

COLOMBIAN SURGEONS ARE SOME OF THE WORLD'S BEST AT SAVING LIVES WITH THE SIMPLEST OF TOOLS: A PLASTIC BAG TO COVER AN OPEN WOUND, A SCALPEL AND LAVAGE TUBE TO CHECK FOR ABDOMINAL BLEEDING. FORGET CT SCANS—PUBLIC HOSPITALS MAY NOT EVEN HAVE MATTRESSES ON THE GURNEYS.



A STUDY IN TRAUMA AND RECOVERY
BY REID R. FRAZIER

LEARNING

WHAT THEIR HANDS ALREADY KNOW

A typical night for an on-call trauma surgeon in Cali, Colombia, looks something like this. The patient in Operating Room 1 has a bullet wound in the heart. There's an abdominal stab victim in Room 2. And in 3, a car crash victim is on a ventilator, barely holding on. The patients will come in ambulances, police cars, taxis. There will be punctured torsos, lacerated blood vessels, and head traumas requiring a series of delicate surgeries. The wounds are mostly from *balas y cuchillos*, bullets and knives. At least one person will die on the table.

Every once in a while, a call will come in telling the doctor to get ready: *A dozen or so soldiers with serious injuries are coming in by chopper.* A few minutes later, the trauma team will hear the *thump-thump* of helicopter blades above. The aircraft carries a load of soldiers who were caught in a firefight with rebels or paramilitaries or were torn up by a car bomb. The victims are too young to die, the surgeon will think.

Welcome to Alberto García's world.

ILLUSTRATIONS | ROB KELLY

García has been a surgeon in Cali, a city of more than 2 million, since 1989. Cali hospitals have among the heaviest trauma loads in the world. Few trauma centers in the United States see more than 3,000 patients a year. UPMC Presbyterian, one of the busiest in this country, with 140 ICU beds, gets about 5,000 patients a year. The public university hospital in Cali, at the Universidad del Valle, with 40 ICU beds, sees about 10,000.

“It’s an enormous figure,” García says, in emphatic, professorial Spanish.

The reasons for the immense trauma load are diverse. The Colombian civil war, which began in 1948 and reignited in the 1960s, and the rise of the drug trade (often a main source of cash for the war), can account for only part of the story. A heavily armed populace and urban crime all play a part. Some of the country’s academics have even established a new type of social science: violentology, the study of violence and its causes.

Whatever the causes for the trauma load,

deaths in Cali for a one-year period. The researchers handpicked their way through paper files in offices around the city. They found an astounding 34 percent died of preventable causes—usually because someone didn’t diagnose a hemorrhage, a perforated bowel, or an infection in time. They are now studying whether an ensuing education campaign for the city’s first responders and doctors has lowered the number of preventable deaths in Cali.

García grew up in a small town a few hours from Bogotá, the country’s capital city. The son of a school teacher and a dressmaker, he considered following some of his classmates to the United States to build a career.

“It was attractive,” he says. “But I felt that, with the things I wanted to do, I would be more useful here. The impact I could have had in the U.S. wouldn’t have been as big; so I decided to stay here and fight on.”

García and other doctors in Colombia are hungry for more progress. There is very little

Doctors like García and Ordoñez are the exceptions. They believe a stronger research program would make a difference for Cali’s trauma patients and perhaps for trauma patients throughout the world.

Juan Carlos Puyana, García’s former classmate, shares these sentiments. Puyana and García both received their medical degrees at the Universidad Javeriana in Bogotá, where Puyana was born. Tall and lanky, with a thick head of straight dark hair and a bushy dark mustache flecked with silver, the 47-year-old Puyana is an associate professor of critical care medicine and surgery at the University of Pittsburgh. He has a jaunty manner and thick crow’s feet around his eyes; they fold in when he smiles. His eyebrows arch upwards when he gets excited in conversation, like when he’s talking about novelist Gabriel García Márquez or Pitt’s new Colombian partnership, of which he is the architect. The partnership is sponsored by the Fogarty International Center at the National Institutes of Health.

