

Δ gorithms hms *for innovation*

CHANGE



What are we so afraid of?

PAYMENT REFORM
ACCOUNTABLE CARE ORGANIZATION
AFFORDABLE CARE ACT
POPULATION HEALTH
CAPITATION
PAY FOR PERFORMANCE
BIG DATA
PRECISION MEDICINE
CONSTRAINED FUNDING
CADILLAC TAX
ICD-10
TELEHEALTH
MEANINGFUL USE
EHR
R
T
TUITION
BUNDLED PAYMENTS
CONSOLIDATION



UNIVERSITY OF UTAH
HEALTH SCIENCES
INNOVATION REPORT 2015

“
THINGS DO NOT CHANGE;
WE CHANGE.”

—Henry David Thoreau

Since 2012, Algorithms for Innovation has been asking questions and searching for solutions to some of the most impossible problems facing health care. We believe there's an unprecedented opportunity to invent a new vision for health care, and academic medicine is poised to lead the way. Algorithms for Innovation is designed to spark conversations, highlight best practices and foster collaboration to help transform the future.

Algorithms for Innovation is powered by University of Utah Health Sciences. See more at algorithmsforinnovation.org

THE RELENTLESS PACE
UNREASONABLE DEMANDS
LOSING CONTROL
NOT GETTING OUR FAIR SHARE
EXPOSURE FAILURE

10 FEARS HOLDING US BACK

BECOMING IRRELEVANT
THE UNKNOWN
MEANINGLESS METRICS
UNFAIR SCRUTINY

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EMBRACING CHANGE

It's true. There are countless reasons to feel overwhelmed and disheartened with the current state of health care. So many external factors are swirling around at once, some of them seeming to threaten the core reasons we hitched our careers to science and medicine in the first place.

The path of least resistance is to dig in our heels and hold on to the status quo. Wouldn't that imply that there was no room for improvement? That we thought things were perfect just the way they are? That we couldn't imagine a better future?

I believe there's always a better way, and it's up to us to find it. If we choose to see threats as opportunities, we can ask the hard questions that will move us forward and not be afraid of the answers we find. We can acknowledge there are forces at work much bigger than we are and still believe we have the power to shape the future. We can link arms and move forward together.

How much? How far? How fast? No one really knows. Change is a process, not a destination. As much as we want data and evidence and a clear path forward, forays into unknown territory require us to accept uncertainty and take a leap of faith. They require a healthy dose of

trust—trust in one another, in ourselves and trust that we're doing the right thing.

We need system-wide transformation. Big ideas. Sweeping movements. Paradigm-shifting breakthroughs. To achieve them, we must believe that individually we can make a difference, and that small, organic change will move us in the right direction.

So who are those people already living in the future and inviting the rest of us to come along? Who are the change agents among us? They are everywhere. Here, we feature a few people embracing change. I hope you'll be inspired. I know I am.



Vivian S. Lee, M.D., Ph.D., M.B.A.

Senior Vice President, Health Sciences

Dean, School of Medicine

CEO, University of Utah Health Care

**WHO'S LEADING UNIVERSITY OF
UTAH HEALTH SCIENCES?**

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ARE WE ROOTED OR STUCK IN TRADITION?

While the nation has been preoccupied with the health care crisis and figuring out ways to deliver better, cheaper health care, how we're educating and training providers has largely escaped scrutiny. We're counting on the next generation to sort out the mess we're in, yet in many cases preparing them with yesterday's tools to do so. In science, the boldest innovations often come from people who have thrown out conventional wisdom. In education, we're hanging on to traditions created more than 100 years ago. Are we ready to ask some hard questions and discern which of those traditions are keeping us rooted and which are holding us back?



“WE NEED TO SET ASIDE TIME TO ALLOW OURSELVES TO GET OFF THIS TREADMILL LONG ENOUGH TO THINK OF THE MOST CREATIVE SOLUTIONS—TO THINK DEEPLY AND BROADLY. AND THEN TO HAVE THE COURAGE TO MAKE THOSE CHANGES NOW.”

Kristen Keefe, Ph.D.
Interim Dean,
College of Pharmacy

“Most of what I’ve learned has proven to be false or replaced,” says Wayne Samuelson, M.D., vice dean of the School of Medicine. While that degree of obsolescence may have come as a surprise to baby boomers like Samuelson, today’s generation is acutely aware that much of what they’re taught will be outdated before they even master it.

Throughout education, teachers are scrambling to figure out how to deliver meaningful knowledge in an age of information overload. The one-way didactic model designed when a motivated person could memorize and keep on top of the latest thinking is a thing of the past. Today it’s estimated that the body of medical knowledge doubles every three to four years.

“It used to be we’d just dump knowledge onto students and house staff,” says Chief Medical Quality Officer Robert Pendleton, M.D. “Now we need to teach them how to access the information they need, when they need it, and know how to communicate with each other and with patients to create shared decision-making.”

That’s not to say there haven’t been improvements. Curriculum committees are continually rolling out new ideas. But the true reforms needed are much bigger than any one committee can solve. How do we break down silos to learn how to work as a team? Why does it have to take so long and cost so much? What is the value of the training we’re providing and how are we measuring it? And what criteria are we using to select future health care providers? “A screaming GPA and awesome standardized test scores predict you’ll be an excellent test taker, not an excellent doctor,” says Samuelson. “It’s no longer going to be enough to be the top guy in organic chem.” Today, we also need to attract the most compassionate, intellectually curious, collaborative and generous students.

Our goal is not to train students to get academic credentials after their names, says Vivian Lee, M.D., Ph.D., M.B.A., senior vice president. “We want our students to be leaders—whether that’s caring for communities, making groundbreaking discoveries, teaching tomorrow’s students or immersing themselves in global health, a biotech startup or health policy. We want to prepare them to change the world.”

The solutions are not out of reach, says Kristen Keefe, Ph.D., interim dean of the College of Pharmacy. “We need to set aside time to allow ourselves to get off this treadmill long enough to think of the most creative solutions—to think deeply and broadly. And then to have the courage to make those changes now.”

Every year, a new crop of health sciences students don white coats at a ceremony that marks a rite of passage in their professional journeys. How we’re training those students in a constantly evolving landscape is a fundamental challenge for the future of science and medicine.



A PERFECT MATCH: STUDENTS AND COMMUNITY

Train in silos; practice in teams. That's the current disconnect between tradition and progress when it comes to educating today's health care providers. Few disagree with the ideals of interprofessional education (IPE) and early clinical experience. But for time- and money-strapped colleges saddled with packed curriculums and conflicting calendars, implementing them can often seem like scaling a logistical Mount Everest.

Thanks to the collegial relationships of the deans of our five schools and colleges and the library director, University of Utah Health Sciences has been tackling that IPE mountain and making impressive inroads. For Wayne Samuelson, M.D., vice dean for education at the School of Medicine, it just wasn't happening fast enough. "Sometimes you can't wait for institutional change," says Patricia Morton, Ph.D., R.N., dean of the College of Nursing. "Wayne said, 'To heck with all of you, I can't sit around discussing this for another year. I'm taking a team of students with me to Midvale.'"

Midvale is a city of about 30,000, and as the name suggests, situated smack in the middle of the Salt Lake valley. Three years ago, Samuelson set up a small clinic to serve a mostly Hispanic, underinsured population. It was a one-doc shop but Samuelson's plan was always to turn it over to the students. As he saw it, there was a community that needed health care and hundreds of students who needed experience. A perfect match. Midvale's firecracker septuagenarian mayor, JoAnn Seghini, Ph.D., who's been a resident for more than 70 years and mayor for almost 20, welcomed the students with open arms.

Now three to four days a week, nursing, physical therapy, medical, pharmacy, dental and nutrition students run a four-hour clinic to serve the tight-knit community. At the Midvale Community Building Community clinic, as it's now called, students care for six to 12 patients a shift. Faculty mentors encourage them to work autonomously and at their own pace, allowing them time to take a good history and do a thorough physical. If the clinic gets behind, they'll swoop in and see

patients themselves. The slower pace allows for a different kind of mentoring. "One time Dr. Samuelson made me listen to a patient's heart for an awkwardly long amount of time. He was convinced I would eventually figure out what was wrong . . . and I did," says Laura Gardner, a second-year medical student. "His encouragement and patience make me feel like an important part of the team, even though I'm still learning."

Students get to see firsthand what others do and gain an appreciation for their skill sets and knowledge. "They have this experience before being socialized with the traditional pecking orders or tensions that arise in clinical settings," says Morton. And they quickly learn that they don't have to have all of the answers. They can ask for a consult, or glean thoughts from other team members, says Laura Shane-McWhorter, Pharm.D., a faculty mentor and Midvale champion. From each other, students learn a more holistic view of care—for example, how to take a thorough medication history that includes the use of supplements, drugs and alcohol. "They rely on one another and realize that as providers, we're not alone. We're all here together to provide patient care," she says. The experience not only breaks down traditional barriers between students, but also between faculty mentors from all disciplines, community organizers and patients.

"It's a wonderful model of team care," says Morton. "They are truly making an impact." Since opening the doors two years ago, nearly 200 students have helped care for more than 900 patients in 2,000 visits. "Without these students a lot of people would be dealing with a lot of pain," says Mauricio Agramont, Midvale's community developer. "Our families are so grateful and feel good about creating an educational center for these students. They're our future providers, and the skills they learn here caring for our families will go on to benefit people throughout the state."

The lines between learner and educator blur as students find they have as much to teach as they have to learn from one another. They learn how the professional skills they need to acquire overlap and reinforce each other: clinical, diagnostic and professional. They interact with a broad range of mentors and a diverse patient population. And they

can volunteer for administrative roles to learn all the behind-the-scenes magic that goes into providing nonprofit clinical services. Many students are motivated to practice Spanish and learn what it's like to work through an interpreter. "Working with our community partners teaches us the difference between our objectives as clinicians and the values of the community," says Katey Blumenthal, a PT student and director of the student physical therapy clinic. "At the core, our clinic explores ways to reduce health disparities by providing care to those with the most limited access to it."

For all the good the clinic is doing for the community, Samuelson doesn't think of it as a charity. "I look at it as a learning lab where we can explore better ways to teach and practice team health care, while teaching clinical skills to students," he says. He's also excited about the possibilities for clinical investigation. "We serve a stable and amazingly cooperative and adherent population that for the most part resides in one zip code."

Samuelson and colleagues are pursuing more institutional IPE opportunities for every student, but Midvale has proven a winner. "I believe the future is bright," he says. Slots fill up so quickly that students complain there aren't more. Some graduates continue to volunteer as residents because they love the community and the experience. "These students are motivated and creative and so smart and they learn a ton from their experiences," says physical therapy faculty advisor Misha Bradford, D.P.T. "I can't help but think they'll be better prepared to contribute to a changing health care environment."

WHAT MATTERS: TIME OR TALENT?

For about 100 years, the framework for how we educate medical students hasn't really changed: Two years preclinical and two years clinical—just like Abraham Flexner recommended. His 1910 report brought sorely needed rigor and standards to what were then for-profit, two-year trade schools usually run by a few local doctors.

Since then, there have been important milestones in medical education and countless improvements to the curriculum. But the basic structure—four years of medical school plus three to five years of residency training—has persisted for more than a century. Time has been the determinant of skill. "We assume that at the end of four years all medical students are competent," says pediatric neurologist James Bale, M.D., who is collaborating on a national project to test a different path. "Maybe some are competent in three years. Maybe some need five," says Bale. "The question is, what do we really care about: Making sure everyone spends the same amount of time in medical school or that everyone is competent?"

The University of Utah is among four institutions handpicked by the Association of American Medical Colleges (AAMC) to pilot a competency-based model of medical school that explores that question. Pediatric students advance as they master certain skills, instead of the traditional "time in place" method. Education in Pediatrics Across the Continuum, or EPAC, which selected its first cohort of students this fall, shifts the focus from time to talent, says Bale.

If the idea was simple enough, the process to make it happen was not, highlighting how deeply entrenched the 'time in place' tradition is. The project's founder, former AAMC Board of Directors Chair Deborah Powell, M.D., dean emeritus of the University of Minnesota, had to get permission from the Accreditation Council for Graduate Medical Education, the American Board of Pediatrics, even the state of California, which has a law that mandates four years of medical school. The National Residency Matching Program also had to sign off on it since EPAC graduates are guaranteed a residency at their respective institutions.

"WAYNE SAID, 'TO HECK WITH ALL OF YOU, I CAN'T SIT AROUND DISCUSSING THIS FOR ANOTHER YEAR. I'M TAKING A TEAM OF STUDENTS WITH ME TO MIDVALE.'"

Patricia Morton, Ph.D., R.N.
Dean, College of Nursing

An interdisciplinary group of student volunteers, supervised by faculty mentors, provides pro bono care to an underserved community in Utah. The students learn to work in teams and gain early clinical experience, and the community receives the care it needs.

OFF THE CLOCK

The AAMC is piloting a time-variable, competency-based model of medical education for pediatrics.

Some quick facts:

SCHOOLS

University of California, San Francisco

University of Colorado

University of Minnesota

University of Utah

STUDENTS

4 cohorts of 15-20

PILOT LENGTH

10 years

The goal is not to fast-track students through training, Bale emphasizes, but rather to focus that training on an area that interests them—in this case pediatrics. EPAC prospects are identified in their first year of medical school and introduced to the world of children’s medicine through weekly seminars and clinical labs. Then, before the start of their third year, a lucky few are chosen to enroll in EPAC, effectively getting a jump-start on residency-level training. While other third-year students are doing clinical rotations in neurology and psychiatry, Leslie Jean McNaughtan will be doing hers in pediatric neurology and child psychiatry. “It lets you focus on pediatrics sooner,” says the mother of four. “Next month I’ll start working with general pediatric patients, who, theoretically, I’ll be able to follow for five years.”

The early focus allows for greater depth of training, and for developing closer ties with mentors. Most students get a week, sometimes a few days, with each physician they shadow. “They have all this expertise to share, but it’s really hard to grow and develop with a mentor who you see for such a short period of time,” says Melissa Ann Wright, who joined this year’s EPAC cohort. Students say it also helps reallocate their time. “Most students spend months and thousands of dollars traveling to interview for a residency,” says Wright. “While students are worrying about applications and letters of recommendation together, we can focus on developing the skills we need to practice.”

If the pilot succeeds, the AAMC hopes to expand EPAC to other pediatric programs across the country and eventually bring other specialties on board. There are no guarantees. “We really have no idea how it’s going to turn out,” admits pediatrician Adam Stevenson, M.D., associate dean of student affairs.

Regardless, this program is asking tough questions that haven’t been systemically asked in 100 years. And it’s challenging old assumptions about what success looks like by asking, which educational outcomes matter? “Right now accountability is based on artificial metrics, such as how many students get licensed or pass their boards on their first attempt,” says Bale. “Does that mean our graduates are good pediatricians? It means they’re knowledgeable, but that’s all we’ve had to go on.”

GME: WHAT’S IT WORTH?

Should the government subsidize the training of doctors when it doesn’t foot the bill for other vital professionals, such as lawyers, teachers or nurses?

Since the creation of Medicare in 1965, the answer has been yes. For half a century, the federal government has chipped in to cover a share of what it costs to train residents, called graduate medical education (GME). Every time a debate surfaced questioning the funding, Congress voted to continue the payments to encourage hospitals and clinics to keep the physician pipeline flowing. Everyone wants access to a doctor, and residency spots seemed to be the bottleneck.

Now as concerns about an impending doctor shortage are heating up, debate is stirring again. This time, the influential Institute of Medicine (IOM) weighed in with an unexpected and controversial perspective. The July 2014 IOM report recommended preserving public financing, worth \$15 billion, but called on health systems to provide greater transparency in accounting for how the money is spent. The report raised provocative questions: Are the nation’s teaching hospitals training young professionals to work as teams and care for an increasingly diverse



population? Are they producing enough primary care providers? Put more succinctly: Are taxpayers getting their money’s worth?

With millions of dollars at stake, many in academic medicine understandably took issue with the IOM report and immediately began lobbying to preserve the funding. The University of Utah chose a different approach. Our health care system is one of a handful of systems in the country that has the ability to drill down to the most granular level to know the true costs of providing care. So we decided to apply that same scrutiny to understand how much it costs to train residents. “Without data on the costs and benefits, how can you accurately respond to critics who wonder if a government investment is still valid or even needed?” asks Brad Poss, M.D., pediatrician and associate dean for graduate medical education.

Measuring the cost of graduate medical education is complicated, because it’s part school, part job. Residents are paid a salary while learning on the job—sometimes they slow things down and cost the system, and sometimes they speed things up and create more efficiency. How that all nets out is highly variable depending on the specialty and the year of residency—clearly a chief resident adds much more value than an intern.

To get a sense of the range, Poss and his team are analyzing three categories of care: primary care (pediatrics), surgical care (ophthalmology) and radiology (a hospital-based service). “We’re defining residents’ activities, documenting every point at which they touch patient care, and comparing their patient costs and outcomes to those of fully licensed staff working solo.”

The numbers aren’t solid enough to draw clear conclusions, but early findings suggest that ophthalmology residents enable our Moran Eye Center to perform more cataract surgeries because residents can counsel patients and prep them for surgery. Pediatrics, on the other hand, nets about \$10 less per visit when a resident is involved, likely because residents can’t charge as much as an attending, and they also tend to be less consistent documenting the right billing codes.

Cost is one thing, but the IOM report’s true concern was how we measure the value of that investment. “The IOM didn’t question our ability to produce technically adept physicians,” says Poss. “It questioned whether we’re preparing our residents and fellows to thrive in a field that is rapidly changing.” In addition to analyzing cost, Poss and team are also working on developing metrics, such as patient satisfaction surveys for residents, to help quantify how residency training is translating to patient care.

“It’s a mammoth undertaking. Next we’ll tackle world peace,” jokes Poss, who will document his findings in collaboration with Harvard Business School Professor Emeritus Robert Kaplan, Ph.D., M.S. Poss is hoping that other systems will take this kind of analysis on and be willing to share their findings. “Not only will this give us valuable information to improve the quality of residency programs,” says Poss, “but it will provide us with solid data to determine if taxpayers’ investment in training tomorrow’s providers is well spent.”

THE GME MONEY TRAIL

1965

Congress creates Medicare and includes subsidies for residency training.

1983

Subsidies are broken into two types: Direct payments to cover residents’ salaries and benefits; and indirect payments, which are a kind of bonus payment for hospitals that train a lot of residents as a way of incentivizing them to create more slots.

1997

Concerns about sustainability of the funding and an oversupply of doctors prompt Congress to cap the number of residencies funded by Medicare.

2014

Amid a doctor shortage, an Institute of Medicine report finds there is no real accounting for how residency programs spend the subsidies.

Right: Two students chosen to be in the first cohort of a pediatric pilot program testing a time-variable, competency-based model of education and training. **Opposite page:** Another pilot program sets out to measure the true cost and value of residency training. At our Moran Eye Center, early results suggest that residents increase overall productivity for cataract surgery.



CAN WE LOOSEN OUR GRIP WITHOUT LOSING CONTROL?

There's a lot of uncertainty swirling in health care, sending stakeholders retreating to their corners or looking for safety in numbers. Change all too often seems like a zero-sum game. Someone comes out the winner, and someone comes out the loser. So we hang onto what we know, believing that loosening our grip means surrendering all control. But do we have more to lose than gain from hanging so tightly to the status quo?



Every year, hospitals and insurers come together to negotiate their rates. “We call it the scrum,” says Chad Westover, M.P.A., CEO of University of Utah Health Plans. Like in rugby, the two sides collide, muscling for control of the proverbial ball, and either the hospital or the payer comes out better. But what happens to the consumer in that equation?

A similar scrum often plays out between independent-minded providers and tightly structured health systems. Those are the rules of the game, we tell ourselves, while the true losers are those relegated to the sidelines—consumers and the American economy. Health care spending has resumed its upward climb, reaching \$3.1 trillion last year, or \$9,700 per person. By 2042, if we continue on the current trajectory, it’s estimated that out-of-pocket health spending will consume 100 percent of the average household’s income. “At some point payers and providers have to realize it’s not just about them,” says Westover, who has played on both sides of the field. “If we as a health system don’t address the issues of value, cost, quality and access, then someone else will.”

Predicting the future of health care is like imagining the iPhone 10, says Westover. But he and many others are confident that aligning incentives and integrating payers and providers through new partnerships will help shape it. These are uneasy and unfamiliar unions, demanding unprecedented levels of cooperation, mutual respect and trust—and requiring individuals and institutions to get beyond the idea that giving up some control is a slippery slope to full surrender. “We can make great progress if we let go of the fear that we’re somehow going to come out worse, and instead ask, ‘What’s the need of the patient? What are the needs of the population? And are we organized in a way to take care of them?’” says Sean Mulvihill, M.D., CEO of University of Utah Medical Group.

