More than 20 faculty members and their students at MIT Sloan seek to improve the ways we care about ourselves as individuals and one another, as we rethink our society’s health care systems.

Here are five examples of real-world engagement and a commitment to solving the world’s most complex problem—health care.

- A much-needed new vaccine arrives in a developing nation.

- Elsewhere on the same continent, groups of MIT Sloan students work the front lines of health care delivery.

- At home in the United States, two professors seek a better, fairer way to distribute the nation’s finite supply of kidneys available for transplant.

- In Florida, another professor asks if spending more on emergency care results in better care.

- And in Boston, across the Longfellow Bridge from Kendall Square, doctors team with MIT Sloan faculty and students to reduce waits for surgery in one of the nation’s premier hospitals.
Waiting at the hospital is bad enough. Waiting for surgery—and after surgery—is a taxing experience with the potential for medical consequences, and a familiar one for many Americans.

But at Massachusetts General Hospital (MGH), those waits are getting shorter, thanks to a strategic partnership between the hospital and MIT Sloan.

In November of last year, surgery units at MGH implemented a new scheduling system that loosened the bottlenecks of patients waiting to enter surgery, in the operating theater after surgery, and in the important Post-Anesthetic Care Unit, where patients are closely monitored immediately after leaving the operating theater.

Since implementation, MGH has halved the number of patients facing long waits to enter surgery. And the hospital has freed up about 4 percent of beds reserved for post-surgery patients—all without new resources or a reduction in caseload.

“As much as 4 percent sounds like a very modest impact, it boils down to the science of queuing systems,” said Retsef Levi, the J. Spencer Standish (1945) Professor of Management. “If the system is highly utilized—as it is at MGH—even a small difference can have a significant positive impact on how long patients are waiting.”

Prior to the changes, the scheduling process for surgery at MGH was rife with inefficiency—and mirrored a problem experienced by hospitals across the country.

Collaborating with Levi and a team of MIT students from the Leaders for Global Operations (LGO) program, as well as post-doctoral fellows, MGH designed two improvements to scheduling.

In the past, the scheduling of elective surgeries resulted in unbalanced bed occupancy levels, peaking in the middle of the week and causing longer waits for both nonelective surgeries and patients waiting for a hospital bed after surgery.

So the group used integer programming to improve efficiency in the hospital’s block scheduling system for operating rooms (OR), smoothing the bed census over the week and reducing occupancy by 4 percent.

The team also reserved some operating room blocks as “open” and allowed central OR administration to determine when nonelective surgeries would be scheduled. That made better use of operating rooms and reduced by half the number of patients with unreasonable waits to enter surgery.

“We found that with a modest number of open blocks, we could reduce the patient waitlist substantially,” Levi said. “We already see a major decrease. The average wait for urgent cases went down by a whole hour.”

But the new schedule threw off surgeons’ long-established work schedules, meaning that change required buy-in from hospital leadership and support from surgeons.

“This was a burning platform that resonated with every single one of our surgeons,” said Dr. Peter F. Dunn, executive medical director of Perioperative Services at MGH. “They struggle to get their patients into the OR in a timely manner. The end product with this system is a positive result for surgeons and our patients.”

“More than 40 percent of surgeons changed their schedules, which is unheard of,” Levi said.

Unlike routine consulting to implement known best practices, MIT Sloan’s work with MGH is seeking innovative solutions to problems experienced by hospitals across the United States. Levi also worked with the hospital to improve wait times in its Pre-Admission Testing Area, where patients receive comprehensive exams before surgery. That work—completed with Kelsey McCarty, MBA ’10; Leo Espindle, LGO ’11; Andres Garro, LGO ’11; Devon Price, LGO ’11; and Jérémie Gallien of London Business School—was summarized in a teaching case and won the New Case Writer award from the European Case Clearing House.

Levi and Dunn, along with MGH President Peter L. Slavin, MD, have presented the results of the scheduling improvements at the Association of American Medical Colleges and the Institute of Medicine.

“What we hope to do,” said Dunn, “is take our lessons learned and help apply them in those institutions that don’t have what we have afforded to us.”

—Zach Church
After four years, measuring a worldwide impact

In the past four years, MIT Sloan’s Global Health Delivery Lab (ghdLAB) has covered a good deal of ground—tens of thousands of miles, in fact.

With some 40 projects completed on African and Indian soil, and another set of student teams overseas in March 2012, MIT Sloan Senior Lecturer Anjali Sastry said ghdLAB has embarked on an interesting look at its impact so far. The goal? To assess the benefits, including performance improvements and lessons learned, gained by partnering organizations that have worked with students on the front lines of health care delivery—from Kenya to South Africa to India.

MIT Sloan’s rich experience with action learning inspired Sastry to design ghdLAB in 2008. The current study could help fill a void in the research on action learning in management education.

