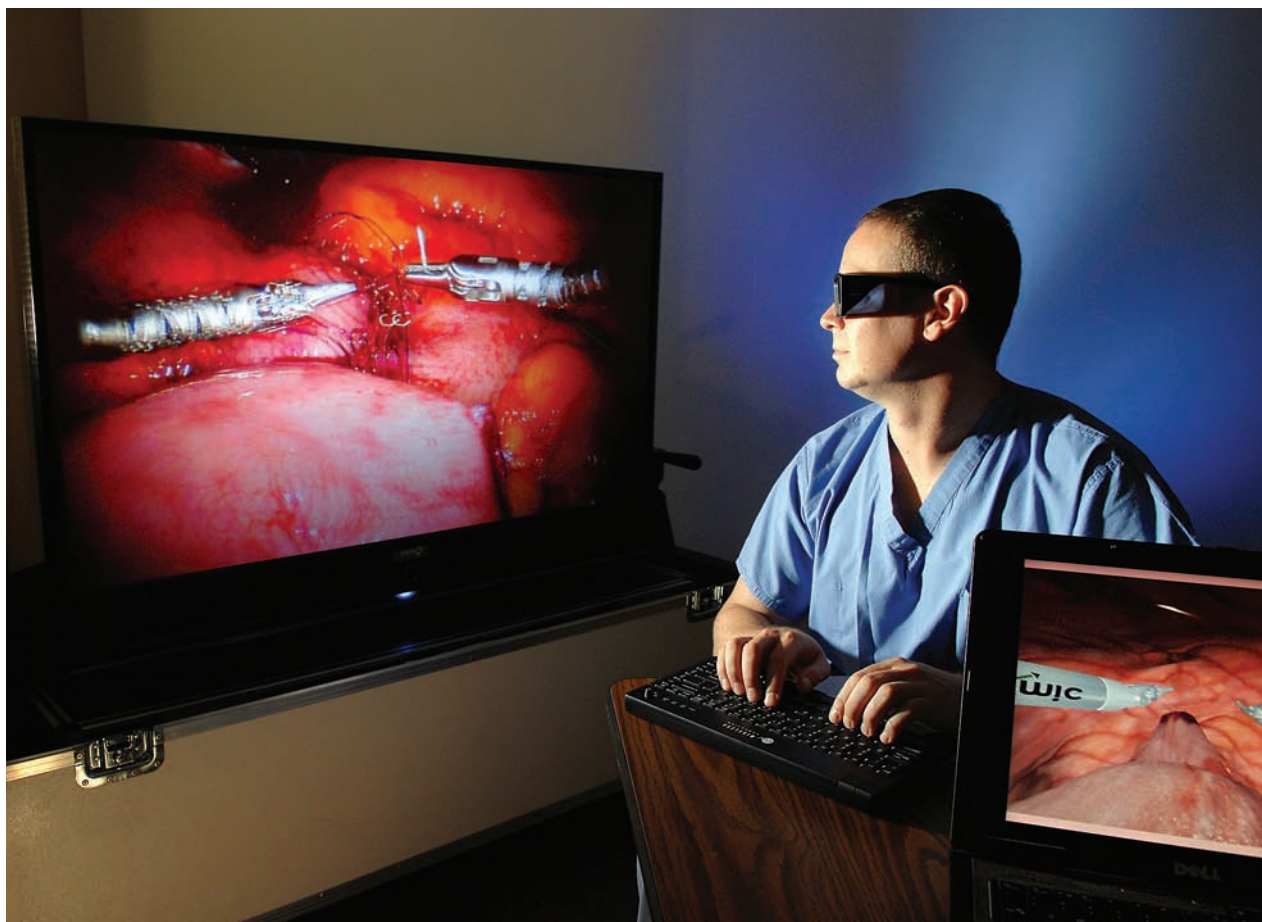
When students master skills, it frees them up to address other critical issues that crop up, says Reihsen. “We want students to know how to make big-level decisions...,” he says. “If they’re struggling to get an IV in a code situation and suddenly a complication comes up, that’s an even bigger problem. We want to eliminate those basic errors by increasing their skills.”