CHASING UNICORNS

The hope is that all of us jointly accepting accountability for the quality and cost of care will make health care better and more affordable. If there’s a gold standard for doing

this, it’s the Accountable Care Organization (ACO), which has famously been compared to a unicorn: A fantastic creature vested with mythical powers that no one has actually seen. This may have been true in 2010 when the idea was enshrined in President Obama’s signature health reform law. But now, there are hundreds of public and private ACOs. The idea of payers and providers working as allies to share in the equity of what they build together isn’t novel for some organizations. But for academic medical centers, it’s new territory. “Right now, we’re focused on providing care, doing research and teaching students. Soon we will be partnered with health plans,” says David Entwistle, M.H.A., CEO of University of Utah Hospitals and Clinics. “It’s really sparking conversations about doing things in completely new ways.”

While it often seems that these conversations focus on the business of health care, at the end of the day, it’s not about the money, says CFO David Browdy, M.B.A. “Money is in the way right now. The goal of these partnerships is to get money out of the way of redesigning care. It’s about delivering greater value to patients.” We’ve had a lot of “magic bullets” that don’t get at the real problem, which is the fundamental structure of health care delivery, said Harvard Business School Professor Michael Porter, Ph.D., on a recent visit to the University of Utah. “We’ve got to transform the actual way we deliver care. How you work, how you measure what you’re doing and how you define success. And we need absolute clarity about what our fundamental purpose is: delivering value to the patient.”

Porter’s recipe for bringing harmony to the cacophony of competing interests and misaligned incentives is the Integrated Practice

Unit (IPU). That is, moving away from organizing health care around specialties and departments to organizing it around the patient’s problems and measuring success based on outcomes. He agrees that how we’re reimbursed for delivering this kind of coordinated care needs to change, but urges health systems not to wait around for payment reform. “Take a hard, honest look at where you are as an organization,” Porter said to health care leaders at a recent conference. “Start with your goal and then ask: Where are you making progress? Where haven’t you started?”

BETTER TOGETHER

There are 100 things that have to happen between having an idea and implementing it, not the least of which is convincing people that change is good. “There’s so much pressure for organizations to move quickly, make decisions and be agile in today’s world, that we often forget to involve and bring people along,” says Health Sciences Chief Counsel Elizabeth Winter, J.D., B.S.N. “Sometimes we need to slow down and acknowledge people for making countless little steps on the way to realizing big ideas.”

Big system changes prompt big concerns, says Sonja Van Hala, M.D., M.P.H., associate professor of family and preventive medicine, such as: “Will I be asked to sacrifice the autonomy or resources I need to do the work I feel is important?” Even smaller changes can meet with resistance. Van Hala gives the example of when she learned that her clinic would be extending hours and expanding from two shifts a day to three. Her first question was, “Why?” followed by, “How is this going to affect my life?” When you don’t know answers to these questions, you can become defensive about maintaining the status quo, she says. But when you understand the reasons behind them (greater access for patients in this case) you open up and sometimes even gain more than you lose. Now, on Mondays Van Hala often doesn’t finish clinic until 11 p.m. But her later shift has opened up new flexibility in her schedule, and she plays tennis every Monday morning. Moreover, she says, there’s a sense of satisfaction that comes with telling patients they can come see you tonight, or that they can get a same-day chest x-ray to see if they have pneumonia. “Patients express gratitude, and we take pride in that,” says Van Hala, who has some of the highest patient satisfaction ratings in the entire system. “It feels good.”

FEELING VALUED

Although “value” in health care is associated with better outcomes at lower cost, the word is rife with meaning. When people feel personally valued—both by their patients and by the administration—they’re much more willing to talk about the “value proposition,” says Dan Lundergan, M.H.A., who has worked at the University for 40 years and is now the executive director of Services Lines, Specialty Clinics and Support Services. “Change is visceral,” says Lundergan. “If as a system we’re not taking care of people’s hierarchy of needs, they may not be in a place to move to a different level.”

For Chair of Pediatrics Edward Clark, M.D., inspiring people to let go and change comes down to thoughtful leadership. “Leadership isn’t management. It’s understanding the social dynamics of a group and how to change the culture of that group,” says Clark. “The two most frequent and powerful questions I can ask are: What would you like and what are you afraid of?” By asking those questions and listening to the answers, Clark believes, we can prepare the organization for the future.

THE PROBLEM

\$5.4T

Projected health spending in 2024

\$10K

Amount spent per-person now

THREATS



Medicare payments tied to quality in 2018

4

Number of 8 largest health insurers contemplating mergers

OPPORTUNITIES

\$50B

Amount that payment bundles could save Medicare over 10 years

\$411M

Savings or bonuses shared by Medicare’s ACOs in 2014

PATIENTS FIRST: OUR VALUE EQUATION

Everyone has an idea for how to improve health care, and they all have merit. There are no one-size-fits-all solutions. There’s one common thread, however, woven throughout all of them: Creating more value for patients. This is how we define value.

$$\text{VALUE} = \frac{\text{QUALITY} + \text{SERVICE}}{\text{COST}}$$

The diagram illustrates the Value Equation. On the left, the word "VALUE" is written in red, with a large red "V" above it. To the right of "VALUE" is an equals sign. To the right of the equals sign is a fraction. The numerator of the fraction consists of two terms: "QUALITY" and "SERVICE". "QUALITY" is represented by an orange upward-pointing arrow with the letter "Q" above it. "SERVICE" is represented by a teal upward-pointing arrow with the letter "S" above it. The denominator of the fraction is "COST", represented by a green downward-pointing arrow with a dollar sign "\$" above it.

Primary Children's Hospital—a pediatric lifeline for the entire Mountain West—is a collaboration between University of Utah faculty and an Intermountain Healthcare hospital. Determined to contain costs and improve care, Chair of Pediatrics **Edward Clark, M.D.**, and Primary Children's Hospital CEO **Katy Welkie, R.N., M.B.A.**, worked together to form a novel ACO that strengthened ties between the two health systems to ensure excellent care for children well into the future.

Case Study No. 1

AN EXERCISE IN TRUST

Sharing risk is scary, and requires a lot of trust, especially between two financially separate organizations that happen to be competitors. So it's perhaps not surprising that the idea of creating an Accountable Care Organization (ACO) with Intermountain Healthcare-owned Primary Children's Hospital; its physicians, most of whom are University of Utah faculty members; and Intermountain's insurance arm, SelectHealth, left a few people scratching their heads. Grant Lasson, M.B.A., associate vice president for strategy, half-jokingly responded. "It's a great idea. The only thing we can't figure out is, what's in it for us?"

To Clark, who straddles both institutions as chair of pediatrics and chief medical officer of the children's hospital, the answer was clear. "What's in it for us? Aligning incentives around delivering more efficient care." By way of example, Clark points out that providers had been successful in eliminating wasteful tests, treatments and spending—in some departments by more than 30 percent. Children were spared poking and prodding, and

families and insurance plans enjoyed the cost savings. But these efforts translated to lost revenue for the hospital and providers. In other words, they were financially penalized for providing better care. "We needed to create a more sustainable solution," says Clark.

DOING THE RIGHT THING

The idea behind an ACO is to align financial incentives around doing what's right for patients. Pediatric Specialty Services (PSS) was designed to be that, an opportunity for everyone to dip their toes into ACO waters while still firmly planted on fee-for-service ground. In this case, the payer agreed to give a certain amount of money to care for a defined population of children. The hospital and providers agreed to pool their revenue and jointly bear financial risk for those patients. If they run out of money, they share equally in the loss. Conversely, if at the end of the year they have a margin, they share equally in the savings.

It wasn't easy coaxing harmony from all the players. "There were a lot of times where it felt like we were going back to baseline,"

says Primary Children's Hospital CEO Katy Welkie, R.N., M.B.A. It took at least a year of telling the story and would have probably taken much longer without the buy-in of top leadership, Welkie says. "The organizations had to agree, 'Even though we're competing entities in other places, in pediatrics, this is the right thing for the community.'"

To govern the ACO, the hospital and doctors started by developing a consensus-building board equally weighted with leaders from Intermountain and the University. The stockpile of trust that the two institutions had built over the years proved to be critical in the early stages, and later, when it came time for letting go of closely held financial and outcomes data. Division Chief of Pediatric Emergency Medicine Howard Kadish, M.D., M.B.A., who co-administers the ACO from the University side says, "I've been on the pediatrics faculty since 1992, and the only place I've worked clinically is at Primary Children's. We all know and trust one another."

SHARED RISK, SHARED GAIN

A prior investment by both health systems in robust data warehouses was also essential. "We know our costs, right down to supplies used in surgery, which is something that eludes most health systems," Kadish says. "You can't do this without sharing detailed data on costs and things like average length of hospital stays for different diseases processes." Strict criteria dictate who is allowed access to what information in compliance with federal privacy and antitrust laws.

Then there was the matter of fairness. "In most ACOs, hospitals take a larger share, but we agreed to an even split," says Kadish's administrative partner from Intermountain, Seth Andrews, M.B.A. "We were very conscious that the financial risk for physicians was greater than for the hospital, which has the support and resources of a large health chain to fall back upon."

What really sets PSS apart from other risk-sharing agreements is its limited design. Because the goal of ACOs is to keep patients healthy and out of the hospital, they generally focus on managing all of their health care needs. But Primary Children's is an acute-care facility drawing patients from five neighboring states. "We looked at our market and we didn't think it made sense for us to get into primary care," says Andrews. Instead, the group defined a realistic scope of services for which they'd be responsible: Specialized outpatient and inpatient care, from appendectomies and pneumonia to transplants and childhood cancer. "We said, 'here's a population of kids who cost this much, and we'll take total risk for their specialty services, but no more.'"

A LEAP OF FAITH

Now just 10 percent of Primary Children's patients fall under ACO, which went live in January 2015. The goal is to bring two-thirds of the hospital's patients into the mix. It's too early to make predictions, but six months into the pilot, providers are on track to come in under budget.

What's in it for the payer? Predictability. Usually the payer has a sense based on historical data of what its claims might be in a year. But in this arrangement, SelectHealth knows upfront exactly what it will pay in claims for those conditions, enabling it to set premiums more accurately. The hospital and physicians win because they are free to focus on delivering the most coordinated, patient-centered care without being restricted to services reimbursable by insurance. Take the example of kidney disease and recurrent urinary tract infections, says Patrick Cartwright, M.D., chief of urology and surgeon-in-chief at Primary Children's Hospital. "Our standard approach is to have these patients visit us on a regular schedule. But maybe what creates the best outcome is to have a nurse visit them every two weeks, helping them manage problems at home."

Money saved through such projects can now fuel a quality improvement pipeline. "This is like an internal granting system," says Cartwright, describing a Value Enhancement Quality Assurance committee set up to review proposals. The committee uses data to model the potential of different ideas and prioritize those projects with the greatest impact.

It took a leap of faith, but now there's a general feeling of excitement, Cartwright says. "When the pay schedule completely changes, people worry that someone will take advantage. But with PSS, there's so much opportunity I think most of us realized we would be foolish, even cowardly, to not take the risk."

WHAT IS AN ACO?

They vary in design, but an Accountable Care Organization is basically a network of doctors and health organizations who agree with payers to be jointly accountable for the health of a population of patients. Financial incentives are set up to ensure all the component parts of a person's care are working together, thereby avoiding wasteful and unnecessary tests and treatments and saving money.

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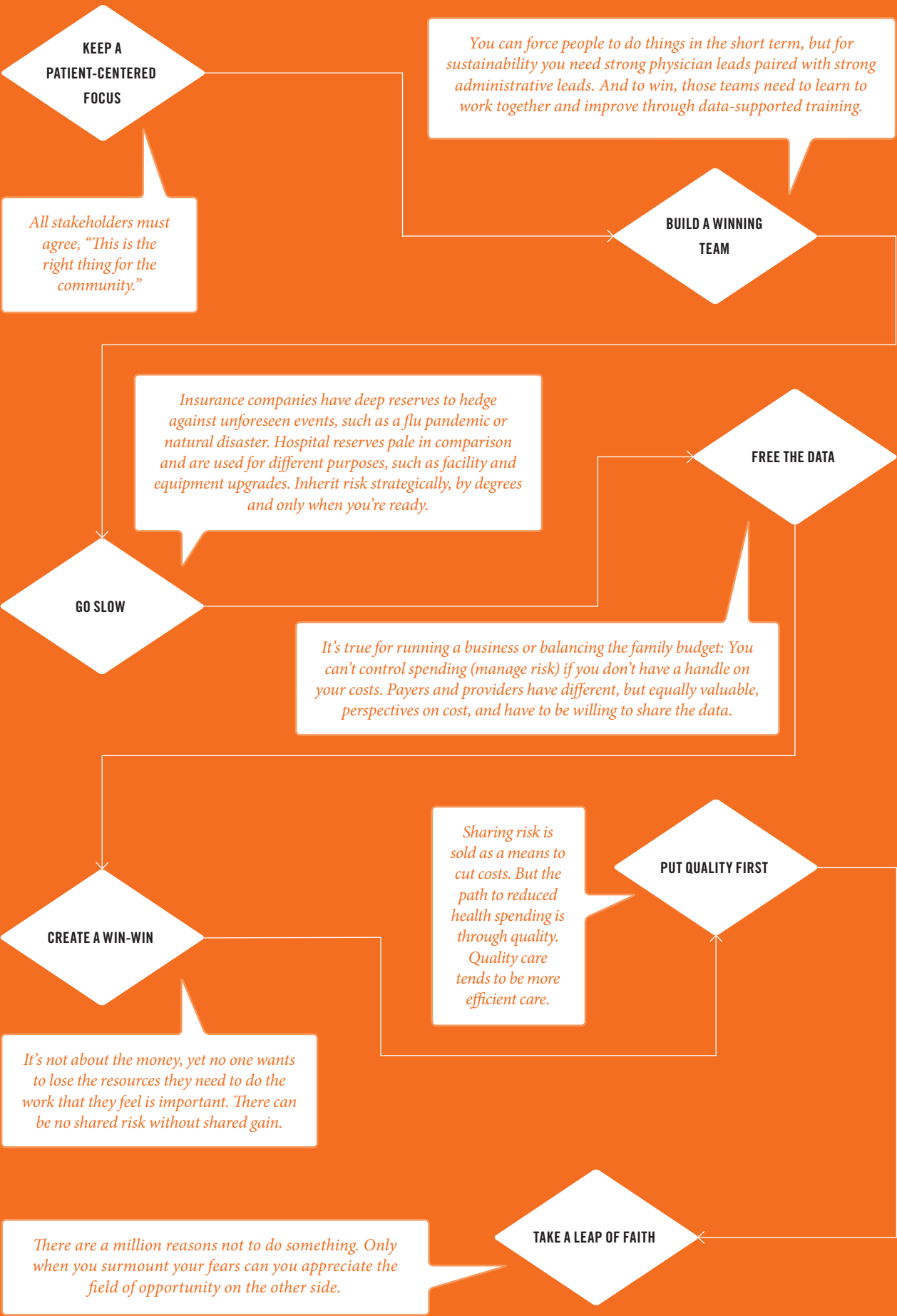
Number of operating public and private ACOs

18.2M

Consumers covered by ACOs

MOVING BEYOND THE HEALTH CARE SCRUM

Hospitals and doctors are now having to shoulder responsibility for not just the quality of care they provide, but the costs—a burden traditionally borne by insurance companies. It's new territory for all of us, but here are a few guideposts we've staked out along the way.



Case Study No. 2 BIRTH OF AN 'IPU'

Hopeful couples come to the University of Utah's Center for Reproductive Medicine with a singular goal: To get pregnant. It's an emotional experience. They pay cash and hope desperately for a good outcome. And for many years the center has exceeded their expectations with some of the highest in vitro fertilization (IVF) success rates and lowest costs. Still, behind the scenes staff knew that care wasn't as streamlined as it should be.

Women were cared for by the obstetrics and gynecology department, men were seen by an andrologist in the surgery department and their eggs and sperm hooked up in a petri dish in a separate lab. "Staff and faculty reported up to two different departments, so everything had to be filtered through the leadership structure, which is not the most efficient way of getting stuff done and a little bit of a game of telephone," says Erica Johnstone, M.D., M.H.S., assistant professor of obstetrics and gynecology. To compensate, the care team developed workarounds that ultimately

contributed to breakdowns in communication and patient flow. "I'd have a patient in my office, and because I didn't have the lab results, I couldn't tell her that we had viable embryos and she might soon be pregnant," says Johnstone. Even technology couldn't bridge the rift: There's currently no way to link a man and a woman in the electronic health record.

THE ACADEMIC LABYRINTH

If health care is complicated, academic medicine, with its tripartite mission, can become labyrinthine. So many of the ways we've organized ourselves and the funding streams that support us seem haphazard, but serve an organizational purpose. At the same time, it sometimes prevents us from providing the most patient-centered care. How can we bridge silos to improve care and still do groundbreaking research? Our Center for Reproductive Medicine, one of the few areas in health care where "the patient" is an entire family, seemed a great test case to find out.



Nowhere in health care is "collaboration" more necessary than in making a baby. And yet, looking at the way the University of Utah's fertility clinic was organized, you'd never know. Obstetrics, andrology and the IVF lab produced fantastic results in spite of the unintentionally convoluted way the clinic was organized. Andrologist **James Hotaling, M.D., M.S.**, and obstetrician and gynecologist **Erica Johnstone, M.D., M.H.S.**, are leading the charge to put patients, not departments, at the center. In six months, patient satisfaction has already improved 38 percent.



The University of Utah's Center for Reproductive Medicine was one of the nation's first IVF clinics and remains among the most successful. Revenue generated by the clinic is reinvested in research to better understand infertility.

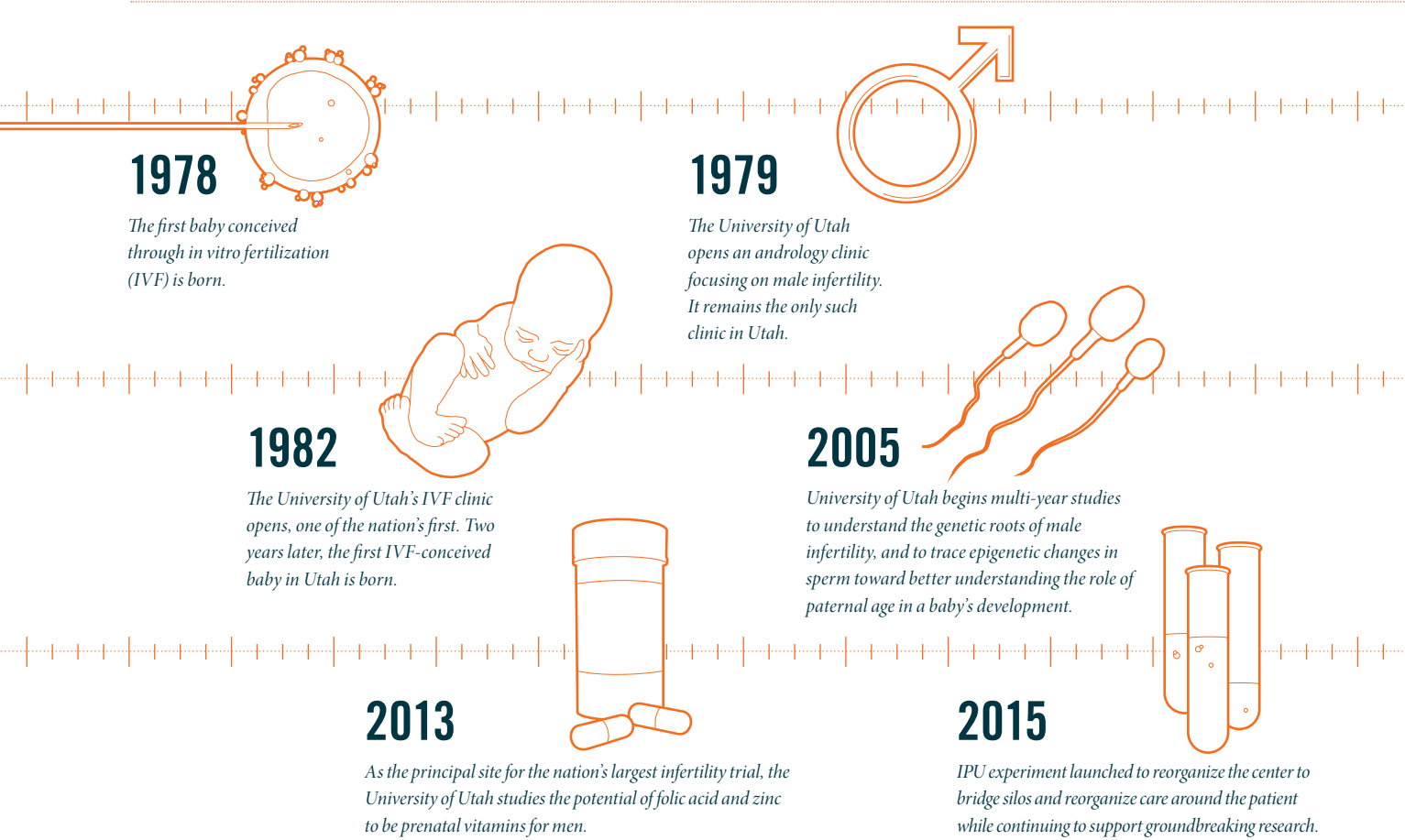
“This was the perfect opportunity to look at the imperfect way we’ve organized ourselves as a health system,” says Senior Vice President Vivian Lee, M.D., Ph.D., M.B.A. Lee issued a mandate to find a better way and suggested the vehicle: An Integrated Practice Unit (IPU). Foundational to an IPU is organizing care around the patient and making everyone involved accountable for the full cycle of care and overall outcomes, not just for their limited role. “We’re climbing a big hill of 100 years or more of a system that’s been provider focused. How do you turn a culture?” says Grant Lasson, M.B.A., associate vice president for strategy. Departments with a stake in the proposed IPU are still ironing out the governance structure, how to pool revenue and the much more difficult task of how to reallocate margin. That is no small thing. “These are some of the hardest conversations we’ve had,” admits Lasson. “But I’m confident that what we figure out here will create the model and inspiration, not just internally but for other systems as well.”