“We are going back to every project to ask how we helped. Did we impose any costs? Are we seeing benefits spilling over to other areas? What about continuity? Are people building on the work that we did?” said Sastry. “We’re gathering firsthand data and conducting systematic interviews. Early indications reveal more positive effects than we had realized.”

“Across the United States and globally, business schools are engaging in more project-based action learning, but we need to better document what makes it effective,” said Sastry. “I think that we can align seeking to deliver the most effective help to our partners with delivering the best learning experience for our students. When ghdLAB students bring to bear the best of their MIT Sloan toolkit to tackle problems collaboratively, I think our contributions can go beyond volunteering. Our study will help us to say, ‘Here’s where we made an impact.’”

As is the case with other action learning courses at MIT Sloan that combine classroom learning with an intensive on-site experience, ghdLAB is much coveted—80 students recently applied for 36 seats. What sets ghdLAB apart is its focus on the challenges of health care delivery in developing nations. Student teams tackle the barriers and constraints facing both for-profit and non-profit enterprises in increasing scale, scope, and quality of care.

Projects have taken on process improvement, business model innovation, marketing, and strategic planning in varied settings. Recently, student teams worked with a Kenyan slum clinic to increase utilization of its health care services, an HIV-prevention initiative in South Africa to build a research function within their monitoring and evaluation department, and a community nursing outreach program in India to improve pre- and post-natal care in the community.

“With ghdLAB, the issues are thrown into sharp focus because needs are so extreme,” said Sastry. “Low-resource settings offer us an opportunity to work with different models and to explore important questions, such as: How can you do more with less? Can for-profit business provide social goods for the lowest-income populations? How do we share what we have learned? And how can the right management tools and approaches be brought to the front lines of health care?”

“People have argued that we need a field of health care delivery studies that investigates needed innovations, explores sustainability and scale, and looks at the entire patient experience,” said Sastry, who discusses this idea and presents student experiences in a video collection on TechTV (start with http://techtv.mit.edu/videos/14635-ghdlab-in-the-world-for-the-world).

“Health care delivery poses challenges that every country is confronting,” Sastry emphasizes. “These are global issues. By working in different settings, not only do students get amazing learning experiences, but we also get a chance to return to the classroom to distill, share, and contrast our learning,” said Sastry. “And, as our impact assessment is revealing, when we focus on how to learn from experience and deliver practical improvements, benefits extend far beyond the project—for both students and partners.”

—Mary Tamer
It is a sad and cynical assumption to consider: There is no guaranteed material benefit to developing and manufacturing drugs and vaccines for the third world.

But a new economic model developed by—among others—Professor Ernst Berndt, the Louis E. Selye Professor in Applied Economics, intends to provide that guarantee.

The Advanced Market Commitment (AMC) model seeks to speed the development of drugs and vaccines for the third world by using philanthropic dollars and a guaranteed price to stoke production. If drug manufacturers are guaranteed a worthwhile price through donor funding, Berndt believes they will pursue the development and manufacturing capacity expansion of critical drugs.

A pilot program is under way with pneumococcal vaccines, which fight infections that kill more than 800,000 children under the age of five every year. More than 80 percent of those deaths occur in countries eligible for assistance from the AMC pilot, according to an article Berndt and colleagues published in Health Affairs last year.

“It’s highly prevalent,” Berndt said. “A lot of kids die from it in the third world.”

The model works like this: A consortium of donors (in this case, five donor countries—Italy, the United Kingdom, Canada, the Russian Federation, Norway—and the Bill and Melinda Gates Foundation) fronts enough funds to allow a project administrator (the GAVI Alliance working with the World Bank) to offer drug companies a set price to develop a finite amount of a new vaccine or drug. Under the model, the first units delivered command a higher price, offering a greater reward for initial manufacturing and a marginal cost for later sales.

The donated funds cover upfront development and additional manufacturing capacity costs, enabling third-world countries to pay a predetermined marginal drug cost from the start.

This advance commitment model has taken hold. In December 2011, Pfizer and GlaxoSmithKline each announced its commitment to supply up to a total of 480 million doses of pneumococcal vaccines Prevnar-13 and Synflorix through 2023, building on their original March 2010 commitment to supply up to 300 million doses under GAVI. In late 2011, GAVI announced it would be introducing the pneumococcal vaccines into an additional 18 countries, bringing the total number of countries supported through the AMC to 37.

“What we hope we can do in several years is to quantify the reduction in infant mortality,” Berndt said. “And how much did we spend? So we know cost per life saved. We are already beginning to evaluate how much more rapidly the diffusion of the vaccine to developing country markets is, as compared with a traditional R&D model.”

The pilot was launched in 2009 and will last until at least 2023. But Berndt has determined a few early lessons. The AMC model requires a sustained donor commitment to GAVI to support early R&D, he said.