Those basic errors can’t be allowed to happen in a clinical setting, says Sweet, which makes the importance of simulated experiences so critical. Instructors can allow a situation to go awry in a simulation, forcing students to confront their errors by fixing them or figuring out what went wrong. “Simulation allows you to train what is right, but it’s those times when things go wrong that we actually learn more,” he says. A mistake that makes a manikin “die” is often devastating to a student, but that process can give him or her the experience to make better decisions when a real person is facing a critical situation.

Another benefit to the SimPORTAL is the ability to train for the life-threatening conditions that doctors see only rarely. A case of malignant hyperthermia, for example, might crop up just once in a doctor’s career. The genetic condition, which is triggered by certain types of anesthesia, can lead to death if not treated quickly. “It used to be that nearly 100 percent of people who had this reaction to anesthesia died,” says Henson. “Simulation gives an opportunity to train people how to recognize the symptoms in a simulated setting, so that when they see it in real life, they’ll know what to do.”

The ability to create nearly any scenario—rare or not—with a simulator gives students an edge when they go into the clinical setting. Students may make errors initially, but they can also recover from them more quickly. Instructors create a range of situations that students must respond to effectively. Studies suggest that students who learn a technique through experience, rather than from a textbook, retain information longer.

Karyn Baum, co-director for evaluation of the center’s Curriculum and Assessment Council, adds that simulated settings teach students learn to work together more effectively, which is critical in emergency situations. “You want to make sure that students are making good medical decisions, but you also want to make sure they’re working together well. When someone asks someone else to do something, are they clear? Do they communicate well?” she says. “Simulation is one way to help teach complex skills like teamwork and communication.”



Demonstrating procedures in a high-tech virtual world is Troy Reihsen of the SimPORTAL team.

### BY THE NUMBERS

Students and residents expect that they'll have access to the latest and greatest technology as they learn. Administrators want to make sure that the cutting-edge technology is coupled with sound educational principles so that learners have the best possible experience.

Baum and others in the Curriculum and Assessment Council are charged with helping professors integrate the SimPORTAL's

technology into the curriculum. Along with Connie Schmitz, an education expert in the Department of Surgery, Baum is one of the people responsible for reviewing all of the applications from instructors hoping to use the SimPORTAL in their classes. She says the questions the council asks professors are basic but revealing: Who are the learners? What are the learning objectives and how will they be taught? How will they be evaluated?

Based on those answers, the committee provides feedback and recommendations. Baum says that though professors are not required to implement changes, many do. "We're there to help cohesive educational planning," she says. "We want to make sure that they're producing the best product possible—that they're using the SimPORTAL at the right time, for the right reasons, in

the right way." Baum says the recommendations can help professors create more innovative curricula. She expects many to go on to publish papers or present their work at national conferences as a result.

Students are rigorously tested as well. Simulators provide detailed, accurate feedback. In some cases, the measurement is the millimeter of wobble in a surgical tool that a student is manipulating. In others, it's a change in a simulator's vital signs after a student takes action on a problem.

Even skills that can't be easily measured are reviewed and assessed. Professors study students' performances on simulators on video, pointing out strengths and deconstructing weaknesses.

Henson believes that integrating simulation and assessment into the curriculum will provide a more comprehensive education to students. "We have written exams and oral exams, and I think we're starting to move toward [testing] with a simulator, too," she says.

Simulation and assessment have the potential to create a much more skilled pool of doctors. "In the past, we haven't had a good way to measure clinical skills," Reihsen says. "But now we can create a portfolio for them that shows how many times they've practiced a skill using the simulator. We can see that they've achieved a standard of mastery of each clinical skill before they move on to the next one."

### LOOKING AHEAD

Simulation will never fully take the place of students learning in the clinical setting. Students must ultimately master the many details of interacting with real patients with real bodies, because there are certain things that simply can't be learned from a machine.

But used in the right way, simulation offers the chance for learners to become exceptionally skilled at tasks without ever putting a patient at risk. As the University moves to a competency-based curriculum, the SimPORTAL will become an increasingly important method for students to build and showcase their skills.

"We think this will help students be more ready on day one—and in the long run," says Henson. Because the more opportunities that students have to learn a skill in the virtual world, the more likely they are to practice it effectively in the real one.

#### WEB EXTRA

To read more about the SimPORTAL and see photos of the simulators, visit [www.simpportal.umn.edu](http://www.simpportal.umn.edu).