THE FORGOTTEN Y CHROMOSOME

At the heart of many of these conversations is a philosophical question. IVF clinics are incredibly competitive and price sensitive. Payment is already bundled. The imperative to deliver greater value—quality, cost and service—is clear. So where does research fit into the value equation?

Truth is, once there’s a treatment for a condition, there’s much less interest in finding out the root cause. IVF is itself a very successful workaround for infertility. The University has persisted in research to uncover the underlying causes—focusing on male infertility and how the sperm contributes to embryo quality. “In many ways, the Y chromosome has been along for the ride,” says James Hotaling, M.D., M.S., assistant professor of urology. The University has one of the top labs, if not the top lab, in the genetics of male infertility. Overseen by Douglas Carrell, Ph.D., professor of surgery, it boasts the largest biobank in North America, two NIH-funded RO1 grants and a clinical trial. The researchers, all based in the surgery department, have linked 40,000 infertile couples to the Utah Population Database, a repository of clinical data matched with genealogical records. “This is critical knowledge for parents to understand their pregnancy challenges and risks,” says Hotaling. In addition, they’re looking at the long-term health outcomes of children conceived through IVF. “Because people have kids so young in Utah, we predict we will be able to follow 170 grandkids of people who did IVF.”

IVF MILESTONES



But that cutting-edge research comes at a price. Historically it has relied heavily on funding generated by the center and the embryology lab, also based in surgery. “We’re faced with how we remain competitive in a highly price-sensitive and price-transparent market and continue our research,” Hotaling says. That’s the journey we’re on, creating a financial model that makes sense for our patients and clearly defines who we are as an academic institution.

A TECTONIC SHIFT

An interesting thing has happened along the way to creating an IPU. The mere idea of integrating the team and aligning care around patients is sparking different conversations and bringing people together for the first time to examine care processes. “These are people who have worked together for years but never had casual conversations with each other,” says Johnstone, who has worked with Hotaling to bring the center’s staff together for “brown bag” lunches. “No one is shocked by the problems we find, or by the fact that it’s convoluted. But until now, we haven’t had a complete view of the system.”

These open conversations are re-energizing staff. Using lean management tools and work-

ing with process engineers, the team is identifying countless opportunities to improve clinic flow. They’ve hired new medical assistants and a dedicated sonographer to better coordinate care and open up capacity. “You get the best performance from people when they feel empowered to make change,” says Johnstone. “Nobody before now, including me, felt empowered to make change. We didn’t even have a pathway to manage change.” Hotaling agrees: “This has been a tectonic cultural shift. We’ve already shifted 180 degrees.”

Over the past three months, patient satisfaction scores have risen 38 percent, driven primarily by reduced wait times, improved communication and ease of scheduling. It’s not clear how much to credit the proposed IPU when other improvement efforts could be influencing the scores, though Johnstone is confident it has helped. With greater transparency of finances, it’s easier to prioritize purchasing decisions and agree to shared goals. Lab manager Benjamin Emery, M.Phil., describes it this way: “It’s just a temperature change overall with the staff. It feels like this weight that was pressing down as things got more complicated is now lifting. Spring is here, and that’s a really good place to be. We hope summer is on the horizon.”

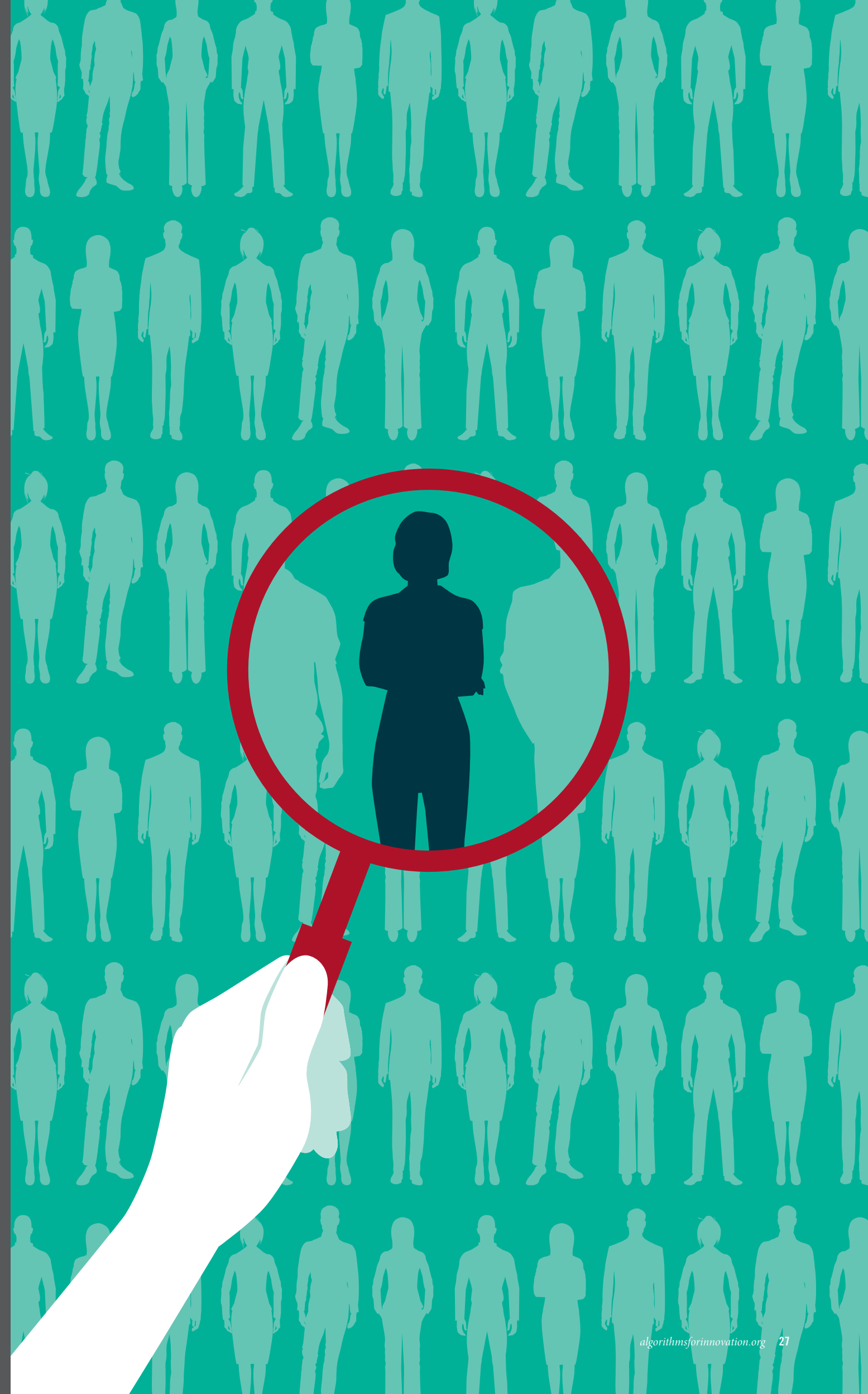
ELEMENTS OF AN IPU

Integrated Practice Units, or IPUs, are a term coined by Harvard Business School Professor Michael Porter, Ph.D. The idea is to move away from organizing health care around specialties and departments to organizing around the patient’s health needs. In a word, it’s value. Porter’s IPU provides the framework; our challenge is to build off of those principles and make it work in an academic setting. While it’s a paradigm shift for health care providers and systems, for patients, it should just feel like excellent care at an affordable price.

VOLUME		VALUE
Care is fragmented and reactive. Patients manage their own care, seeking referrals to specialists and scheduling appointments as symptoms call for it.	PATIENTS	A team of providers that specializes in treating specific medical conditions—whether that’s heart failure, diabetes or cancer—maps out a care plan and coordinates appointments over the full cycle of that care.
Individual providers report to a department or unit, identifying and mostly associating with colleagues in the same discipline.	PROVIDERS	Multi-disciplinary teams work together, often at a shared location. They share accountability for the quality and cost of care they deliver.
Quality is a measure of provider-focused outputs and adherence to care processes.	OUTCOMES	Quality is defined by determining the outcomes that are important to patients and measuring them.
Care is paid for on a fee-for-service basis and money accrues to individual departments, providers or service lines to spend at their discretion.	FUNDS FLOW	Care teams and departments are equity partners. Revenue is pooled, margin is shared and priorities are set through a shared governance structure that makes the flow of money transparent.

TRANSPARENCY: WILL IT HELP OR HARM HEALTH CARE?

Transparency is a noble quality. We like people who are open and honest, so it makes sense that we yearn for those same virtues in health providers and institutions. But transparency is a double-edged tool. Responsible transparency can build trust just as quickly as reckless transparency can erode it. It can be used to teach us something important about ourselves or to punish and shame. Doing it right takes time, money and a careful weighing of competing priorities—a complicated, and time-sensitive, calculus for today's health organizations.



“Google me,” said Courtney Scaife, M.D., as she walked into the office of Chief Medical Officer Thomas Miller, M.D. He did and up popped an ugly comment about the pancreatic cancer surgeon. How long had it been floating around on the Internet? Was it even a former patient? A disgruntled co-worker? “Now look at these comments,” she said, placing a stack of Press Ganey patient survey results on his desk.

Scaife has a tough job. The five-year survival rate for patients with pancreatic cancer is 6 percent. Most of her patients are dying, yet they fill their surveys with overwhelmingly positive and appreciative comments about the care she provides. “You privately email these comments to me every month, but that’s not what my patients see when they Google me,” an impatient Scaife told Miller. “You have a website. You have my bio. Why don’t you put these reviews online?”

There was no denying Scaife’s logic. “We have reams of unbiased, accurate data that we know is from actual patients, and most of it is very positive,” says Miller. “Why keep this feedback so private? Why not share it?”

Scaife had hit on a fundamental problem in health care: Information asymmetry. We collect terabytes of data and keep most of it behind a firewall, sometimes not even sharing it internally, for reasons that often have nothing to do with delivering care. And the American public—in most ways, incredibly demanding consumers—has shown uncharacteristic patience with the lack of information.

It’s not that we don’t want to find good doctors and safe hospitals. We’ve just accepted that we’ll have to rely on the advice of friends and family—even perfect strangers if they have reasonable suggestions. “It’s kind of shocking,” says Robert Pendleton, M.D., chief medical quality officer. “We spend more time vetting a new car or TV than a doctor or hospital.”

Consumerism, though, is on the march and so are out-of-pocket expenses, prompting patients to take a more active role in their health. No longer satisfied playing the role of acquiescent patient next to the paternalistic physician, they’re increasingly empowered, informed by Dr. Google and asking tough questions, such as: Where is the best, safest place to get this procedure, and is it worth the risks and expense? Proponents see the rise of consumerism as a powerful means to make health care better and more affordable. What’s missing is what’s always been missing: Access to the information patients need to participate as equal partners in their health care.

“EVERYONE WANTS TRANSPARENCY TO BE A TRICK. IT’S NOT A TRICK. TRANSPARENCY DOESN’T START FROM THE OUTSIDE. IT STARTS FROM WITHIN AN ORGANIZATION WHEN WE LOOK TO EACH OTHER AND LEARN FROM EACH OTHER. THAT’S HOW CHANGE HAPPENS.”

Vivian S. Lee, M.D., Ph.D., M.B.A.
Senior Vice President

THE PROBLEM WITH RANKINGS

More data isn’t the answer. Consumers need reliable data organized in a meaningful way to guide their choice of doctors, hospitals and health plans. Trouble is, most of the information available today is incomplete, incomprehensible or designed to expose bad actors, which paints a distorted picture of the profession, causing patients to distrust physicians and physicians to feel under attack. “In our own experience with posting data online, we’ve really tried to reduce that level of pain, because it shouldn’t be an adversarial relationship between patients and providers. It should be a partnership,” says Senior Vice President Vivian Lee, M.D., Ph.D., M.B.A.

Want to find the best hospital? There are plenty of report cards out there catering to our appetite for easy-to-digest rankings and lists, but don’t expect to find any consensus. A study in *Health Affairs* revealed no single hospital receives high marks from all four of the most popular rating services: U.S. News & World Report, The Leapfrog Group, Healthgrades and Consumer Reports. The very same 27 hospitals that were rated “best” by one group were rated among the “worst” by another ranking.

Federal data dumps comparing the cost (average charges) and safety of hospital procedures bring some consistency and objectivity to the scoring. But, assuming you have the patience to download the information into a massive spreadsheet, good luck making sense of it. “The challenge is putting data into a format that’s useful, and not having people shrugging their shoulders. It falls to all of us to try to make sure that doesn’t happen. Because it’s too important,” says Charles Ornstein, an investigative journalist for the nonprofit ProPublica. “We want to make sure our data has as much context as possible and is as helpful as possible.”

The online tools are getting sharper, thanks in part to Ornstein and his ProPublica colleagues, who recently launched a Surgeon Scorecard that shows how surgeons performing eight elective procedures compare on safety using Medicare death and complication rates. ProPublica’s methodology has been praised by patient safety experts and criticized by some providers who question the scorecard’s reliance on readmission rates as a proxy for skill. Should a hip surgeon be held wholly responsible for such complications as constipation or deep venous thrombus? But no metric is perfect. “Recognizing that all of these methods have advantages and disadvantages, progress will be iterative and incremental,” opined David Classen, M.D., adjunct associate professor of internal medicine, in a review posted on ProPublica’s website.

Pendleton agrees: “It will get better over the next five to 10 years. But for now, most health decisions will still be made based on the kind of insurance one has, convenience and word of mouth.”

ENTER THE CROWD

Fortunately, “word of mouth” is no longer limited to friends and family. We now have the Internet, or the crowd, to rely on. Online reviews are like “Ask Martha” on steroids, bringing an exponential “n” factor to the discussion. In one month in 2015, the three doctor review sites, HealthGrades, Vitals and ZocDoc logged more than 10 million unique visitors. The problem with these third-party sites is that their sample size is small (two studies found an average of two and three reviews per doctor), and there’s no way to verify that the reviews are from actual patients and not a family member, competitor or paid promoter. Recognizing this weakness, Yelp and ProPublica teamed up to augment consumer reviews with verifiable survey data from Medicare—a crowd-meets-data combination that could be a game-changer.

But the question remains: Why sit back and let Yelp, ProPublica and HealthGrades take the lead and define our online reputation for us? That’s what Miller wondered as he weighed the pros and cons of putting the University of Utah’s physician reviews online. It was the right thing to do, and the smart thing to do. Of that, Miller was confident. But the University would be forging new territory—no other academic medical center had gone public with its data from Press Ganey, a processor of patient satisfaction surveys for about half the nation’s hospitals. Miller knew physicians would be unsettled, and in fact, their objections were numerous.

Won’t this be bad for business when none of our competitors are making this information public? In trying to avoid negative reviews, won’t providers be encouraged to bend to the unreasonable demands of patients who are unqualified to judge the quality of care? And won’t this, in turn, lead to over-testing, over-treatment and higher costs? Why should we be on the bleeding edge of something so risky and untested?

But believing “the best defense is a strong offense,” Miller persisted in championing the idea to his physician colleagues. And on Dec. 1, 2012, after six months of spirited debate and countless meetings, the online reviews went live—posted, as Scaife had suggested, on the institution’s Find-A-Doctor website with unedited comments and an accessible five-star ranking. “I’m glad it worked, but it was a very rocky road,” says Chrissy Daniels, M.S., director of patient experience. “I see my job as trying to make physician practices more

PATIENTS AS CONSUMERS



Of Internet users say they looked online for health information within the past year



Of consumers say they trust web reviews as much as personal recommendations



Say physician rating sites are “very important” when choosing a physician



Of online review users say they avoided a physician with bad ratings



Of those who don’t use online physician reviews say they don’t trust the information on the sites

INVITING THE CROWD

It’s hard to imagine making a critical purchase—buying a car or refrigerator, or hiring a roofer—without first surveying “the crowd” on review sites such as Angie’s List or Yelp. But when it comes to buying health care we’ve relied mostly on word-of-mouth recommendations from a friend or relative. Hospitals have been surveying discharged patients for years, asking them about care providers’ friendliness, courtesy and clarity of communication. But they never publicly reported the results. “Why?” wondered pancreatic cancer surgeon **Courtney Scaife, M.D.**, who lobbied her employer, the University of Utah, to be the first academic medical center to put its scores online. Here’s how Scaife ranks:

4.8 ★★★★★

Likelihood of recommending care provider

4.8 ★★★★★

My confidence in care provider

4.7 ★★★★★

Time care provider spent with me

4.8 ★★★★★

Care provider spoke using clear language

4.8 ★★★★★

Care provider’s effort to include me in decisions

4.8 ★★★★★

Care provider’s concern for questions & worries

4.8 ★★★★★

Care provider’s explanation of condition/problem

4.1 ★★★★★

Wait time at clinic

4.8 ★★★★★

Care provider’s friendliness and courtesy

satisfying and to be a support to them, and this felt like it put us at odds with them. We presumed no harm would come but there’s always a risk. I worried, ‘What if this doesn’t work?’”

A DOSE OF TRUST

Looking back now, it’s tempting to paint the experience as proof of the miraculous, transformative power of transparency. Once in the 28th percentile nationally for patient satisfaction, we now rank in the 85th percentile. One of every two of our physicians are in the top 10 percent when compared with their Press Ganey peers, and one in four physicians place in the top 1 percent nationwide. And we achieved these gains with no sacrifice in quality or rise in costs. But transparency is no panacea. Embracing it takes a heavy dose of trust—trust in each other, trust in the organization and trust that what’s about to happen is, in fact, in the best interest of patients. And that kind of trust isn’t built overnight. “Everyone wants transparency to be a trick. It’s not a trick,” says Lee. “Transparency doesn’t start from the outside. It starts from within an organization when we look to each other and learn from each other. That’s how change happens.” Online reviews may have been the accelerant, but the groundwork for improvement was meticulously laid over seven years. “It was the result of a ton of spadework to engage provider teams and align the organization around a shared purpose and shared set of goals,” Daniels says. And that spadework began in 2008 at a leadership retreat organized by Lee’s predecessor, Lorris Betz, M.D., Ph.D.

GIVING PATIENTS A VOICE

Over the years, the University had earned a reputation as the regional center for cutting-edge, high-end specialty care. But service took a back seat to the pursuit of clinical excellence. Betz was unhappy with the feedback he was receiving from unsatisfied patients, including his wife, Ann. So he summoned the chairs, deans and hospital leadership to his home, where he read aloud excerpts from patient complaints about long wait times, delays in scheduling appointments, poor communication and an overall lack of professionalism. “It was the perfect storm of embarrassment and frustration that created the urgency to change,” says Betz, who ended the retreat with an uncharacteristically stern mandate to create an “exceptional experience” for every patient at every point within the system.

The former vice president’s mantra—“medical care can only be truly great if the patient thinks it is”—fundamentally changed the paradigm by making the patient, not the physician, the arbiter of good care. “It’s important for organizations to understand what they’re aspiring to be. Our problem wasn’t just in some processes. It was about who we thought we were,” says Sean Mulvihill, M.D., CEO of University of Utah Medical Group.

With a goal in sight, the next step was to find the right way to measure progress. Metrics matter. The University chose to use nationally benchmarked Press Ganey data, bringing consistency and credibility to the scoring, and took great care in deciding how to survey patients, focusing on questions related to professionalism, communication and shared decision-making. “We specifically did not ask, ‘Did your physician do whatever you asked for?’” Daniels says.

But for physicians it was still a huge shift. The metrics didn’t jibe with how they defined quality. For every study linking satisfied patients with good clinical outcomes and patient safety, there was one showing how patient satisfaction didn’t matter and would make quality worse and push costs higher. “What physicians think the patient wants is for them to think clearly, draw on their knowledge, make an accurate diagnosis, and if there’s surgery, operate with skill,” says President of Medical Staff Blake Hamilton, M.D. “So it creates a disconnect. When they receive surveys back they’re thinking, ‘I just saved someone’s life and I’m being docked because I wasn’t nice enough in the follow-up visit?’”

Doctors have pride of ownership over their practices, but they don’t deliver care on their own. “The patient experience is everyone’s responsibility, which is why we were very clear that these metrics would never be used in a punitive manner,” Miller says. To further reassure and support physicians, the hospital took responsibility for things it could control, implementing system-wide changes, such as offering valet parking (no tips allowed). An on-call “patient ambassador” was hired to cater to

WHO WOULD YOU TRUST?