Some level of trust is also required. The model creates a legally binding promise that the program administrator will pay a certain price for drugs or vaccines—so long as the demand exists. Drug manufacturers are taking a risk on that demand appearing.

“Industry has to take some risk here,” Berndt said. “One of our goals was to ensure that the risks industry takes are similar to those they take under first-world drug market conditions.”

But even with some risk and some uncertainty, Berndt is optimistic the model can bring affordable drugs to market in the third world more quickly than in the past.

“I think we’ll know a lot more in the coming year,” he said. “As far as I can tell, it’s the first collaboration of its kind. The potential payoff is so great. Industry can play a vital role. Mutually beneficial transactions are possible.”

—Zach Church
When someone is rushed to an emergency room with heart problems, does it matter how much money the hospital spends on that patient?

It may seem logical that high-end medical care would lead to better results for patients. But economists and policy specialists have debated the question extensively, and uncovering a clear answer has proven difficult.

Now an innovative study by Joseph Doyle, Alfred Henry (1929) and Jean Morrison Hayes Career Development Professor, shows that hospitals that spend more money to treat people who enter their emergency rooms are indeed successful in lowering the mortality rates of those patients.

“More intensive and expensive treatment leads to better outcomes,” said Doyle, whose study examined tens of thousands of cases in which out-of-state visitors were admitted to emergency rooms in the state of Florida over a span of several years.

Among other findings, Doyle discovered that an increase of about $4,000 per patient in hospital expenditures led to a 1.4 percent decrease in the mortality rate. The results were published in American Economic Journal: Applied Economics.

Uncertainty over the effectiveness of medical spending stems, in large part, from the fact that health care providers in some regions of the United States spend considerably more on their patients than providers in other regions do, yet some studies have shown that patients in higher-spending areas do not necessarily have a lower mortality rate than those in lower-spending areas.

But other economists have found data suggesting that additional spending does make a difference; hospitals that spend more money while producing similar outcomes may simply be dealing with sicker patients.

Doyle studied the problem by looking at emergency room visits of people visiting Florida, an approach that reduces the impact of local patient variation on medical spending.

The study examined nearly 37,000 hospitalizations from 1996 to 2003. Doyle analyzed patient data by ZIP code, age, and even seasonality of visit to ensure he was studying demographically similar tourists being treated throughout Florida.

Florida has significant “variation in how areas treat patients after heart attacks,” Doyle said. “Florida looks like a microcosm of the U.S., with high-spending and low-spending areas. And the per-capita income of an area is not correlated very well with [hospital] spending.” In Fort Lauderdale, for example, hospitals spend 30 percent more on heart patients than they do in nearby affluent West Palm Beach.

Therefore, the variation in results that Doyle found does not stem from the prior health of patients, but from the level of care itself. Specifically, the greater expenses—and benefits—in heart treatment seem to come from a broader application of intensive care unit (ICU) tools and having more medical personnel on hand.

“The higher-spending hospitals use more ICU services, and they have higher staff-to-patient ratios, so they use more labor,” Doyle said. “And that’s expensive.”

Overall, a 50 percent increase in what Doyle calls a hospital’s “spending intensity” allows it to reduce mortality rates due to heart problems to about 26 percent below the mean. He said that identifying the precise medical technologies that provide the greatest additional benefit per dollar spent remains a work in progress—and will require ongoing analysis as new technologies are introduced.

“There are smart ways to spend money and ineffective ways to spend money,” he said. “And we’re still trying to figure out which are which, as much as possible.”

— Peter Dizikes, MIT News
Fewer than 20,000 kidneys are available for transplant in the United States each year, yet more than 80,000 people are waiting for a kidney transplant.

A new method for determining who receives a transplant, developed by MIT Sloan faculty and a former student, can increase the years of life gained by recipients by 8 to 10 percent. And it does so without undermining the fairness criterion that is a central part of the kidney allocation process.

Developed by Dimitris Bertsimas, the Boeing Leaders for Global Operations Professor of Management; Vivek Farias, the Robert N. Noyce Career Development Professor; and Nikolaos Trichakis, PhD ’11, the method focuses on the desired outcome—a fair distribution of transplants based on age, race, blood type, illness, and other factors. It also creates a formula for allocation that best matches that outcome while maximizing efficiency.

Until now, selecting who receives a kidney has been determined by a scoring rule that prioritized patients based on their time on dialysis. That rule worked, but was not efficient. A proposed new scoring rule focuses on achieving a fair and equitable distribution of kidneys. Using their method, however, the professors set out to find an equation that not only resulted in the same fair distribution of kidneys achieved by the proposed new rule, but also maximized the number of extra years lived by recipients.