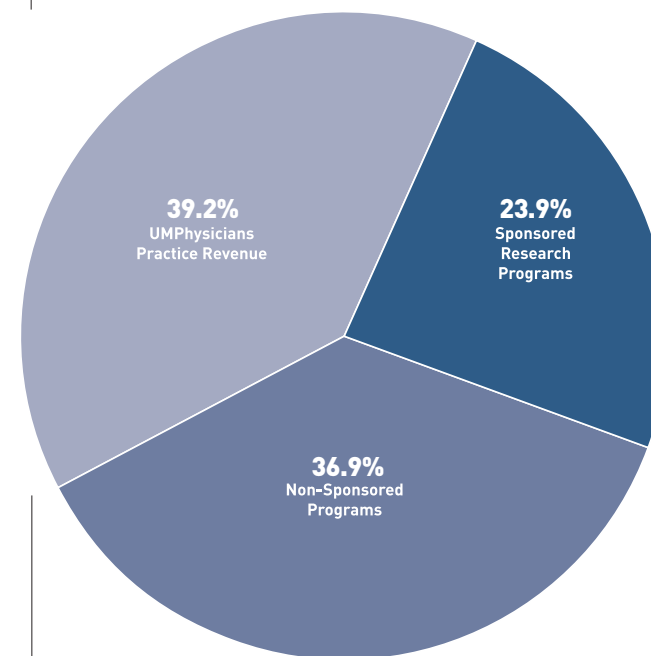
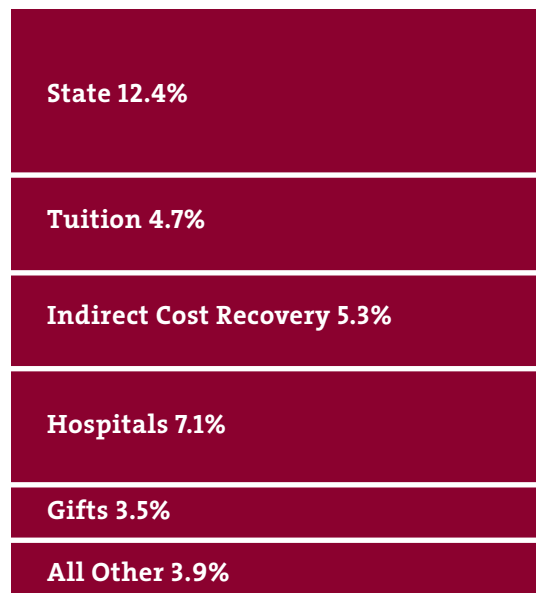
# Financials

The University of Minnesota Medical School benefits from the support of the state of Minnesota, which has designated funds for faculty recruitment; from transfers from the faculty practice plan, University of Minnesota Physicians; and from the Minnesota Medical Foundation. In fiscal year 2008, the Minnesota Medical Foundation supported hundreds of faculty research and education projects, while earnings from endowments and outright gifts provided more than \$1.7 million for 626 medical student scholarships.

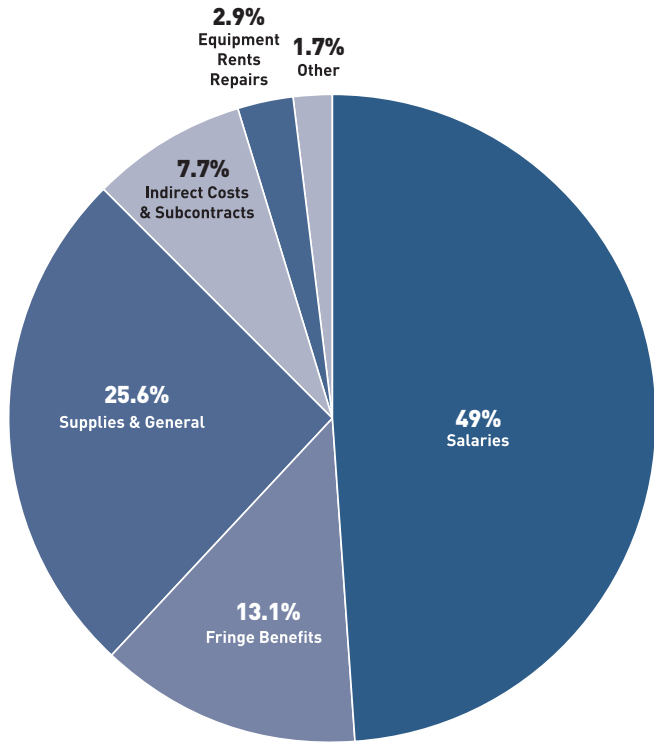
## Medical School Funding

University of Minnesota  
 Medical School  
 Major Funding Sources, Fiscal  
 Year 2008  
 Budget = \$730 million