Google “Courtney Scaife” and here’s what you’ll find:

HEALTHCARE.UTAH.EDU

4.8 out of 5 stars

131 patient ratings

74 patient comments

HEALTHGRADES.COM

4 of 5 stars

9 votes

VITALS.COM

3 of 5 stars

7 responses

2 reviews

As a consumer, which reviews would you trust? Feedback from a critical number of real patients or unverifiable data from an anonymous few?

LIFTING THE VEIL

When it comes to transparency in health care, the field is wide open. Quality, price, outcomes, safety . . . no one system can tackle it all. We can learn by example, though, from organizations taking the lead.

PRICE

How much will I pay?

Level: Direct-to-consumer

In “a sea of sameness,” the question facing every health organization is, “How do you distinguish yourself?” Increasingly the answer is through price transparency, says Michael Glenn, M.D., chief medical officer at [Virginia Mason Health System](#).

With rising out-of-pocket costs, consumers are demanding it and states are mandating it. Trouble is, there’s not just one list price. Insurance-dependent health care prices are highly variable and “patients don’t like surprises in their medical bills,” says Glenn. So, instead of just publishing a price list, Seattle-based Virginia Mason introduced an on-call service for customized price quotes. The path to affordability is through quality, believes Glenn. “But you can’t market quality, and say, ‘Come to the place with better care,’ if you don’t disclose how much you’re going to charge for that care.”

COST

What’s the price based on?

Level: Internal to system

Price vs. cost. While the terms are often used interchangeably, they’re not the same. How much a consumer is charged (price) does not necessarily reflect how much it costs to deliver the care—and the latter has been shrouded in mystery.

[University of Utah Health Care](#) is among a handful of health systems that can track cost data for every patient and procedure. A data tool developed in-house (Value Driven Outcomes or VDO) allows physicians to see variation among providers at a high level and then drill down to the granular details to figure out how to improve. “As we move from volume to value, our survival will depend on our ability to deliver the best care for the lowest price,” says Senior Vice President Vivian Lee, M.D., Ph.D., M.B.A. “The only way we can do that is to have a grip on our costs.”

[continued on page 35]

patients’ non-medical needs, such as fixing broken bed alarms. “All of our care teams wanted to be part of the solution. The first scores to improve were ‘courtesy of the receptionists and medical assistants,’” says David Entwistle, M.H.A., CEO of University of Utah Hospitals and Clinics. “When you call upon people to do the right thing, they respond.”

COACHING NOTES

But if physicians no longer objected to the metrics, they didn’t really pay attention to them until 2011 when the University shifted from paper surveys to emailed questionnaires, driving up the response rate by nearly 400 percent overnight. The feedback with email surveys was more timely (seven days old) and more detailed. “With written comments, you’d get, ‘It was great. He was nice. The check-in process was smooth,’” says Daniels. But with e-surveys there was no more mind-reading about what patients meant by a score of three or four, because they explained exactly what they meant. “We got little coaching notes,” says Daniels. Patients gave tips suggesting that the physician needed to have more eye contact, or that the exam room needed an extra chair for family members or that the doctor “was very knowledgeable, but could work on being more personable.” Suddenly, hospital administration was no longer the middleman—patients were talking directly to physicians and telling them what they wanted.

One by one, department chairs started sharing data with their faculty. At first the comparisons were blinded so faculty members could see how they performed in comparison to their peers but there were no names attached. “Guess what?” says Daniels. “No one paid attention.” But then the department chairs unblinded the data so everyone could see everyone else’s patient satisfaction scores—your name in green if you scored higher than the goal and in red if you didn’t. “This was the most emotional work we did. There was a lot of heartache and grief around this time,” says Daniels.

There are two reasons to embrace transparency, according to Pendleton: “To give patients more information and to encourage providers to change behavior.” After unblinding the scores, patient satisfaction scores jumped from the 28th to the 50th percentile. “Doctors are competitive and most want to do the right thing. It’s sometimes the busyness of health care that gets in the way,” says William Dunson Jr., M.D., director of Huntsman Cancer Institute’s Acute Care Clinic and Internal Medicine Service. “When confronted with data, physicians have two options. They can either ignore it or they can own it and, if needed, make changes to improve. Most of our faculty intuitively chose the latter,” says Robert Glasgow, M.D., chief value officer for the Department of Surgery. When Lee arrived in 2012, she took transparency a step further and began sharing scores by specialty at leadership meetings with department chairs. “That grabbed the attention of the remaining few departments that we’d struggled to engage for years,” says Daniels.

Patient reviews brought science to the art of bedside manner, showing through data why it’s important to knock and pause before entering the exam room, to be respectful and to make eye contact. “Patients want the best care they can get, but they also want their emotional needs met,” says Dunson, who has been a tireless champion of patient satisfaction at Huntsman Cancer Hospital, which has all of its clinics rated in the 99th percentile nationally. “Having their responses fed right back to you . . . It re-centers you, and reminds you of why you got into this career in the first place.”

THE FINAL PUSH

By the time the University was contemplating going fully public with its scores, physicians averaged 4.7 out of 5 stars. Still, it took Miller and Daniels going door-to-door to assuage individual concerns by pointing out how Press Ganey scores compared to those already being published on sites like HealthGrades. “It was a small

“WE HAVE REAMS OF UNBIASED, ACCURATE DATA THAT WE KNOW IS FROM ACTUAL PATIENTS, AND MOST OF IT IS VERY POSITIVE. WHY KEEP THIS FEEDBACK SO PRIVATE? WHY NOT SHARE IT?”

Thomas Miller, M.D.
Chief Medical Officer

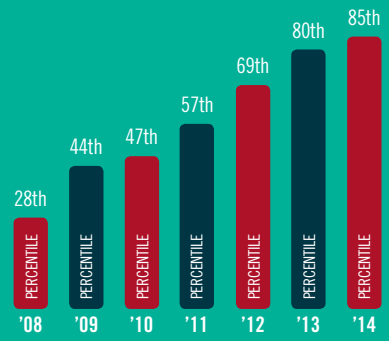
Championed the idea of going public with patient reviews to his physician colleagues.

LET THE DATA SPEAK

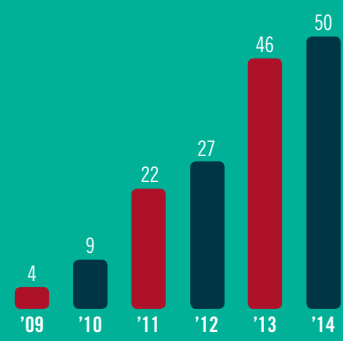
It's hard to argue with results. As University of Utah Health Care became more transparent with its patient satisfaction metrics, scores improved—with no sacrifice in the quality of care delivered or rise in costs. In fact, the University saw improvement on both fronts. Coincidental? Maybe. But giving voice to patients certainly hasn't hurt.

OUR PATIENTS ARE...MORE SATISFIED

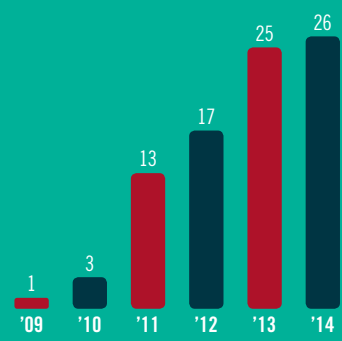
How we compare to our peers nationally



Percent of our providers in 90th percentile or above



Percent of our providers in 99th percentile or above



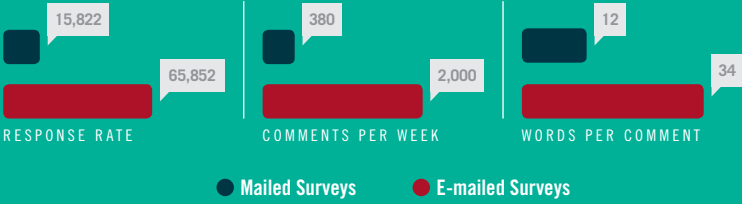
Source: Overall score, Press Ganey Medical Practice Survey.

MORE ENGAGED...

Improved Web Traffic

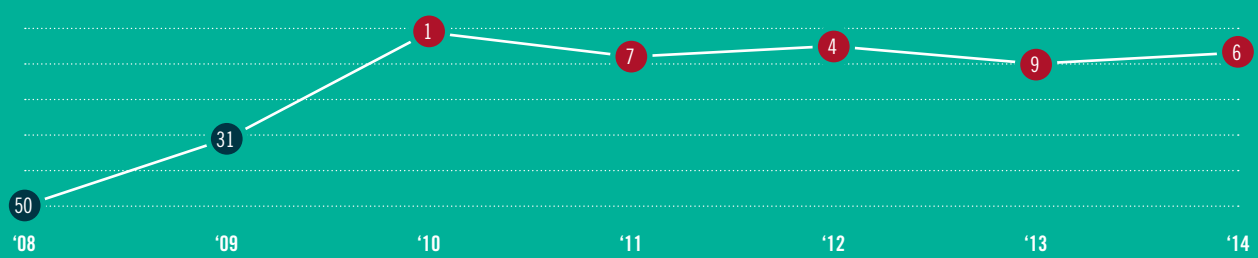


Improved Survey Response



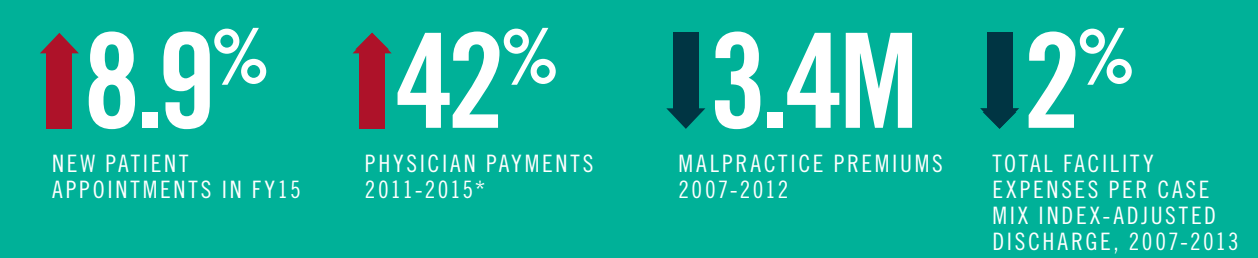
RECEIVING QUALITY CARE...

Top 10 in quality five years running



Source: University HealthSystem Consortium ranking, a measure of quality comparing 118 teaching hospitals.

MEANWHILE, WE'RE TREATING MORE PATIENTS MORE EFFICIENTLY



Source: University of Utah Office of Budget & Planning Institutional Analysis and Data Management; and "Patient Complaints and Malpractice Risk," JAMA (2012)
*Financial data for 2015 are preliminary

minority who persisted in opposing it, but they pushed back pretty vigorously," Miller says.

Some feared one or two negative comments would sink their practice. And they worried that only the most disgruntled or the most pleased would post reviews, skewing the data. To counter that, University of Utah decided to only publish the reviews of doctors who have worked six months within the system and accumulated at least 30 surveys. That's far more than found on other "shop-a-doc" sites, making it ring truer for consumers, who are adept at sifting through and weighing the opinions they read.

Also, there would be no editing of comments. "The public is not foolish, they are going to be distrustful if there is not a spectrum of comments," says Miller, who simply sees the negative comments as an opportunity to improve—"we want to be held accountable." And, as for the positive comments? "They're far more effective and affordable than advertising," says Miller.

A year after reviews went live, traffic to physician profiles had more than doubled. "Any digital marketing strategist would kill for that kind of growth," says Brian Gresh, M.P.A., former senior director for Interactive Marketing and Web. Not all of that growth can be directly attributed, Gresh says, but it certainly played an important role. It also improved search position. Studies estimate that one-third of all web traffic comes from the first result and now the University owns that top spot. Meanwhile, satisfaction scores continued to rise.

For providers like Scaife—whose scores rank in the high 90th percentiles—it's about accuracy. Now when prospective patients Google her, they can be sure they are hearing from actual patients. Consumer feedback hasn't resulted in wholesale changes to her practice, but it has reinforced certain things. "I always draw out the anatomy of the surgery I'm going to perform," says Scaife. "And even though we all feel a lot of pressure to be more efficient, that is something I will never get rid of because I know from the comments how much patients appreciate it."

A lot of patient satisfaction is about managing expectations and the ratings and comments accomplish that too. The patient knows beforehand that she might have to wait longer, or that the nurse is really the fountain of information. "Patients certainly look at the reviews and vote with their feet," says Glasgow. "I get comments a few times a week saying, 'I read about you.' That feels good."

Other health centers have started going public with their reviews, including, Stanford University, Wake Forest Baptist Health in North Carolina, Cleveland Clinic and University of Pittsburgh Medical Center. Daniels has talked to more than a dozen organizations about how they can put their reviews online. "We're entering a marketplace driven by competition. And it's competition on the right things, not on who's got the best brand," says Thomas Lee, M.D., Press Ganey's chief medical officer. "It's competing on who can actually meet patients' needs and do it as efficiently as possible. It's really value."

WHAT'S NEXT?

"Five-star" care is now ingrained in our culture, and opening the way to even greater levels of transparency. It's giving patients a voice, and in so doing, shifting the paradigm for how we deliver and gauge the quality of care. We're moving more of our specialists off campus into conveniently located neighborhood clinics that stay open after hours and on weekends. Some clinics even do house calls and deliver same-day mammography results. We've launched an online scheduling pilot, allowing patients to schedule appointments the same way that they book hotels and flights. And, following years of internal transparency of our costs (see Lifting the Veil, page 32), we plan to publish prices for hundreds of our procedures. Ten years ago, we might have written off these improvements as impossible or impractical. But now they're happening with increasing speed, because it's what patients want and we're finally listening. The hard part is past us. In fact, when we asked one

[continued from page 32]

QUALITY

Is my doctor any good?

Level: Available to public but written for physicians

No one seems to agree which of more than 600 quality metrics matter, and it's questionable how many are of interest to consumers. But one thing we know physicians care about is how they compare to their peers.

For the past 10 years, **Cleveland Clinic** has published dozens of Outcomes Books, each detailing how the Ohio-based health system performs on a multitude of metrics, from cataract surgery complications to in vitro fertilization success rates.

The books are written by specialists and intended for colleagues, so some of the information may be too technical for a lay audience. The true value is the learning that happens when physicians track their own outcomes and share them with peers. "Doctors respond to data . . . and peer pressure," says Cleveland Clinic President and CEO Delos "Toby" Cosgrove, M.D. "No one in medical school wanted to be last in class, and no one wants to be last in a certain quality metric."

OPEN NOTES

What is my doctor thinking?

Level: Individual patients

If patients could read what their physicians wrote about them, would that encourage them to take charge of their health? In 2010, three health systems—**Beth Israel Deaconess Medical Center**, **Geisinger Health System**, and **Harborview Medical Center**—set out to answer that question as part of an experiment sponsored by the **Robert Wood Johnson Foundation**.

"Patients tend to remember less than half of what their doctor tells them and often something gets lost in translation," says Tom Delbanco, M.D., who co-led the experiment at Beth Israel. Some doctors resisted, but five years of data shows participating patients are more engaged and better adhering to their care plans. Having another set of eyes—the patient's—helps avoid medical errors and diagnostic delays. Dozens of health systems and five million patients have joined the OpenNotes movement. "I think this will become the standard of care," says Delbanco.

“THE OUTCOMES THAT MATTER MOST TO PATIENTS ARE THE OUTCOMES THAT MATTER MOST.”

Charles Saltzman, M.D.
Chair, Department of Orthopaedics

of our division chiefs what he thought about going public with more of our data he said: “Do whatever you want. You’re already putting what my patients say about me online for all the world to see.”

The next step is to marry our cost data with quality metrics—specifically, metrics matched to the individual health goals of patients. “The outcomes that matter most to patients are the outcomes that matter most,” says Orthopaedics Chair Charles Saltzman, M.D., who spearheaded an initiative where every orthopedic patient is given an iPad at check-in and asked to answer questions about how they are feeling and functioning. The information helps doctors understand patients’ needs and tailor treatment accordingly. Eventually, it will enable providers to more precisely predict what different patients—a 23-year-old athlete versus a 67-year-old retiree—should expect to gain from treatment. By 2016, one-third of the University’s outpatient units will use Saltzman’s model.

“Like all health systems we’re experimenting and we still have a long way to go,” says Lee. “What we’ve found, though, is that with the right patient-centered vision, the right data and the right teams, change is possible. Transparency is vital to that process, but it’s just one of the levers driving improvement—not an end goal in and of itself.”

Frequently Asked Questions

ONLINE PHYSICIAN REVIEWS: THE METHOD TO OUR MADNESS

Health organizations understandably have reservations about putting their physician reviews online. There are, of course, no guarantees, or surefire recipes for success. We’re all experimenting. In the spirit of transparency, here are answers to some of our most frequently asked questions.

WHICH PROVIDERS ARE INCLUDED IN ONLINE SCORES?

Providers are evaluated on their outpatient clinic visits. For statistical reasons, providers must have 30 surveys returned in 12 months.

HOW DO YOU CALCULATE THE STARS?

We take the mean score and divide it by 20, which corresponds to the five-star Likert scale used by other rating websites, such as HealthGrades.

HOW DO YOU PROMOTE THE SURVEYS TO PATIENTS?

We send an email to patients three days following their visit, with a reminder sent two days later.

DO DOCTORS SEE THE COMMENTS BEFORE POSTING?

Yes. We pull comments every week, and send them to unit managers (and any provider who asks for them). They have 14 days to flag comments of concern.

DO YOU EXCLUDE ANY COMMENTS?

Yes. We exclude comments for profanity or language that is discriminatory, libelous or risks patient privacy. We do not edit comments. All comments are posted in their entirety.

IS THERE AN APPEALS PROCESS?

Comments of concern are sequestered until they are reviewed and adjudicated by a panel of physicians. We receive very few appeals.

HOW OFTEN DO YOU UPDATE RATINGS?

Five-star ratings are updated two times a year. Comments are updated monthly and posted for at least 12 months.

HOW DID YOU COLLECT PATIENT EMAIL ADDRESSES?

We engaged registration staff and offered awards to those who collected the most emails. Our patient portals and federal Meaningful Use standards are also helping with collection.

DID YOU HAVE PUSHBACK ON RESPONSE RATES AND N-SIZES?

Yes, response rate is important. We believe a minimum of 30 survey responses per physician is necessary to draw meaningful conclusions from the data. Moving from paper to email surveys yielded a fivefold increase in our return rate.

DID YOU NOTICE A DRAMATIC INCREASE IN INTEREST IN HIGH-SCORING PROVIDERS OR DECREASE IN LOW-SCORING PROVIDERS?

This might be happening but we haven’t measured it directly, and we haven’t seen a revenue or patient-volume decline in any of our units. That’s partly because we’ve focused on improving access across the board, which has led to more patients entering our system.

HOW DO YOU REWARD OR RECOGNIZE HIGH-PERFORMERS?

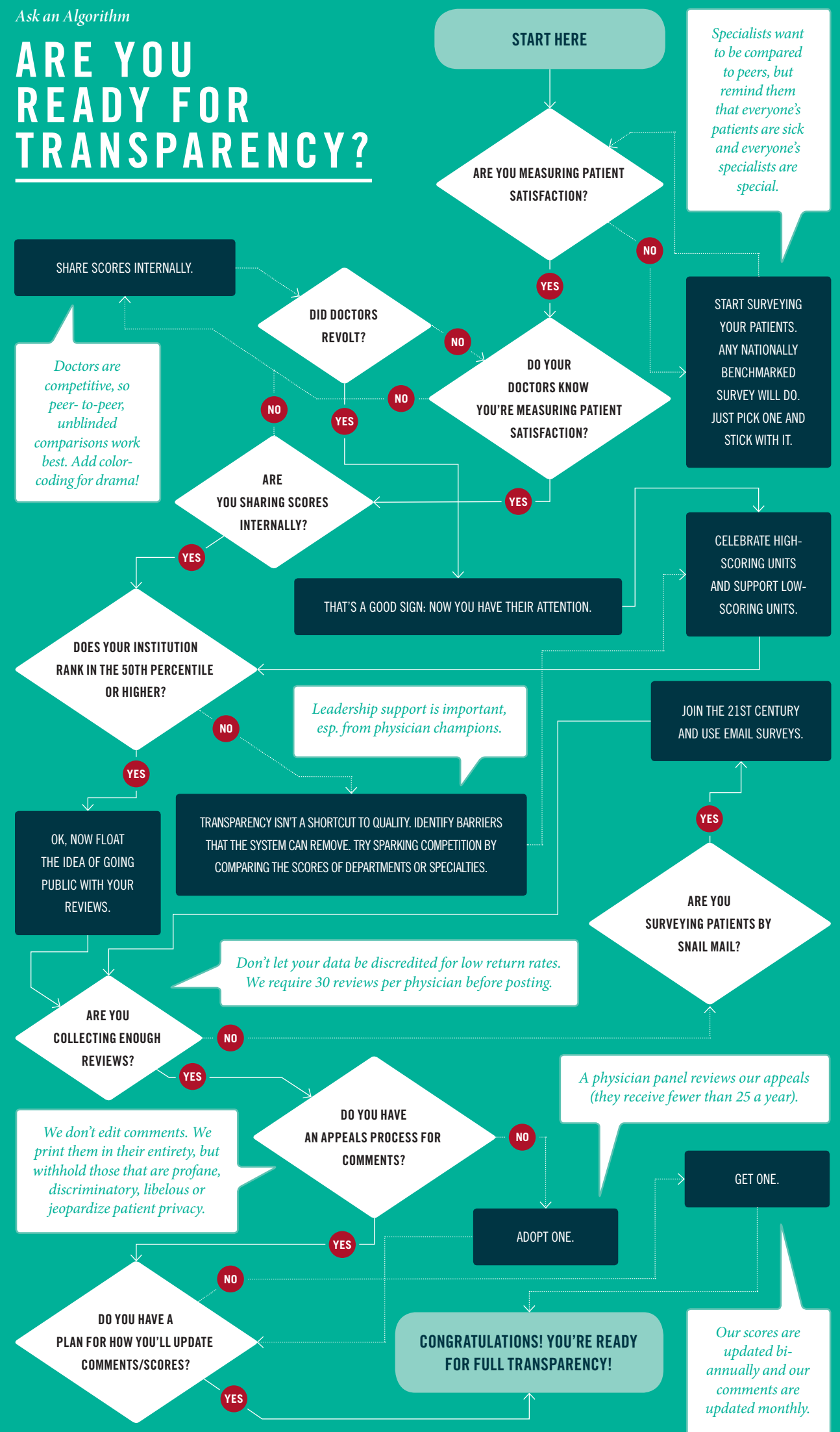
We have a “no carrots, no sticks” approach re: financial incentives. But we make quarterly rounds to celebrate units that are exceeding goals in quality, patient satisfaction and efficiency. We also give lapel pins to our top 1 percent and publish newspaper ads congratulating them and their units.