It worked, with an 8 percent bump in life years. In real terms, that’s about 2,000 extra years of life distributed among recipients.

What is considered “fair” is, of course, subject to periodic reevaluation. But the beauty of the new method, the professors said, is that it can be easily adjusted to the changing definitions of fairness. The federal committee tasked with determining who goes where on the kidney waitlist could come up with any desired result—directing more transplants to teenagers or diabetics, for example—and the tool would almost instantly determine the best new scoring rule to start with.

“Let’s say in the future there are new requirements, new ethical regulations,” Bertsimas said. “Our system is built to accommodate these ideas.”

“Our aspiration is that the system, because of its flexibility and because it is outcome driven, will become the key tool to design and evaluate future kidney allocation proposals,” he said.

Any proposed allocation scheme requires that potential kidney recipients are ranked based on a number of factors, such as wait time, transplant-ready matches, patients with extensive pain, age, and prior donors. On the other side of the equation, kidneys must be distributed in a fair manner relative to race, age, blood type, and other factors.

Working backward, the professors’ method uses recipient and waitlist data to determine the allocation rule that gives the greatest outcome in life years, while matching the fairness requirements agreed upon by the federal Kidney Transplantation Committee.

“There is no methodology, prior to our work, that maximizes the outcome while fulfilling fairness requirements,” Bertsimas said.

And it’s fast. No more hit or miss, testing rules one by one to find the best fit. The desired answer comes first, and the method determines the best rule to get there.

“What we’ve done is take that entire process and reduce it to a number of hours,” Farias said.

While still a proposal, there is some likelihood that the method will be put into use. Farias recently joined the scientific advisory committee of the Scientific Registry of Transplant Recipients, the non-profit group charged with managing the kidney waitlist. As medical realities rapidly change, the need for a flexible tool to fairly and efficiently allocate donor kidneys becomes only more urgent.

“In the arsenal of policymakers,” Farias said, “it is a powerful tool.”

—Zach Church
Health care in the United States is—and here’s an understatement—a complex challenge.

A fractured network of providers, insurers, government entities, and vendors of medical drugs, equipment, and technology operates with little collaboration or systems-level coordination. This often leads to spiraling costs, poor care, and bureaucratic tangles.

Retsef Levi, the J. Spencer Standish (1945) Professor of Management, thinks there is a better way. At MIT Sloan, he is forming the Center for Management of Engineering and Healthcare Systems.

Why does this center need to exist?

“If you look at health care costs in the U.S. over the last 50 years you see, with few exceptions, that costs increase. Last year, they amounted to over 17 percent of GDP. That’s over $2.9 trillion annually. And compared to other developed countries, the U.S. is not ahead of the curve. It is estimated that every year 100,000 people die in hospitals in the U.S. from avoidable medical errors, and that at least 30 percent of spending on health care is waste due to overuse, underuse, and misuse of resources.

“Two approaches to ‘fix’ the health care industry have emerged over the years, a market incentive approach that views the problem as simply an incentive problem driven by the current payment schemes used in the health care industry, and a ‘lean approach’ that views the problem as simply a process re-engineering problem.

“What is missing is the recognition that the challenge of fixing the health care industry is, in essence, a complex management problem of health care delivery organizations, and not enough attention has been spent considering the capabilities these institutions need to develop to deliver more cost-efficient, higher-quality care. This is where the MIT Sloan approach comes from. We will focus on the organizations and systems that deliver care, and we want to develop a multidisciplinary approach to study them and then propose different ways and develop new analytical tools to structure them and operate them. This includes finances, HR policies, analytical tools, operations and system design, and so forth.

“This is where I think that the center will bring a new message that does not replace, but rather complements, other approaches.”

What partnerships do you expect to develop for this collaboration?

“MIT Sloan has long-term partnerships with many academic medical centers in the Boston area, including some of the most prestigious hospitals in the world. These partnerships have already resulted in large-scale implementations with tangible results.

We also have connections with drug and biomedical companies, as well as insurers and payers.

“Direct collaboration with health care providers and other players is critical. They will have to transform their missions and the way they do business. We will see more distributed networks of institutions that will manage the health of specified populations in a proactive way. In addition, they will need new and different types of employees, and will need to educate existing employees on new business models. In both cases, I think MIT—and MIT Sloan in particular—can help in a fundamental way.

“We are envisioning a new model of funded research. Unlike traditional models in which external organizations provide financial support to fund the research work of faculty and students, we will build collaborative teams that engage different players in the industry—hospitals and health care delivery systems, insurance companies, pharmaceutical and biomedical companies, patients—to create new frameworks and tools that could be applied immediately in the field.

“There are over 20 faculty members at MIT Sloan working on health care-related research, and more across the Institute. And they span all the academic groups at the School. The opportunities for strategic collaborations are enormous.”