Includes UMPhysicians



## Medical School Sponsored Research

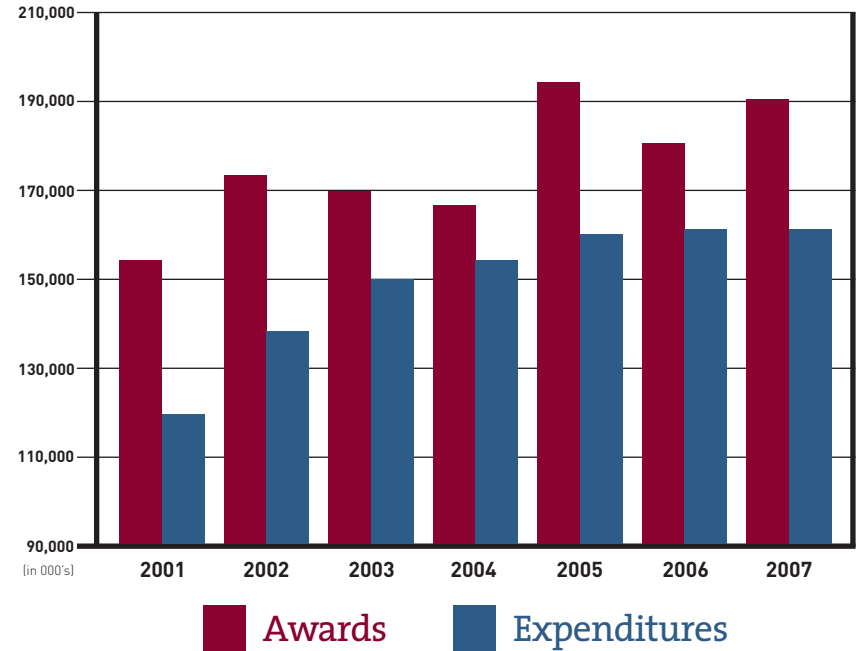


## Medical School Spending

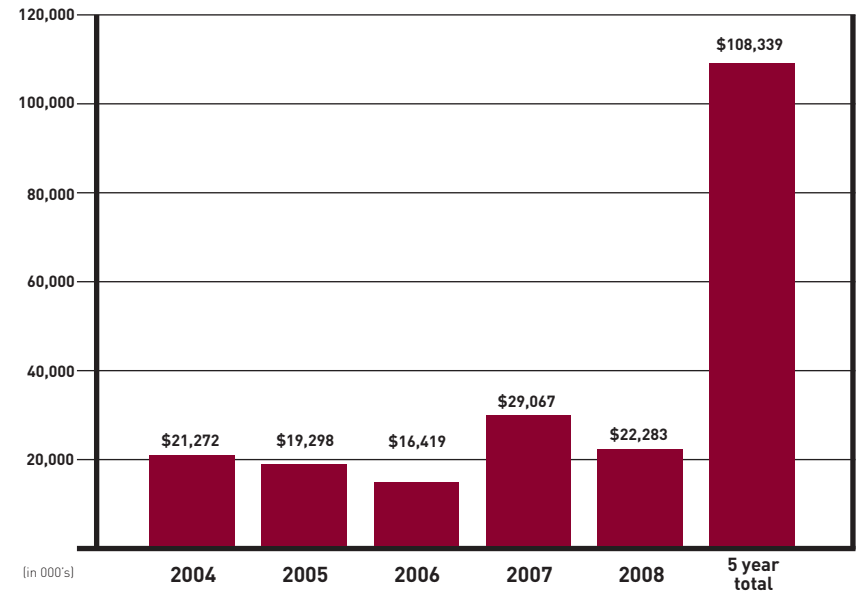
University of Minnesota Medical School Expenses  
Fiscal Year 2008

Budget = \$741 million

Includes UMPhysicians



## Minnesota Medical Foundation's Disbursements to the Medical School



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