WHO CAN I CONTACT TO LEARN MORE?

Chrissy Daniels at chrissy.daniels@hsc.utah.edu

Ask an Algorithm

ARE YOU READY FOR TRANSPARENCY?



Source: Chrissy Daniels, M.S., director of patient experience

HOW CAN WE FIND RELEVANCE IN A LANDSCAPE THAT WON'T STOP SHIFTING?

Science is the pursuit of truth. What could be more clear-cut than that? Yet for today's scientists, that search can be a winding, unsettling path through a constantly evolving landscape. Funding constraints, new trends and a growing emphasis on translation has investigators worrying there may be no place for them when the ground stops shaking. With their livelihoods hanging in the balance, they're figuring out how to be adaptable and competitive, how to be open to eclectic partners and funding streams, and how to look at threats as opportunities to take science further than they imagined.



“WE ARE ASKING SCIENTISTS TO FIGURE OUT NEW WAYS TO WORK AND ALIGN WITH THE GOALS OF THE CLINICAL SYSTEM; NOW IT’S OUR RESPONSIBILITY TO CREATE A SYSTEM THAT SUPPORTS AND REWARDS THAT KIND OF WORK.”

Carrie Byington, M.D.
Associate Vice President
for Faculty and Academic Affairs

Funding for science has always been a moving target. Thirty years ago, we launched an all-out war on cancer, 15 years ago we were racing to sequence the first human genome, and now the nation’s capital is abuzz with the promise of precision medicine. Public health issues, the whims of politicians, the media, public perception and hard economic facts all mix together to shift priorities. Sprinkled into today’s recipe is the growing influence of patients, viral crowdfunding—think ALS Ice Bucket Challenge—and multimillion dollar, pink-ribbon campaigns.

What captures the imagination of the public—or the NIH—doesn’t always match up with the most promising science or the impact of disease. In fact, when researchers analyzed NIH funding for 29 common conditions against the World Health Organization’s Global Burden of Disease data, they found there was only a moderate correlation. Conditions such as AIDS and diabetes came out funding winners while depression and chronic obstructive pulmonary disease came out on the losing side. Why? Good question. “Often, there’s no scientific rationale for funding or leaving certain areas,” admits Carl Thummel, Ph.D., professor of human genetics. He speaks from experience. NIH funding for his area of research—using the fruit fly to solve basic biological conundrums—has plummeted 30 percent in five years.

Unfortunately, there’s no discovery crystal ball to peer into, and when dollars are tight, as they are today, those fickle trends can make or break careers. With the NIH having lost about 22 percent of its purchasing power since 2003, many scientists consider it an all-out crisis, says Wesley Sundquist, Ph.D., co-chair of biochemistry. “Now when I go to conferences, people spend half of their time talking about how to get funding for their labs instead of their best scientific ideas.”

Whether or not we agree with the current funding trends, the simple fact is that we can’t afford to ignore them. And at the top of today’s priority list—for the NIH, venture capitalists, philanthropists and crowdfunders alike—is the potential to translate discovery into clinical applications. Translation gets a bad rap among some basic scientists, but is it really such a dirty word? “Improving human health through science is the mission of an academic medical center. That was the whole reason we decided to put hospitals and medical centers next to research-intensive enterprises,” says Dean Li, M.D., Ph.D., associate vice president for research.

A focus on translation doesn’t mean we shove basic science aside. It’s basic scientists who have the ability to affect more diseases than anyone else, says Li. “If we had said that every discovery had to be translated and every investigator had to translate, then we would have made a mistake based on the history of science.” How to recognize the drive for translational science while creating a fertile environment to make those fundamental discoveries, is today’s billion-dollar question.

ALIGNING THE SYSTEM

If we think about the translational mandate as less about the final product and more about creating the environment required to support translation, then the focus isn’t on directing science but on bridging institutional gaps. “We are asking scientists to figure out new ways to work and align with the goals of the clinical system; now it’s our responsibility to create a system that supports and rewards that kind of work,” says Carrie Byington, M.D., associate vice president for faculty and academic affairs. That means finding ways to lower the energy barrier to do translational work so that we protect researchers’ most valuable resource—time. Byington has been building a smorgasbord of resources to do just that through the Utah Center for Clinical and Translational Science, which she co-leads.

Because translational science moves across boundaries, it’s also made teamwork the new imperative. “No one individual holds all of the knowledge and expertise to tackle complex diseases,” says Mary Beckerle, Ph.D., CEO and director of Huntsman Cancer Institute. The power will come from disease-focused teams, something the cancer field has known for a decade. That brings with it another set of challenges for researchers whose success has been based around individual excellence, not on the ability to negotiate expectations, manage conflict and share both power and glory. “People are messy,” admits Beckerle. “And more people are messier.”

And who gets the credit for a groundbreaking discovery that involves a team of five or 30 or more? Genetic epidemiologist Hilary Coon, Ph.D., is one of hundreds of scientists in the Autism Sequencing Consortium that published a seminal *Nature* paper on the genetics of the disorder. “Bringing together an enormous quantity of data is making it possible to unravel new patterns that we couldn’t see otherwise,” she says. “Everybody in this consortium is more concerned with scientific progress than in making their name in the world.” While Coon’s altruistic attitude is admirable, the academic paradigm needs to catch up and reward contributions to a consortium, being a middle author and generously sharing data and samples. The University’s medical school recently revised its faculty appointment, retention and

advancement guidelines to redefine excellence and reward team contributions, but Byington admits there’s a long way to go—institutionally and globally.

A NEW KIND OF PI

A new breed of scientist has emerged to help guide colleagues through this changing world. Part institutional PI, part coach, part matchmaker, they’re forgoing the traditional lab route to become research administrators who can draw upon their scientific expertise to connect the right people, resources and knowledge. “I think this is one of the most promising pipelines for scientists and one of the most valuable resources for the institution,” says Senior Vice President Vivian Lee, M.D., Ph.D., M.B.A. “These are very smart, well-trained scientists who are thinking strategically and operationally about research.”

These research ambassadors are also tapping into philanthropic funding avenues and forging bold, new partnerships with the pharmaceutical and biotechnology industries. In two years, Amy Davis, Ph.D., director of research program development, has helped bring \$20 million to a precision medicine initiative, the Utah Genome Project (UGP), and establish a partnership between UGP and the Regeneron Genetics Center (RGC). The collaboration is connecting five investigators who research autoimmune disorders to new resources and creating a pipeline to translate basic science discoveries into potential therapeutics. “We’ve put in years of work carefully characterizing symptoms and gathering patient samples,” says pulmonologist Mary Beth Scholand, M.D. “This partnership will help us get the answers that we—and our patients—are looking for, so we can act on them much more quickly.”

THE ONLY CONSTANT

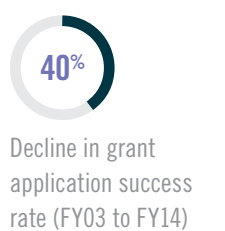
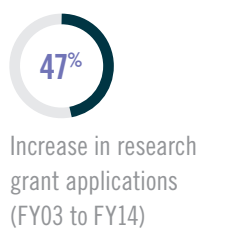
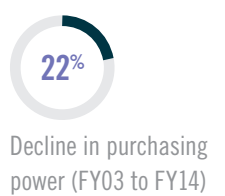
Here’s what we can count on: Just when we figure out these funding trends, they will change again. Already there are signs that the pendulum is swinging back to basic science. Concerned by the decline in basic research, the NIH’s National Institute of Neurological Disorders and Stroke announced new funding for projects that aren’t explicitly disease-related. Politicians are changing too. For the first time in a decade representatives—from both sides of the aisle in the House and Senate—are calling for an NIH funding increase. And the field itself continues to evolve sparking funding announcements for new areas of research in cancer genomics, big data science and the use of mobile and personal technologies in medicine.

Just as science never stops moving, neither will the funding landscape. As far as Thummel is concerned, “we can learn a lot more by taking advantage of opportunities than we can by resisting change.”

STATE OF THE NIH

\$30.1B

Total budget in FY14



\$8.75B

Proposed funding increase over 5 years (21st Century Cures Act)

THE TRAILBLAZER



“THERE’S THIS TENDENCY TO FOLLOW THE LEADER. I THINK IT’S FUNDAMENTALLY THE WRONG WAY TO GO. BIOLOGY IS SO INFINITELY WIDE AND DEEP, WHY NOT EXPLORE IT?”

Rutter is used to his ideas being unpopular. Ten years ago, when he started his research lab, few wanted to join, and at times he struggled to cobble enough funding to run it. Rutter had decided to study metabolism, a discipline filled with dizzying mazes of arrows pointing to impossibly long names that many scientists consider to be, well, boring. “At times I had doubts about whether I was doing the right thing,” admits Rutter.

He was convinced, however, that metabolic processes were so fundamental to life they would have to have their fingers in major disease. “I was driven by wanting to be at the forefront, making discoveries that no one else is making,” says Rutter. Years later, he did just that, making discoveries that move us closer to solving a century-old mystery—how cancer cells undergo a metabolic shift that allows them to outpace healthy cell growth. With the help of his now robust research team, Rutter discovered a protein complex critical for converting carbohydrates to cellular energy, and showed it was key to the so-called Warburg effect. They’ve also shown that abnormal tweaks in metabolic pathways contribute to diabetes, among other ailments.

Six major grants, two spin-off companies, and several top-tier publications later, Rutter’s innovative and creative work has become too important to ignore. He is now co-director of the University’s Diabetes and Metabolism Center, co-leader of Huntsman Cancer Institute’s Nuclear Control Program and an HHMI investigator.

Rutter has gone from bucking the trends to setting them, as the once boring metabolism is now red hot. “Now that my field is getting more crowded, I’m starting to think, ‘What’s the next frontier?’” says Rutter. “Maybe, it’s about time to move on and do something different.”

Jared Rutter, Ph.D.

Professor, Biochemistry

Dee Glen and Ida Smith Endowed Chair
in Cancer Research

Howard Hughes Medical Institute Investigator

ADVICE

Don’t be afraid to stray from the beaten path if your convictions are well founded

ON POSSIBILITIES

There are discoveries to be made everywhere. There’s more to science than the topics that are sexy and hot.

ON TRANSLATION

It’s up to us to be creative and insightful enough to move basic understandings toward translatable outcomes.

THE INFORMATION CONDUIT



Jean Shipman, M.S.L.S.

Librarian and Director,
Spencer S. Eccles Health Sciences Library

Director for Information Transfer,
Center for Medical Innovation

Director, National Network of Libraries of Medicine
(MidContinental Region) and Training Center

ADVICE

Drill down to your core skill set and reimagine how it can be used in new and meaningful ways.

ON CHANGE

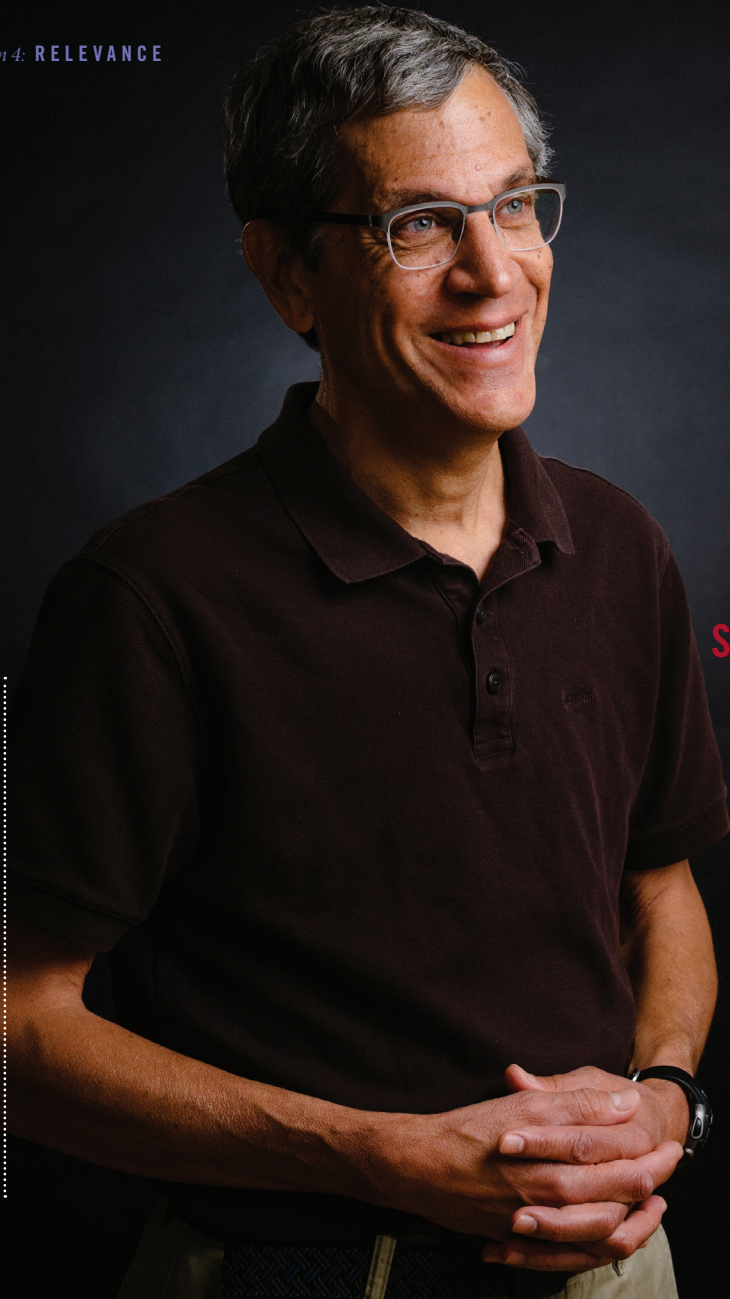
Disrupting 300 years of tradition has been a breath of fresh air. It’s freed us to redefine ourselves and operate at a higher level.

ON WHAT’S MISSING

The speed of knowledge is faster than the publication cycle—even e-publications. How can we get it sooner? What about failures, where are they recorded?

“IT’S AN OPEN QUESTION HOW LIBRARIANS WILL WORK FIVE YEARS FROM NOW. IT’S UP TO US TO IMAGINE THE FUTURE.”

THE FLY GUY



“SCIENCE IS ALWAYS CHANGING ITS FOCUS. SURVIVING IS ABOUT LOOKING FOR OPPORTUNITIES AND EMBRACING THEM.”

Thummel is well aware that most of his colleagues only think about flies when they have to swat them away. Yet for 100 years, generations of scientists like him have honed *Drosophila melanogaster* into a data-generating machine. Feed them questions about fundamental biology, and they'll spit out answers with unparalleled speed.

Thummel is used to being the only “fly guy” in the room, but he's not used to being left out of the conversation entirely. That's what happened when his field switched its focus to metabolism. “It's not exactly rocket science to realize that everyone is working on something that I wasn't,” says Thummel. The key is not to take it personally, he says. “When a field changes you have to change with it. All we had to do was step sideways and do what we already knew but in a different context.”

Soon after, one of his experiments turned up flies with the most notorious metabolic disorder—diabetes. “No one expected that something as simple as a fly could have a disease as complicated as diabetes,” he recalls. To pursue the research further required that he step sideways once again. He sat down with the chief of endocrinology, metabolism and diabetes and asked: “So what's this insulin thing?” His curiosity sparked an invitation to the division's weekly meetings.

Working with physicians, Thummel has figured out how to diagnose the six-legged animal, even miniaturizing a version of the glucose tolerance test used in clinics. In return, the flies are doing what they do best: revealing previously unknown molecular mechanisms driving the disease. In the wake of these advances, Thummel has become a sought-after expert. “It's been terrifically exciting,” he says. “And it's satisfying to know that what we're doing could have a real impact.”

Carl Thummel, Ph.D.

Professor, Human Genetics

H.A. and Edna Benning Presidential Endowed Chair

ADVICE

Listen, watch, and when the time is right, dive in and don't look back.

ON CHANGE

It's not just about being smart. Like with any other professional operation, it's about being competitive.

ON FLIES

I actually don't like bugs. But you've got to be patient to do research with a creature that has a backbone, and I'm just not a patient person.

It's not every day that a scientist forays into the complicated, time-consuming world of clinical trials. It's much easier to stay in the lab and collaborate with like-minded colleagues.

For Bild, that path was never an option. “Life experiences shape you and help identify what really matters,” reflects Bild, who in graduate school helped close family members and friends battle cancer. She knew then that she didn't want her research to live in a journal, she wanted it to help patients fighting for their lives. So when she found evidence that an epilepsy drug, valproic acid, had tumor-fighting capabilities, she assembled the best team—a pharmacologist, medical oncologist and bioinformaticist—to help transform her discovery into a clinical trial.

Bild delved into her teammates' unfamiliar worlds and learned what made them tick. “The advice I have is to learn everyone's perspective and respect what they need,” says Bild. Their common goal—to help patients with the greatest possible impact—looked differently to each of them. For the bioinformaticist, it meant making the data and software publicly available. For the oncologist, it meant turning down research ideas that didn't optimize patient care. With that shared understanding, they moved administrative and procedural mountains to make the clinical trial happen.

With the first phase of the Valproic Acid Signature Trial (VAST) complete, data analysis will determine if they're closer to a new treatment for breast cancer patients. “We've been told the way we work together to link the benchwork to the bedside is rare,” says Bild. The approach has helped them outcompete some of the nation's top cancer teams for National Cancer Institute support and greased the wheels for further collaboration. “It would be a shame if we didn't do it,” says Bild. “We would be missing out on a great scientific opportunity.”

Andrea Bild, Ph.D.

Associate Professor, Pharmacology and Toxicology

Adjunct Assistant Professor, Biomedical Informatics and Oncological Sciences

Investigator, Huntsman Cancer Institute

ADVICE

Assemble the right team to get the job done, even if it means leaving your comfort zone and giving up control

ON CLINICAL TRIALS

I'm fascinated by how few researchers tap into clinical trials. I almost want to keep the secret to myself.

ON DEDICATION

The hard part is sticking with something that isn't immediately rewarding. This has been a two-decades-long journey for me. Work like this is about running a marathon, not a sprint.

THE TRANSLATOR



“YOU HAVE TO PUT OTHERS FIRST AND MEET THEIR NEEDS. PROGRESS DOESN'T TOLERATE SELFISHNESS.”

KEEPING PACE: WHO'S DRIVING DISCOVERY AND WHERE ARE WE HEADED?

We're on overload. It's not just the deluge of emails, articles, texts and Tweets we have to keep up with to stay current. It's the complexity of the information and the pace at which it's rendered obsolete. How do we balance expediency with the need for accuracy and thoughtfulness? How do we prioritize translational research against the need to first understand? Will we crumble under constrained resources, exploding technology and heightened consumer demand, or seize these challenges as opportunities to propel us forward?



“MY HOPE IS THAT WE TAKE THE BEST OF THE PAST AND MARRY IT WITH NEW OPPORTUNITIES TO TAKE SCIENCE IN DIRECTIONS WE NEVER EVEN IMAGINED.”

Willard Dere, M.D.
Executive Director,
Program in Personalized Health

As press releases go, this one was pretty standard: *Recursion Pharmaceuticals Announces Funding for Rett Syndrome Research*. What wasn't standard was the short email that the company's founder, Christopher Gibson, Ph.D., received back: “Our daughter is 38 months old—we hope you are successful.” Attached was a photo of a little girl on a tricycle.

For all the miraculous breakthroughs of medicine, the sober reality is that it's never enough. There will always be diagnoses, treatments and cures that lie just out of reach. But if in the past, desperate families hung their hope on the doctor's knowledge . . . and waited, today it's a different story. They're canvassing the Internet, sharing information on listservs, funding research, advocating for legislative reform and showing up to doctor's appointments having earned a Google Ph.D. “I can tell you with certainty that nobody cares more about driving research and clinical trials than patients and their families,” says Emily Coonrod, Ph.D., a molecular biologist and personalized health program manager. With their passion, persistence and the power of the Internet, patients are resetting the scientific agenda. “That email changes how I think every day,” says Gibson. Within minutes of receiving it, he forwarded it to his entire team.

“Successful,” as the little girl's parents hope for Gibson, is a loaded word for today's scientists and clinicians. With the plummeting price of genome and exome sequencing, and the productivity-enhancing power of big data, it seems we're closer than ever before to finding solutions to some of our most vexing medical problems—cancer, diabetes, mental illness as well as rare and ill-defined diseases. Yet the advancing flood of scientific knowledge and data is nothing short of mind-boggling. A paper per minute is added to the PubMed database, an index of biomedical abstracts that contains more than 24 million citations. Surgeon and author Atul Gawande, M.D., recently described it this way: The human body has 13 organ systems and 60,000 documented ways they can fail. The job of the scientist and clinician is to figure out how to treat each individual as an “n” of one, with health profiles as unique to them as their fingerprints.

“I feel like I let people down on a regular basis because we can't get answers for them,” says pediatric geneticist John Carey, M.D., M.P.H., editor-in-chief of the *American Journal of Medical Genetics*. He estimates that half the patients he sees should be sequenced, but admits that even if insurance agreed to pay for that, it wouldn't always yield an answer. “I feel disappointment and guilt that I'm not coming through for them.”

MAKING GOOD ON THE PROMISE

Call it personalized health or precision medicine, the paradox is the same. Science is infinite and resources are limited. “There are always opportunity costs when you pick one thing over another. Who is responsible for weighing those costs?” says Carrie Byington, M.D., associate vice president for faculty and academic affairs. “How are we going to navigate these competing desires?”

And who will pay for it? “We want to sequence everyone, unleash scientists to explore every avenue and find treatments that are precisely targeted for each unique individual. At the same time, we feel incredibly pressured to keep costs down,” says Senior Vice President Vivian Lee, M.D., Ph.D., M.B.A. “How can we unite these goals?”

Truth is, no one can predict *a priori* where the money is best spent. “Science is always a calculated risk,” says citizen scientist Matt Might, Ph.D., whose son's diagnostic odyssey sparked discovery of a new gene (see page 50). “You can try to invest as strategically as possible, but sometimes your hit, if you're lucky enough to get one, comes from left field.”

As CEO and Director of Huntsman Cancer Institute, Mary Beckerle, Ph.D., has carefully stewarded countless donations, including the foundational and ongoing gifts of Utah philanthropists Jon and Karen Huntsman, whose ambitious founding goal was to understand and eliminate cancer at its roots. “When there's a bi-directional understanding and dialogue between the research community and donors, as has been our experience with the Huntsman family, those partnerships can flourish,” says Beckerle, a prolific researcher who has guided the institute for the past decade. “Strong communication insures that donors feel a part of the

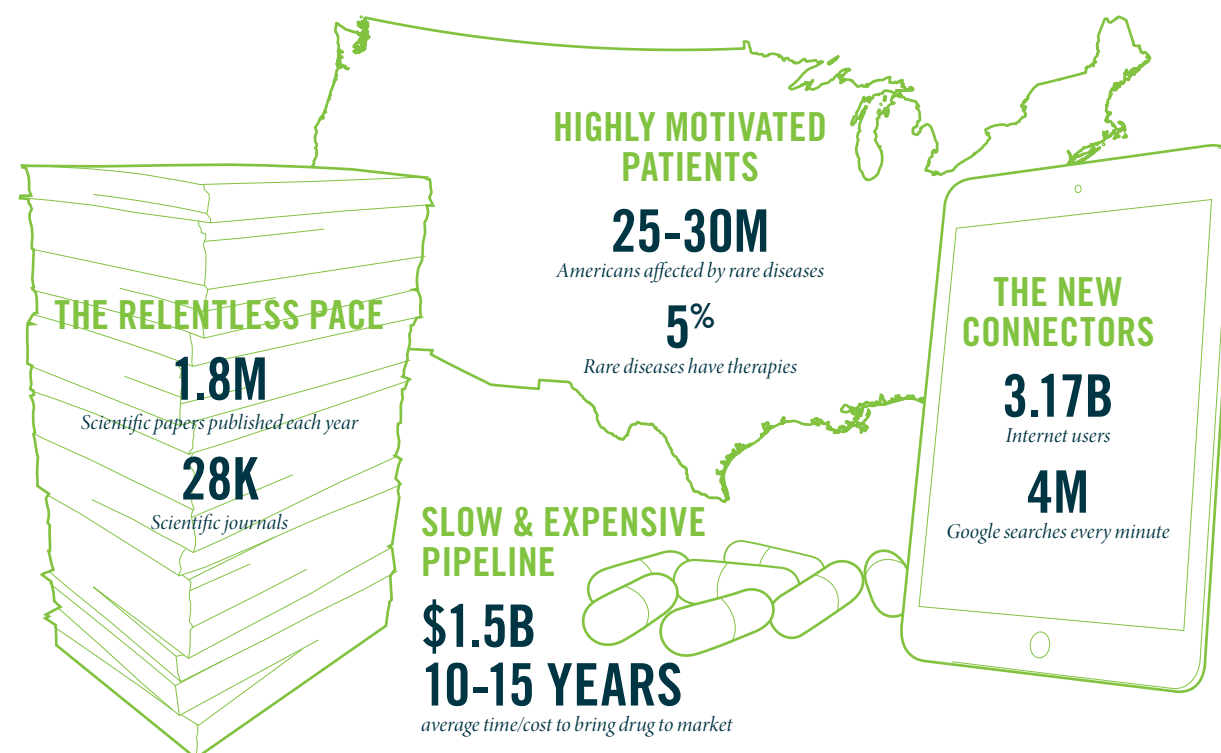
discovery process, understanding both the exciting potential and the limitations that we, as scientists, face each day.”

ECONOMIES OF CONNECTION

If the industrial world was all about economies of scale, the post-industrial era is about economies of connection, where progress is driven by how effectively we connect our resources, knowledge and ideas, and how open we are to sharing. “We're moving away from this feeling that I have to own it and I have to build it myself,” says Byington, who as head of the Center for Clinical and Translational Science makes core resources available to the whole scientific community. Beyond sharing, how do we match up all of this knowledge? “We've probably cured every disease five times, we just don't know it,” says Gibson. Might refers to it as the “unknown known.”

Keeping pace in this fast-paced information age requires us to cultivate a new set of skills. Publish or perish may still be the path to advancing in academia, only now that depends on tapping into a proliferating number of non-traditional sources. One of those is motivated patients. While sometimes their enthusiasm and single focus may seem more distracting than helpful, the truth is they are finding new ways to connect the dots for time-starved clinicians and stressed-out researchers.

“My hope is that we take the best of the past and marry it with new opportunities to take science in directions we never even imagined,” says Willard Dere, M.D., who left the pharmaceutical industry to lead our Program in Personalized Health. We want to get to the future first, says Dean Li, M.D., Ph.D., associate vice president for research. “And to do that, you have to do something no one has done in a way that no one else has done it . . . But no one says you have to do it alone.”



Case Study No. 1: The Patient

ESCAPING ‘UNDIAGNOSED ISLAND’

Not actionable. Matt and Cristina Might would like to see those words stricken from medicine’s vernacular.

To parents of children with ill-defined diseases, those words are disempowering, signaling another dead end in the search for a diagnosis and treatment. They’re also misleading, says Matt Might, Ph.D., associate professor of computer science and adviser to President Obama’s precision medicine initiative. Because in the absence of actionable knowledge, treatments or cures, “science becomes medicine,” he says.

For millions in the rare disease community, the Might’s diagnostic odyssey has a familiar beginning. The family had just relocated to Salt Lake when concerns deepened about their 6-month-old son, Bertrand. The couple feared autism, the first of a cascade of disorders—each scarier than the last—to be ruled out over four years of EKGs, CT scans, biopsies and blood draws. “You don’t know why your child is hurting or how to stop it,” recalls Matt. In their case, they didn’t know why Bertrand was having seizures and couldn’t cry tears.

They cried plenty for him, says Cristina Might, M.B.A., who put aside her career plans to care for Bertrand and “stitch together” a team of experts. “I spent my time flying him to Duke, Stanford, Baylor; my full time job was just getting answers.” She scoured the Internet for research and clinical trials, sharing everything she learned on a blog: “It’s difficult feeling so alone, so un-Googleable.”

From physical therapy to a stem cell transplant, they explored all avenues. In 2009, they closed Bertrand’s college account to cover medical expenses. Then in 2012, a breakthrough: Duke University scientists who knew the Might’s through their transplant attempt invited them to take part in a study of the use of exome sequencing for diagnosing rare diseases. The study unearthed a mutation in the NGLY1 gene that they suspected was the source of Bertrand’s disorder. Matt describes it as having been “rescued from undiagnosed island.”

‘REVERSE DRAGNET’

There was comfort in having something to target with experimental therapies. But they needed to confirm this mutation was the culprit, which traditionally entails months of lab work. Instead, the Might’s found success with a user-friendly tool—the Internet. Matt leveraged the social media audience he had amassed through his academic writings and in May, 2012 published a blog post about the “hunt” for his “son’s killer.” He hoped it would act as a “reverse dragnet” to find other patients just like Bertrand.

It worked. The post was seen by millions. Within months the Might’s heard from a handful of NGLY1 patients from around the globe, and from researchers who volunteered to test Bertrand’s cells and explore treatments. “Within three months of getting a diagnosis we were trying a compound,” says Matt.

Early in a four-year quest to diagnose their son, Matt and Cristina Might received test results that pointed to a disorder they were told was untreatable and likely fatal. In a somber blog post announcing the results, the Might’s ended with this promise to their son: “Of course, we will do everything possible for him. And, if that fails, we’ll try the impossible.”



Another series of Google connections coupled with Matt’s relentless self-education pointed to a promising supplement. He found it on Amazon and after taking it himself with no adverse effects—“In my house, I am the FDA,” he says—gave it to Bertrand. Within three days, his son cried his first tear. “It was one small tear but an ocean of science for the disorder because it gave us a clue that this is in some way fundamentally impacting the disorder,” Matt says. Months after taking the supplement, which costs 25 cents a day, Bertrand’s seizures stopped. And his medical expenses have dropped from hundreds of thousands of dollars to less than \$30,000 a year.

Their newfound cyber support group replaced “the darkness of isolation” with the “comfort and power of community,” Matt says. Also, sharing stories and clinical data sparked threads for scientists to follow, such as an uncanny ability of NGLY1 patients to ward off viruses, which could be instructive for fighting infectious disease. The families started two nonprofits and supported development of an assay and animal models for testing the 30-plus compounds they’ve identified as possible treatments.

FROM CITIZEN SCIENTIST TO THE WHITE HOUSE

The Might’s are acutely aware that not everyone has their depth of resources, knowledge or connections. “We had means to travel the world, but most families don’t,” says Cristina. “We’re trying to figure out how we can level the playing field because it’s not fair.”

Matt believes their success is replicable and scalable, which is why he accepts many of the near-daily invitations to share what he’s learned with audiences around the world. Patients can drive science and shape it, he says, offering as proof his own trajectory from concerned father to advising the president’s precision medicine initiative, testifying before Congress and collaborating with University of Utah researchers to develop an NGLY1 therapy. The optimism that drives the Might’s doesn’t cloud their view of reality. “I’m very proud of the fact that Matt’s trying to make it better not just for our son,” says Cristina. “Bertrand’s not going to benefit from a lot of the work we’re doing now but other families will and already have. That’s the beautiful thing.”

With Bertrand and two younger children, Cristina’s geographical radius is smaller but her influence is no less great. She is a connector of families, doctors and researchers and a mentor. “It helps to know how the game is played,” she says. “There are little ‘cheat codes’ that make a big difference in finding the right specialist or getting seen sooner.” She’s also co-founded an advocacy group, Utah Rare, and is helping to raise money for an “undiagnosed” clinic at the University of Utah, designed to shepherd families through complicated diagnoses (see page 53).

There remain barriers to building a scientific community that’s truly inclusive of patients—from Institutional Review Board (IRB) restrictions on sharing data to the pay walls barring public access to many scientific journals. But it’s getting better, says Matt. “Institutions that figure out how to harness patient energy will be the ones that leapfrog to the front. Patients will seek those places out.”

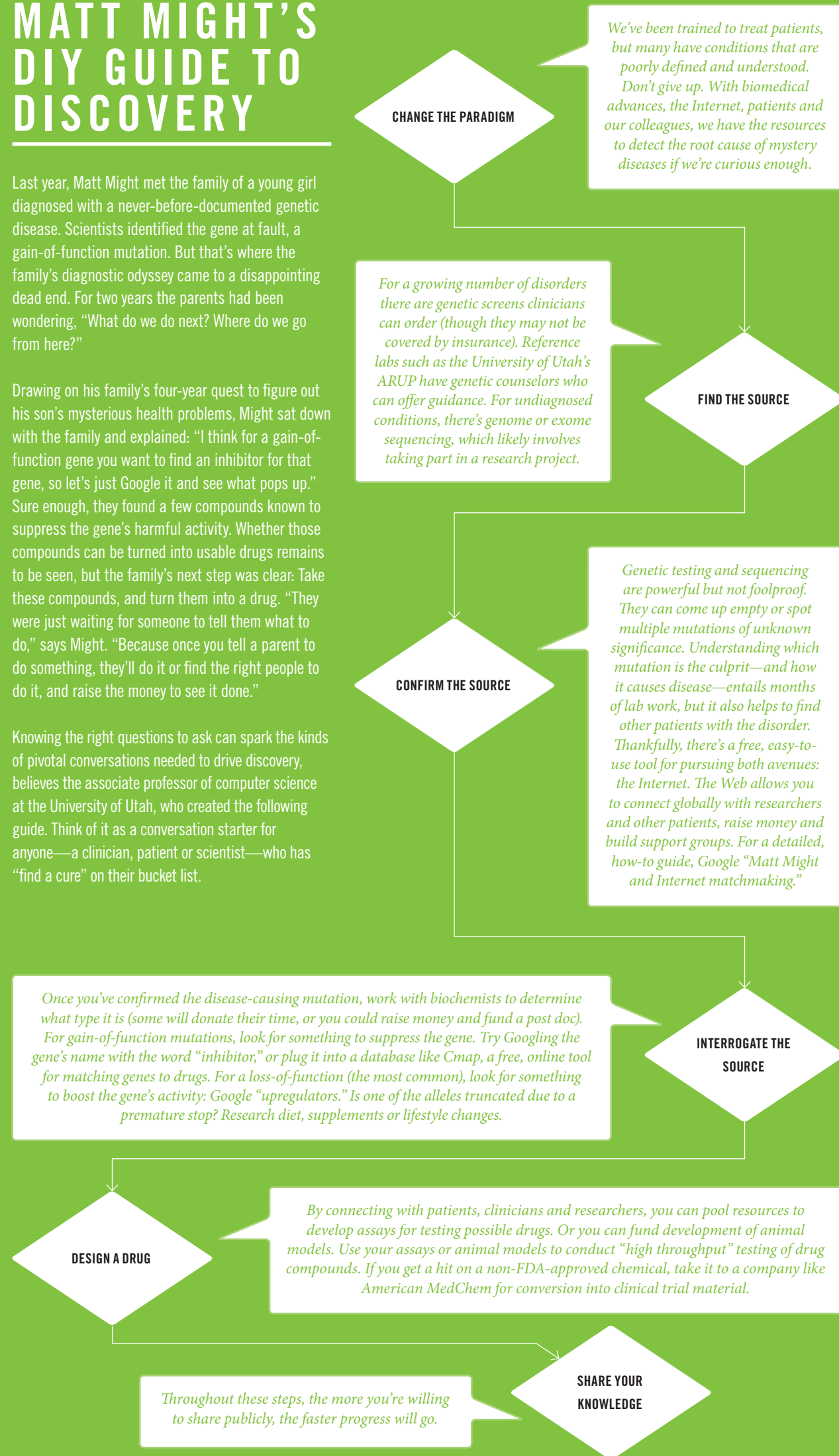


MATT MIGHT'S DIY GUIDE TO DISCOVERY

Last year, Matt Might met the family of a young girl diagnosed with a never-before-documented genetic disease. Scientists identified the gene at fault, a gain-of-function mutation. But that's where the family's diagnostic odyssey came to a disappointing dead end. For two years the parents had been wondering, "What do we do next? Where do we go from here?"

Drawing on his family's four-year quest to figure out his son's mysterious health problems, Might sat down with the family and explained: "I think for a gain-of-function gene you want to find an inhibitor for that gene, so let's just Google it and see what pops up." Sure enough, they found a few compounds known to suppress the gene's harmful activity. Whether those compounds can be turned into usable drugs remains to be seen, but the family's next step was clear: Take these compounds, and turn them into a drug. "They were just waiting for someone to tell them what to do," says Might. "Because once you tell a parent to do something, they'll do it or find the right people to do it, and raise the money to see it done."

Knowing the right questions to ask can spark the kinds of pivotal conversations needed to drive discovery, believes the associate professor of computer science at the University of Utah, who created the following guide. Think of it as a conversation starter for anyone—a clinician, patient or scientist—who has "find a cure" on their bucket list.



Case Study No. 2: The Clinician

A LESS-THAN-EPIC DIAGNOSIS

Lately, Lorenzo Botto, M.D., has been intrigued by *The Odyssey* and its many parallels to the maddening diagnostic journey faced by so many of his patients.

The genetics and pediatrics professor specializes in inborn diseases of metabolism, a cluster of rare, complex disorders that aren't well understood and often go undiagnosed and thus untreated. By the time most families are referred to him, they've spent years bouncing from specialist to specialist, waiting months between appointments and test results only to learn they've reached another dead end or been swayed off course. Like Homer's protagonist, Odysseus, who loses his crew in the first year of his 10-year quest, they battle isolation and despair. "I often hear parents saying, 'I just wish I knew what my child has, even if it's a bad thing, so I would know who to connect with,'" says Botto.

The criticism often launched at rare and undiagnosed disease efforts is that we're throwing too many health care resources at conditions that impact very few children. What critics often don't realize is the toll on families and the cumulative cost of caring for children who don't have a diagnosis. "That's where the frustration and the costs are," says Botto.

There are a handful of centers in the U.S. that specialize in rare diseases, but most are research focused. Botto is set on streamlining the clinical side of the equation. "Families, doctors, nurses, care coordinators—we all agree that the system is not working well for this subset of patients," says Botto. "There are too many steps. It takes too long and it's far too expensive." He believes that game-changing tools like whole genome and exome sequencing have the potential to cut costs rather than increase them if deployed at the right time in the diagnostic odyssey. "I believe we can care for these individuals in a way that's in alignment with the broader goals of the health system."

The program, still in a pilot phase, will accept children based on their symptoms and the urgency of their health problems. All of their clinical and genetic data will then be gathered into a single, portable and easy-to-understand format that they can take with them. Next, experts will gather in a room to analyze the data, discuss the possible diagnosis and map out a diagnostic plan of attack. They will obtain the opinion of other specialists as needed. "This is a team effort," says Botto. "We will be combining the collective talents of our master clinicians to push the diagnostic envelope with new tools and processes." A care coordinator will be a single point of contact for each patient and manage the flow. When no diagnosis is found, the clinic—with its close ties to the University's Eccles Institute of Human Genetics and the Utah Genome Project—will identify additional research studies in which families can participate.

And who will pay for all of this? Like so many other ideas designed to improve care delivery, Botto admits that much of the care will not be reimbursable by insurers. Instead, an upfront investment by the Department of Pediatrics is funding this pilot program. Long term, Botto is hopeful. By assessing patient and parent satisfaction and tracking time and costs, he hopes to prove to payers that it's a better, more efficient way to deliver care.

Botto believes that the program will serve as a model for managing more common disorders too. After all, in this age of precision medicine, isn't every patient arguably an "n of one?" If the goal is to deliver the right treatment to the right person at the right time and for the right cost, this model is scalable, says Botto.

In the meantime "we are joining these families on a journey," says Edward Clark, M.D., chair of pediatrics. "Maybe we'll only reach a diagnosis in 30, 40, 50 percent of the cases, but that's not the end of our commitment to them. We will be their partners throughout their lifetime. Because, if you abandon your patient, they abandon hope."

"FAMILIES, DOCTORS, NURSES, CARE COORDINATORS—WE ALL AGREE THAT THE SYSTEM IS NOT WORKING WELL FOR THIS SUBSET OF PATIENTS. THERE ARE TOO MANY STEPS. IT TAKES TOO LONG AND IT'S FAR TOO EXPENSIVE."

Lorenzo Botto, M.D.

Professor, Department of Pediatrics

Piloting a program to streamline clinical care for children with rare and undiagnosed diseases.





Case Study No. 3: The Researcher

ADDING MEANING TO MINUTIA

After listening to a colleague give a presentation, Gabrielle Kardon, Ph.D., associate professor of human genetics, couldn't help herself. Kardon approached the scientist and pointed out that if she took her research in a slightly different direction, she could potentially help kids with congenital diaphragmatic hernia (CDH). "I didn't used to think about science in terms of clinical outcomes," says Kardon. "Now it's almost all I think about."

As a career biologist, Kardon is a master of minutia, coaxing an understanding of complex physiological processes from their constituent parts: DNA, molecules and cells. The

tiny beacons showed her that the diaphragm is greatly weakened when muscle doesn't form properly, providing new insights into the mechanistic basis of CDH. *Nature Genetics* and *The New York Times* featured her work, but Kardon had no idea how important the discovery was until she stepped out of the lab and into the patient community.

A desire to understand what her experiments couldn't tell her—what it's like to live, or

die, with CDH—led her to Josh Hensley, Utah representative for the support group CHER-UBS. He lost two girls to the birth defect, a hole in the diaphragm through which the liver and guts creep into the chest cavity, interfering with the lungs. "I'll help however I can in the hopes that one day, no one will have to bury their children," he says. He connected Kardon to the larger CDH community, and through them she learned that even after surgical repair, many deal with a host of complications, not the least of which is the fear that the diaphragm could rupture again at any time.

"Meeting these patients and families has completely changed my perspective on why I do science," says Kardon, who has since re-focused much of her lab toward CDH. That's why she brought members of her lab to a CDH Awareness Night event at a local baseball stadium. The lab carried balloons proclaiming "No CDH," and handed them to survivors and their families who carried them with pride. "The students were so excited to meet the kids. And the patients' parents were amazed that a researcher would go out of their way to spend time with them," she says.

Now, when making scientific decisions, images of those kids chasing each other around the stadium concourse race through Kardon's head. Why study the effects of a genetic mutation that, although scientifically interesting, is irrelevant to CDH when she can study ones that ruin lives? "I feel like there is too much riding on the patients," she says. "It wouldn't feel like the right decision to ignore projects that could potentially help them." One of her main objectives is to transform her discoveries into novel interventions.

The community has helped her in unexpected ways as well. In spending time with them, she has become privy to tidbits of their lives that can't be found in the medical literature. When one parent told her that her son with CDH also had a cleft palate, she thought it was interesting. But after she heard the same tale from five different parents, she knew it was significant. "They'll mention something in passing, and I'll say, 'Wait, what was that again?'" says Kardon. "They don't even realize they're a gold mine of valuable information." Their observations have given her additional clues to the underlying causes of the birth defect.

Her devotion has extended beyond the science, and she has strengthened their voice by adding her unique one, traveling with the community to Washington, D.C. to advocate for additional funding. CDH research receives 1/20th the amount of government support as cystic fibrosis, a birth defect that occurs at about the same rate—one in 2,500. "She is a ray of hope for a community that is desperately seeking answers," says Hensley.

Case Study No. 4: The Drug Developer

100 DRUGS IN 10 YEARS

Christopher Gibson was halfway through medical school and finishing his doctorate in bioengineering when he faced a career-making decision. He and a team of University of Utah scientists had found a shortcut to drug discovery that might quickly identify therapies for dozens of so-called "orphan diseases."

The 33-year-old could either take the more assured path of finishing medical school to become a cardiothoracic surgeon. Or, he could go the riskier route of starting a drug company, which might fail but had the potential of prolonging the lives of tens of thousands, many of them children. He chose the latter. "There will probably be plenty of talented heart surgeons to fill society's need, but there was no one on this side doing drug repurposing the way we're doing it," explains the newly minted Ph.D.

Develop 100 drugs in 10 years. That's the ambitious goal set by the founders of Recursion Pharmaceuticals, which harnesses the power of computers and "big data" to quickly and affordably test existing drugs for use with rare diseases. "We're trying to teach old drugs new tricks," says Gibson. The conventional path to drug discovery is to identify the biological mechanism behind a given disease and then target it with a drug, testing it first in the lab, then in animals and finally on humans. The entire process can take 10 to 15 years on average and \$1 billion or more. Often, despite the best science, the drug fails to work as promised. "For every drug that's approved by the FDA, there's usually eight or nine that made it pretty close," Gibson says. "It's not a viable business model in the long-term. Drug companies can't afford it and neither can we as a society."

Recursion's strategy is two-fold. Instead of targeting diseases one by one, its assembly-line strategy is to tackle many at once. "We're trying to take a systems-level approach where we bypass understanding the ins-and-outs of each disease and instead try to recognize what fixes it," says Gibson. The company manufactures genetic diseases in human cells and then bathes them in drug compounds to see if they can be restored to their normal "healthy" state. And they partner with manufacturers to salvage and repurpose drugs that are collecting dust on shelves. These are often drugs that passed early safety trials but never made it to market, perhaps because they weren't a perfect match for a particular disease.

At a time when health care is under pressure to contain costs, and federal funding for science is less certain, academic medical centers need to find faster paths to discovery, says



Dean Li, M.D., Ph.D., associate vice president for research, in whose lab the start-up was born. "If Chris succeeds at repurposing shelved drug assets, he'll not only benefit patients. He'll have rescued dozens or maybe hundreds of drugs from the dustbin of history, along with the tens of thousands of hours and millions of dollars invested in producing them."

The idea of a pharmaceutical company tackling hundreds of diseases at once is unthinkable for even the largest drug makers. But Recursion has already applied for expedited FDA approval to move forward on a clinical trial of a possible therapy for cerebral cavernous malformation (CCM), a rare hereditary vascular disease that leads to hemorrhagic strokes. The company has also secured nearly \$4 million in federal grants and private investments to fund the screening of thousands of drugs across hundreds of genetic diseases.

One of the biggest challenges, says Gibson, is finding ways to bridge the tech part of the equation with the biology, which tends to move more slowly. "We're constantly balancing urgency with the need for accuracy," he says. "With technology you can iterate so quickly. But we can't speed up biology. Cells take time to grow and drugs take time to dose." There's no shortage of motivation to be found as a scrappy start-up. For his part, Gibson is driven by the families and patients who are counting on their success. "It frankly just comes down to really caring about what you do."



"I think about that picture every day," says Christopher Gibson, Ph.D., of the photo of a 3-year-old girl with Rett Syndrome. Gibson's company is investigating possible treatments for the debilitating disease.

Josh and Melanie Hensley lost two daughters to congenital diaphragmatic hernia. Now they are devoting their lives to raising awareness and supporting research.



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THINGS ARE CHANGING AND WE'RE NOT STANDING STILL.
HERE'S A SNAPSHOT OF SOME OF THE REMARKABLE PEOPLE,
RESOURCES AND OPPORTUNITIES MOVING US FORWARD.

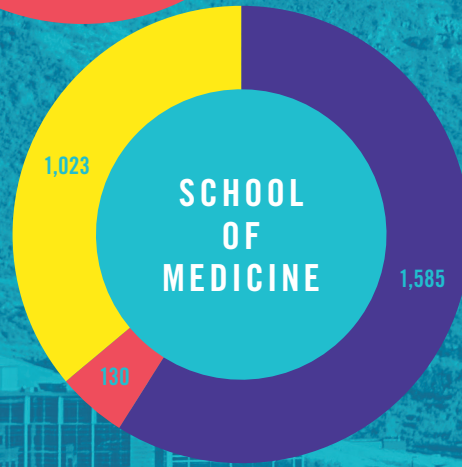
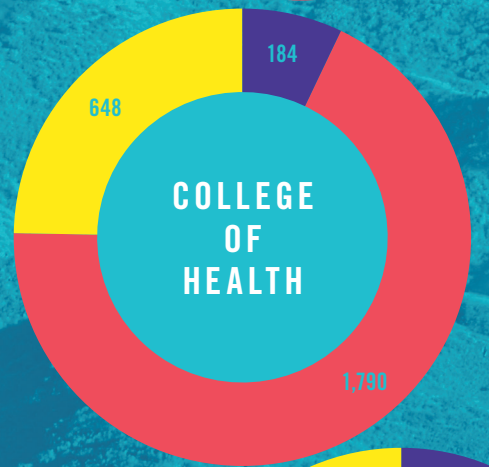
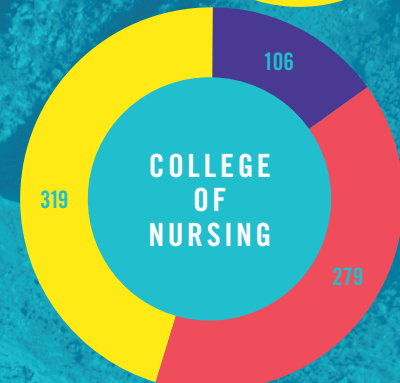
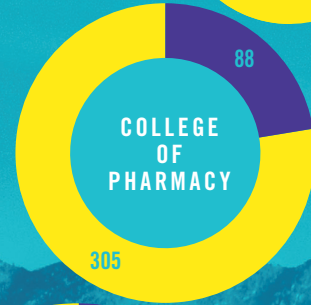
ADVANCING HEALTH

PATIENTS AT THE CENTER

We have brilliant people, a collaborative culture and an ambitious vision. That, we believe, is our value proposition, our special sauce, our Utah Algorithm. We strive to learn from everything we do and harness that knowledge to find solutions to the seemingly impossible problems we face today. As an academic medical center serving five states, we feel a deep responsibility to care for the health of people living in 10 percent of the continental U.S. We're doing that by searching for new ways to connect our significant resources to make a difference in the lives of patients in our community and throughout the world. When we educate students, make discoveries and care for patients, we have a singular goal in mind: To Advance Health.

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HEALTH SCIENCES
\$3.2 BILLION
Expense Budget in FY15

**2.5X
GROWTH
IN 10 YEARS**



FACULTY

UNDERGRADUATE STUDENTS

GRADUATE STUDENTS

EDUCATION

NATIONAL RANKINGS

- No **2** Average Pre-Dental GPA
- No **3** NIH Research Grants (College of Pharmacy)
- No **5** Physician Assistant Program
- No **7** Most Popular Medical School
- No **10** Pharm.D. Program
- No **14** Physical Therapy Program
- No **16** NIH Research Grants (College of Nursing)

Sources: US News & World Report
American Association of Colleges of Pharmacy
NIH
American Dental Association

NATIONAL LEADERS

60+ Faculty are Current and/or Past Presidents of Professional Organizations

ACCESS



4 Hospitals



11 Community Clinics



14 Regional Partners



10% of Continental U.S.



1,380 Physicians

750 House Staff

7,700 Staff

PATIENT SATISFACTION

Half of our providers rank in the

TOP 10%

A quarter rank in the

TOP 1%

Source: Press Ganey Surveys

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TOP 10 FOR 5 YEARS

One of only two U.S. health systems to receive the prestigious University HealthSystem Consortium Leadership Award five years in a row.

1.4 MILLION
Patient Visits

DISCOVERY

\$270 MILLION+

Grants in FY15

22 MILLION+

Records in the Utah Population Database

19 MILLION+

Visits to learn.genetics.utah.edu in FY15

2,500

Papers in Peer-Reviewed Journals in CY14

810+

Grants Received in FY15

30+

Disease-Causing Genes Discovered

1

NCI Comprehensive Cancer Center: Huntsman Cancer Institute

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**248 UNIVERSITY OF UTAH
STARTUP COMPANIES**

500+ Students Participants

115 Technologies Developed

BENCH-2-BEDSIDE STUDENT COMPETITION

32 New Ventures

86 New Patents (10 Licensed)

150+ New Technologies

67 Industry Partners

100+ Faculty Partners

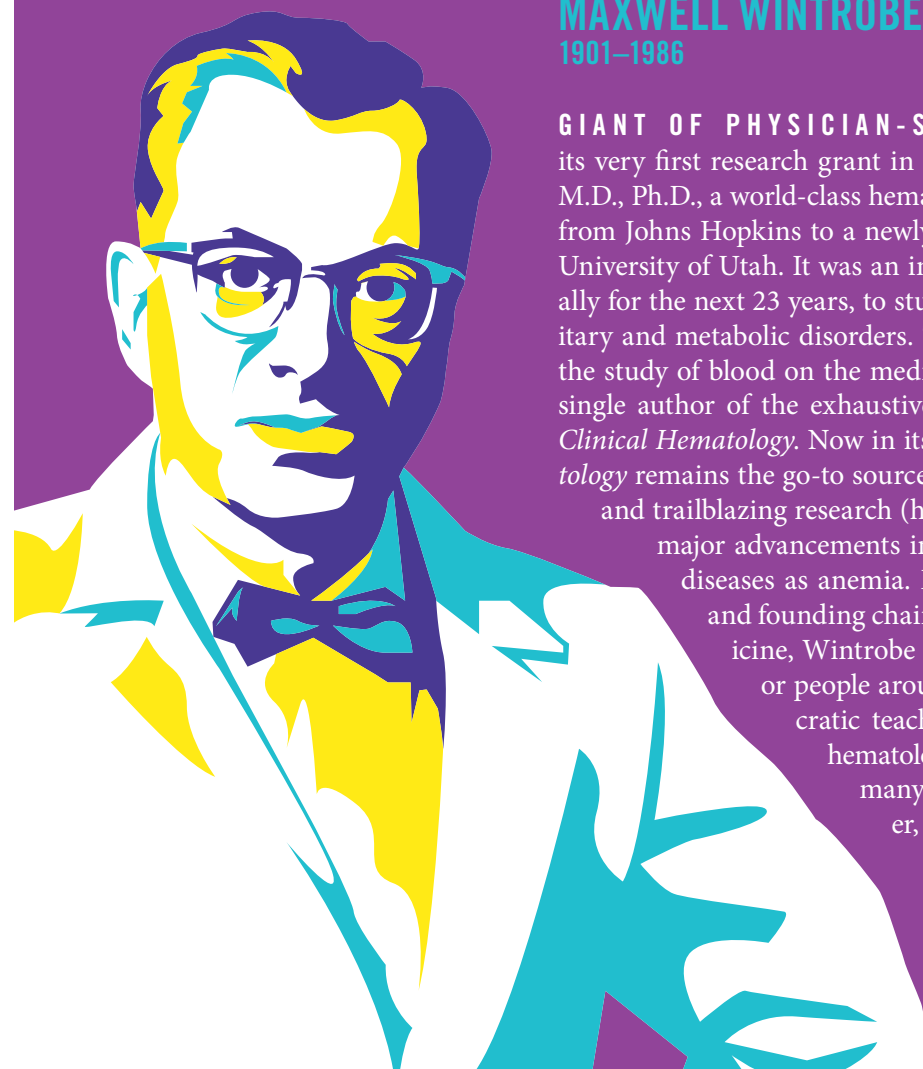
700+ Student Partners

CENTER FOR MEDICAL INNOVATION (In Three Years)

CELEBRATING A RICH HISTORY

PIONEERS OF MEDICINE

Since the humble beginnings of our two-year medical school in 1905, we've enticed some of the best minds in medicine to help shape our great Western adventure. This year, as we celebrate the 50th anniversary of our medical center built in 1965, we reflect back on the remarkable contributions our faculty have made. From securing the first-ever NIH research grant, to building the earliest version of an electronic medical record, to inventing and implanting the first artificial heart, Utah's medical pioneers are giants in their fields. With gratitude, we celebrate their contributions to our community . . . and to the world.

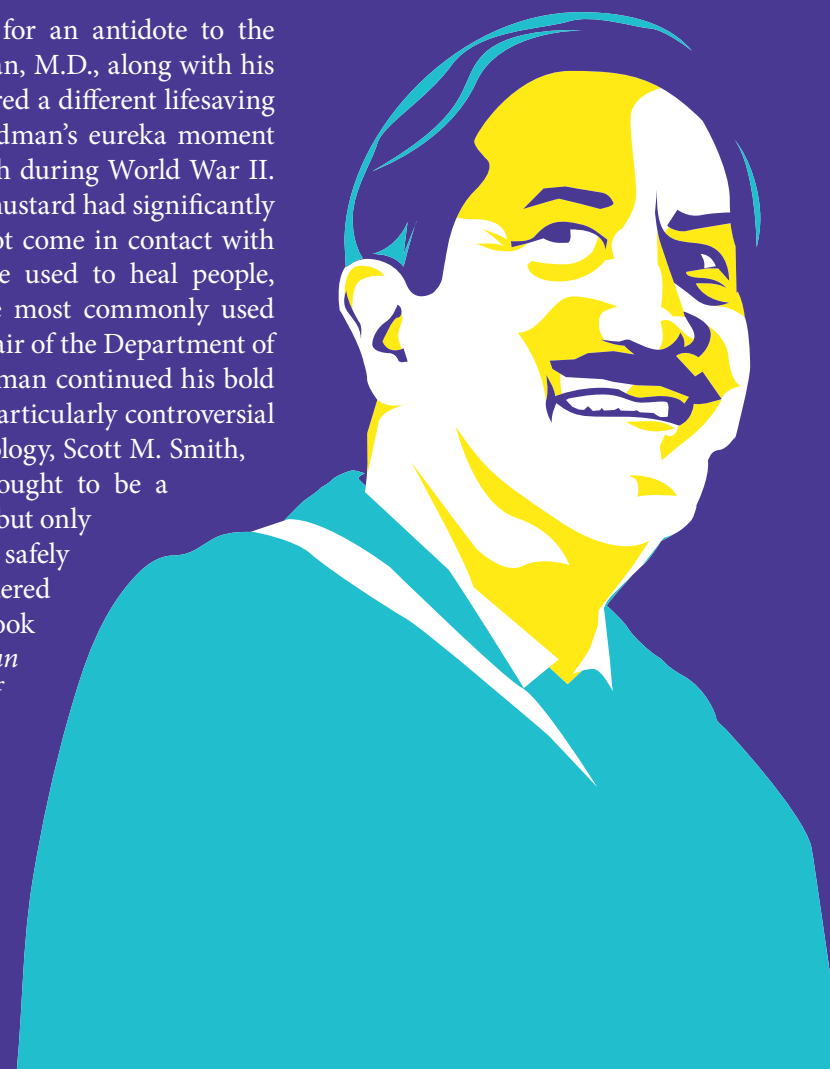


MAXWELL WINTROBE, M.D., PH.D.
1901–1986

GIANT OF PHYSICIAN-SCIENTISTS When the NIH awarded its very first research grant in 1945, they gave it to Maxwell Wintrobe, M.D., Ph.D., a world-class hematologist, who had made the unlikely trek from Johns Hopkins to a newly formed four-year medical school at the University of Utah. It was an impressive \$100,000 grant, renewed annually for the next 23 years, to study muscular dystrophy and other hereditary and metabolic disorders. Three years earlier, Wintrobe had placed the study of blood on the medical map as a distinct subspecialty as the single author of the exhaustive and meticulously referenced textbook, *Clinical Hematology*. Now in its 13th edition, *Wintrobe's Clinical Hematology* remains the go-to source for the field. His unrelenting work ethic and trailblazing research (he published more than 260 papers) led to major advancements in the field, including treatments for such diseases as anemia. During his 30-year tenure as a professor and founding chairman of the Department of Internal Medicine, Wintrobe refused to tolerate mediocrity, in himself or people around him. Famous for his demanding, Socratic teaching style, he created a world-renowned hematology training program, which produced many of the leading experts in the field. Teacher, investigator and physician, Wintrobe defined the physician-scientist, mentoring and inspiring generations of clinical investigators.

LOUIS S. GOODMAN, M.D.
1906–2000

ANTICANCER WARRIOR While looking for an antidote to the deadly effects of mustard gas, Louis S. Goodman, M.D., along with his colleague, Alfred Gilman, M.D., Ph.D., discovered a different lifesaving treatment—the first chemotherapy agent. Goodman's eureka moment came in 1942, while doing government research during World War II. He observed that soldiers exposed to nitrogen mustard had significantly lower white cell counts than those who had not come in contact with it, and hypothesized that it could actually be used to heal people, not just to harm them. It remains one of the most commonly used chemotherapy agents today. As the founding chair of the Department of Pharmacology at the University of Utah, Goodman continued his bold and game-changing experiments, including a particularly controversial one in which he injected the chair of anesthesiology, Scott M. Smith, M.D., with curare, a chemical compound thought to be a paralyzing poison. Smith was indeed paralyzed but only temporarily, proving that curare could be used safely and effectively in surgery. Goodman considered his most lasting accomplishment the textbook that he and Gilman co-authored: *Goodman and Gilman's The Pharmacological Basis of Therapeutics*. Known as the Blue Bible, and now in its 12th edition, this seminal work helped establish pharmacology as a legitimate and important discipline in medicine, paving the way for major advancements in drug therapy for all types of diseases.



WILLEM J. KOLFF, M.D., PH.D.

FATHER OF ARTIFICIAL ORGANS Known to quip, “If man can grow a heart, he can build one,” Willem J. Kolff, M.D., Ph.D., did just that, “building” the first artificial kidney and later the first total artificial heart. Kolff’s early kidney prototypes—made from orange juice cans, washing machines and sausage casings—became the precursor to today’s hemodialysis machines, which have saved the lives of millions. At the University of Utah, where he headed the Institute for Biomedical Engineering and the Division of Artificial Organs, his team worked on creating artificial placentas, lungs, eyes and, most famously, the Jarvik-7 heart, which was the first successful artificial human heart transplant. Kolff’s collaborative and cross-disciplinary work was foundational for today’s burgeoning field of medical device innovation.

HOMER R. WARNER, M.D., PH.D.

MEDICAL INFORMATICS MASTERMIND Decades before desktop computers and the electronic health record, Homer R. Warner, M.D., Ph.D., believed computers could help improve patient care. This steadfast conviction powered him through countless late nights in the mid-’50s and early ’60s to develop one of the first versions of an electronic medical record. In 1963, the computer he built and the software he wrote was installed at a local hospital. Nine years later it could perform the same kind of targeted clinical decision support that health care software companies are still trying to perfect today. Known as the “Father of Medical Informatics,” Warner became the founding chair of what is now called the Department of Biomedical Informatics at the University of Utah—the first department to grant degrees in the field.

WILLIAM C. DEVRIES, M.D.

HEART TRANSPLANT TRAILBLAZER It’s not often that a doctor holds the entire world captive for seven hours. But that’s exactly what William C. DeVries, M.D., did when he performed the first total artificial heart implant at the University of Utah on Dec. 2, 1982. DeVries was the only physician approved by the FDA to perform the experimental surgery when he inserted the Jarvik-7, the first patient-ready artificial heart, into the chest of Barney Clark, who was dying of congestive heart failure. The surgery prolonged Clark’s life for 112 days. DeVries’ greatest legacy may be that this bold work sparked innovations for mechanical pumps that help failing hearts recover their function and avoid transplantation altogether.

F. MARIAN BISHOP, PH.D., M.S.P.H.

FAMILY MEDICINE’S FIRST LADY Never intimidated by being first, F. Marian Bishop, Ph.D., M.S.P.H., had a lifetime filled with pioneering career moves. She helped establish two disciplines in academic medicine—family medicine and preventive medicine—earning her the title, Mother of Academic Family Medicine. “Just as long as I’m not the grandmother!” she used to quip. Among her long list of “firsts” included becoming the first female chair in the history of the University of Utah’s medical school and the first woman president of the Society of Teachers of Family Medicine. A devoted mentor and role model, Bishop’s trailblazing contributions have impacted the careers of every family physician practicing today.

KRISTEN RIES, M.D.

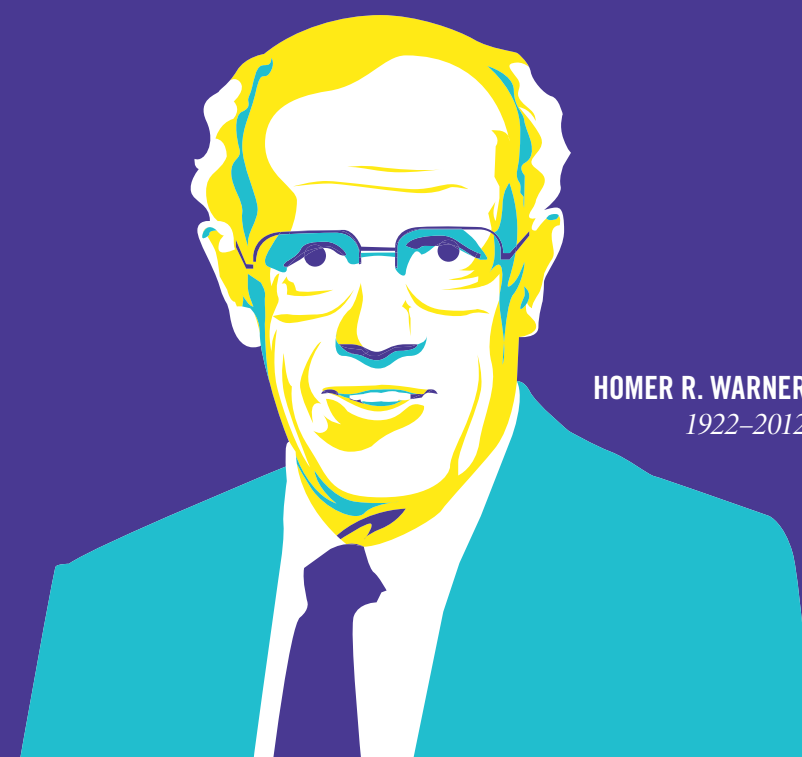
ACCIDENTAL AIDS ACTIVIST In 1994, as the AIDS epidemic terrified the nation, an intrepid infectious disease doctor, who had been treating HIV for years, made her way to the University of Utah and rolled out the welcome mat at the hospital’s startup HIV clinic. Refusing to be influenced by the fear associated with AIDS, Ries balanced medical knowledge and educated assumptions to protect herself against the deadly virus. Patient volume at the clinic almost immediately doubled, and Ries and her PA, Maggie Snyder, worked around-the-clock on a shoe-string budget, making house calls when needed. At the height of her career, Ries treated nine out of every 10 AIDS cases in Utah and the clinic was recognized as one of the nation’s top three university HIV programs.

MARIO CAPECCHI, PH.D.

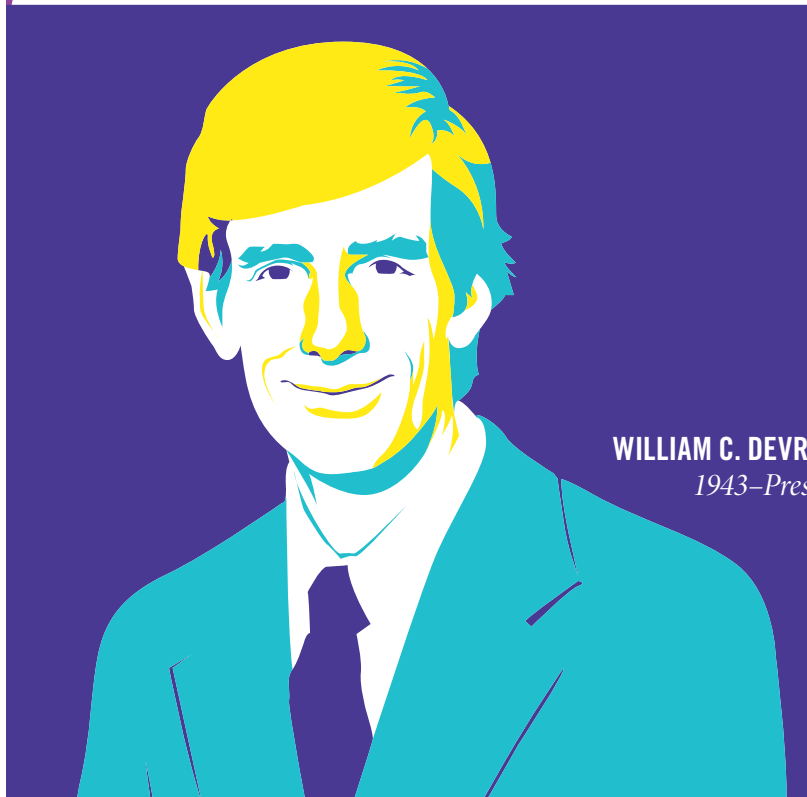
UTAH’S NOBEL HERO From a homeless 6-year-old living on the war-ravaged streets of Italy, to a Nobel laureate shaking hands with the king of Sweden, Mario Capecchi, Ph.D., followed an unlikely path to greatness. His groundbreaking work in gene targeting using knock-out mice enabled researchers to test how genetic mutations morph into disease and earned him the 2007 Nobel Prize in Physiology or Medicine. Today, his gene-targeting discovery impacts investigations into everything from the correlation between heart disease and diabetes, to the genetics behind epileptic seizures and new therapies for childhood cancers. Capecchi has generously shared his research with the global scientific community, encouraging others to improve on it in their own unique ways.



WILLEM J. KOLFF
1911–2009



HOMER R. WARNER
1922–2012



WILLIAM C. DEVRIES
1943–Present



F. MARIAN BISHOP
1927–2003



KRISTEN RIES
1940–Present



MARIO CAPECCHI
1937–Present

RECRUITING ROCKSTAR TALENT

OUR NEWEST TEAMMATES

We know that the best and the brightest can choose to work anywhere. That's why we're thrilled that more than 200 of them chose to come to Utah this past year. Here we highlight just a few of the accomplished people from top institutions all over the world who joined our team. We have our own ideas of why Utah is so fantastic, but we're always curious about what drew them here. So we asked them: Why Utah?



Ana Maria Lopez, M.D., M.P.H.
Associate Vice President for Health Equity and Inclusion, Director of Cancer Health Equity, Huntsman Cancer Institute

“There’s a passion for collaboration here—we’re all rowing in the same direction—toward health equity. By systematically addressing access to care and to education through community partnerships, we’re making a difference and improving health for the individual, for the family and for our communities.”

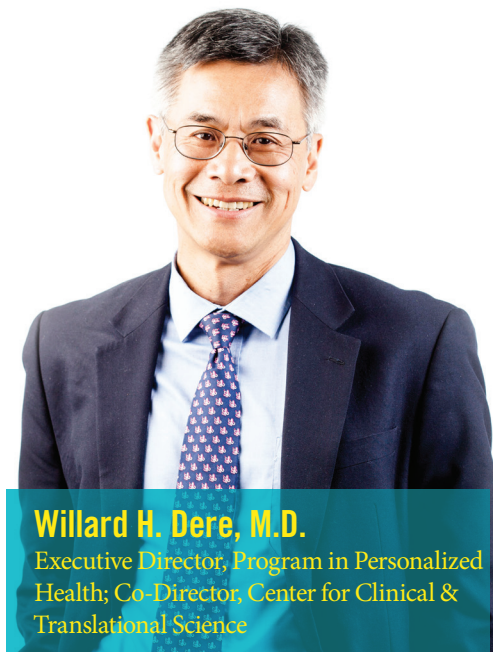
FORMER Medical Director, Arizona Telemedicine Program, University of Arizona **AMBITION** Partner with the communities we serve to develop and assess community-based solutions that improve health. **REPUTATION** Lopez was known as the “doctor to see” among women with cancer along the Arizona-Mexico border.

“The biggest attraction for me is how Utah’s leadership is embracing health care transformation and preparing for the future. With so much at stake, I want to make sure academic radiology can thrive and make an impact in the new landscape. Utah’s ambitious and entrepreneurial culture make this the perfect environment for me.”

FORMER Wil B. Nelp Professor of Radiology and Vice Chair for Research, Adjunct Professor of Bioengineering, 2014 University of Washington Presidential Entrepreneur Fellow **INNOVATION** Developed software for neuroimaging analysis that is currently used in 39 countries. **DISCOVERY** Discovered the early imaging signs of Alzheimer’s that can lead to better diagnosis. Principal investigator for 11 NIH grants since 1997, including a \$1.7 million R01 grant.



Satoshi Minoshima, M.D., Ph.D.
Chair, Department of Radiology



Willard H. Dere, M.D.
Executive Director, Program in Personalized Health; Co-Director, Center for Clinical & Translational Science

“Twenty-five years in private industry was great... and enough. My brain’s still working, so I still want to contribute. I’m fascinated by discovering disease-causing genes and developing targeted medicines to treat those diseases. There’s no better place in the world to do that than Utah. The Utah Genome Project is a truly unique program.”

FORMER Senior Vice President; Head of Global Development; Corporate Chief Medical Officer at Amgen **VISION** Help identify new disease-causing genes through the Utah Genome Project. Also discover new ways for “big data” to be more useful and better personalize health care-related interventions. **DISCOVERY** Led the development of several new medicines over 25 years in the biopharma industry, with particular emphasis on three bone-active drugs.



Alexandra L. Terrill, Ph.D.
Assistant Professor of Occupational
Therapy

“With the mountains so close by, I knew Utah would be a perfect place to live. But what really sealed the deal was that everyone was so approachable and enthusiastic about my interests. It was easy to see myself collaborating with people from different disciplines all over campus. I knew this is a place I could not just work, but really thrive.”

FORMER Rehabilitation fellow at University of Washington
AMBITION Understand how resilience impacts people with medical conditions and disabilities and how to foster more of it to promote recovery.
IMPACT Published 12 peer-reviewed articles, presented at 19 professional conferences, and recently awarded two internal grants for her interdisciplinary work.



Danny Chou, Ph.D.
Assistant Professor of Biochemistry
Utah Science Technology and Research
(USTAR) Investigator

“Under other circumstances, I could spend my entire life in my lab and never see how my research is helping others. Here, it’s different, and that’s why I came to Utah. Because of the resources at USTAR and the very strong clinical force, I know I’ll see the impact of my work in people’s lives.”

FORMER Postdoctoral Fellow in Chemical Engineering at MIT **DISCOVERY** Developing long-lasting “smart” insulin that self-activates to keep blood sugar levels normal. Early tests in mouse models proved successful and could lead to daily or weekly injectable insulin to manage Type 1 diabetes. **EDUCATION** B.S., National Taiwan University; Ph.D., Harvard University

“Today, our community is really the world. At Utah, Global Health has strong institutional support and is nicely integrated. All of the efforts from the different schools and colleges live under one roof, which is uncommon, but so important for entering the global health space.”

FORMER Managing Director of Johns Hopkins Medicine International
VISION Establish sustainable, international partnerships to improve the health and social conditions of developing areas around the world.
EXPERIENCE More than 25 years of experience in health programs design, implementation and management.



Juan Carlos Negrette, M.B.A.
Administrative Director for Global Health

“Everyone’s looking into the crystal ball to see what’s next. What I see is the need to provide accessible, convenient and high-quality care. I want to be part of a system that’s tackling those issues and has the value equation front and center. The University does, and I believe that uniquely positions us for success.”

FORMER President of Molina Healthcare of Utah **MISSION** Align incentives with payers, health systems and patients. Transform health care with value-based reimbursements and population health management.
DISCOVERY Senior legislative aide during Clinton health reform years; first director for the Utah Children’s Health Insurance Program; leadership with WellPoint (now Anthem Inc.) and Molina Healthcare.



Chad Westover, M.P.A.
CEO, University of Utah Health Plans



Cornelia Ulrich, Ph.D.
Senior Director of Population Sciences,
Huntsman Cancer Institute

“Utah’s stunning landscape is the perfect backdrop for the first-class science taking place here. It’s truly inspiring.”

FORMER German Cancer Research Center and National Center for Tumor Diseases Director; Full Member at Fred Hutchinson Cancer Research Center
MISSION Discover how health behaviors and biologic factors affect cancer prevention and cancer prognosis. **IMPACT** PI of 20 active and completed funded projects, including seven R01 grants, one R21 grant, four R03 grants, one U54 grant and seven European grants.



David Perrin, Ph.D.
Dean, College of Health

“The major attraction for me was the leadership’s vision. They understand the important role that a college of health has in transforming health care and that prevention has in health care delivery. I want to support that vision.”

FORMER Provost and Executive Vice Chancellor at the University of North Carolina at Greensboro **ASPIRATION** Foster new collaborations in the College of Health and throughout the Health Sciences with interdisciplinary research and degrees, shared appointment faculty hires and a more coordinated approach to care delivery. **INFLUENCE** Launched research programs on concussion in sports and anterior cruciate ligament injuries in physically active females while a professor at the University of Virginia.

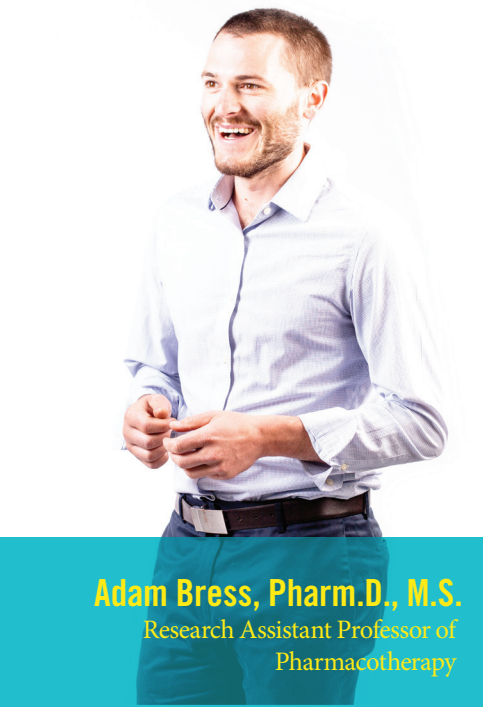


Mark A. Mahan, M.D.
Assistant Professor of Neurosurgery

“As a clinician, I want to partner with leaders in science to tackle difficult problems, and there’s no question that Utah has world-class research capabilities. I can also tap into the breadth of talented clinicians here to work in teams to improve the success rate of complex surgeries.”

FORMER Resident at Barrow Neurological Institute; Fellow at Mayo Clinic and University of California, San Diego **TALENT** One of a handful of surgeons in the country dedicated to restoring function in patients with serious neurological damage, such as nerve injury, stroke or spinal cord injury. **EXPERIENCE** A.B. in molecular biology from Princeton, worked in private equity buyouts for five years; then in the wake of 9/11 had a change of heart and earned his M.D. from Columbia.

I’m passionate about individualizing care for each patient, and I can’t do that alone. When I came to Utah, I was thrilled by the genuine culture of friendliness and collaboration. There’s really an open-door policy with even the most influential researchers. If one of your strengths is collaboration, Utah is for you.”



Adam Bress, Pharm.D., M.S.
Research Assistant Professor of Pharmacotherapy

FORMER Research Fellow in Pharmacogenomics at the University of Illinois at Chicago **VISION** Understand issues surrounding race, genetic ancestry and variable drug treatment outcomes in hypertension, heart failure and anticoagulation in atrial fibrillation. **EDUCATION** Pharm.D., University of Maryland School of Pharmacy; residency, Yale-New Haven Hospital; and M.S., residency and fellowship, University of Illinois at Chicago Schools of Pharmacy and Public Health.



Julie Balk, D.N.P.
Executive Director for Nurse Practitioner Education

“I want to transform health care, and I think Utah has the resources and expertise to do it. Most people are looking for an immediate impact and that’s important. But I love how Utah is also looking ahead and training the next generation in teams.”

FORMER Associate Professor of Nursing at Westminster College **GLOBAL REACH** Traveled to the Amazon jungle and the Solomon Islands on humanitarian medical missions. **PIONEER** Helped start on-site health and wellness clinic for CHG Healthcare Services, which saved more than \$2.13 million in claims in the first year.



Mark Durham, D.M.D.
Division Chief of Prosthodontics,
Chair of Continuing Dental Education

“It takes more than just a dream to solve the problems we’re facing in health care. I can dream up ideas and say, ‘Why not?’ But I need the superb network of innovation for technology, research and licensing that the University of Utah has mastered to make those dreams a reality.”

FORMER Clinical Prosthodontist, Assistant Residency Director and Lab Manager at the VA SLC Dental Service and General Practice Residency **INNOVATION** Piloting and developing several dental devices, including a prosthetic that restores normal chewing functional abilities for patients without teeth. **LEADERSHIP** Started an online global education portal that was influential in helping launch the Dental School’s continuing education program.

“The library here is really all-in for innovation. It’s spectacular and so rare to find leadership that embraces change and is willing to take chances. We’ve built a stellar reputation of technology innovation, and I love working in that dynamic environment.”



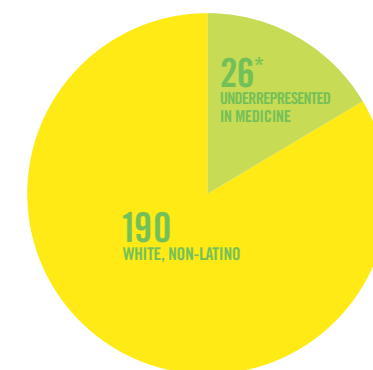
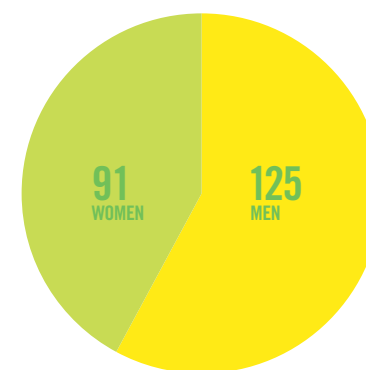
Melissa Rethlefsen, M.S.L.S.
Associate Librarian

FORMER Education Technology Librarian and Assistant Professor of Medical Education at Mayo Clinic **PASSION** Enable students, staff and faculty to make better, evidence-based decisions to improve health. **DISCOVERY** Was lead author of a book, and published 57 articles on technology, social media, bibliometrics and systematic review methodology.

NEW FACULTY RECRUITS IN 2014

TOTAL: 216

SCHOOL OF MEDICINE: 186
SCHOOL OF DENTISTRY: 12
COLLEGE OF HEALTH: 7
COLLEGE OF PHARMACY: 7
COLLEGE OF NURSING: 4



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This publication is produced by the University of Utah Health Sciences Office of Public Affairs. For sources of data cited in this report, visit algorithmsforinnovation.org.

Printed on New Leaf Reincarnation and Ingenuity 100 papers, which are FSC -certified, and chlorine-free.





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