Puyana and his Pitt colleagues are partnering with professors at the Universidad del Valle, including García and Ordoñez, to build the program. The new five-year initiative, dubbed Trauma and Injury Excellence in Education on Research (TRAINEER) will immerse young Colombian doctors in the American system of research, particularly clinical research.

“One thing is to teach people in Colombia to learn how to do research with what they have,” Puyana explains from his office on the 12th floor of UPMC Presbyterian.

Puyana has already been inspired by studies he published recently with García and Ordoñez. And he notes that the first Fogarty-sponsored results are in hand. In September, just six months into the partnership, Ordoñez presented results of a study examining surgical alternatives to ostomies (which are linked to high mortality rates) before the annual meeting of the American Association for the Surgery of Trauma in New Orleans.

“We want impact now,” Puyana says, grabbing a sheet of paper from his desk. As he talks, he sketches a flowchart of the program, drawing arrows between boxes surrounding acronyms of various university programs in Pittsburgh and Cali. One of the boxes surrounds *CRTP*, Pitt’s Clinical Research Training Program, through which visiting Colombian Fogarty trainees can pursue certificates or master’s degrees in clinical research. Another box contains *CISALVA*, the

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García and other surgeons in Colombia must function on a shoestring budget. The big-ticket diagnostic aids, such as echocardiograms and CT scans, are luxury items, especially in the public hospital where García was head of critical care until early last year. (Private hospital wards are likely to be as well equipped as those in the United States.)

UPMC Presbyterian has more than a dozen state-of-the-art scanners. Cali has one. It is reserved for the most serious injuries.

So most Colombian doctors have figured out how to save lives without advanced equipment. In cases of abdominal bullet wounds, for example, they’ve found a physical exam once every hour tells them as much as a CT scan would.

In the mid-1990s, García and fellow Cali surgeon Carlos Ordoñez studied hundreds of patients to determine whether X-rays were needed to detect a pelvic fracture, a common injury in a car crash. They found the physical exam worked just as well as the X-ray at diagnosing the injuries. The hospital stopped giving X-rays for most pelvic fractures; X-rays few patients could afford.

A couple of years later, García and Ordoñez’s team surveyed all 2,500 trauma

money in Colombia for the kind of research García would like to do—like studying the efficacy of certain antibiotics on infections. The patient information system is improving, but it’s a far cry from what it could be. Information is scattered, basic, and hard to access.

In a big-city U.S. hospital, two or three staff members will oversee a trauma database with 400 or so data points per patient. In Cali, the information is collected mostly on paper and stored in files.

Therein lies a problem.

Colombia’s hospitals are eye-opening places to learn about trauma surgery. Colombian surgeons are some of the best in the world at saving lives with the simplest of tools: a plastic bag to cover an open wound, a scalpel and lavage tube to check for abdominal bleeding. Forget CT scans—public hospitals may not even have mattresses on the gurneys. Their feats in the O.R. may be Herculean at times, but most of the trauma world isn’t learning from Colombian surgeons. Their work isn’t, generally, written about in international journals. They simply don’t do as much research as their counterparts in more developed countries. There is no time. No money. No training.

partner program at the Universidad del Valle and Colombia's national injury prevention center. Arrows zigzag all over the page, and an arrow from CISALVA's box lands on the word *VIOLENCE*.

Puyana talks about CISALVA's director and coinvestigator for the Fogarty, Maria Isabel Gutiérrez, an MD and Johns Hopkins University-trained PhD epidemiologist. Among other things, she has studied how to prevent child abuse in some of Cali's roughest neighborhoods. Her systematic research found public awareness campaigns can curb such violence by 10 percent, reducing the number of people entering the city's strained hospital system.

CISALVA was created by physicians, social scientists, and epidemiologists at the Universidad del Valle in response to escalating levels of violence during the early 1990s. At the time, murder rates were at or near the highest in the world. One of CISALVA's first triumphs was to help the city study the nature of murders in Cali—when, where, how, and why they happened. The researchers found that most occurred on weekends, especially after holidays or payday. So city authorities stepped up police patrols in crime hotspots and, on weekends, banned concealed firearm possession and late-night alcohol sales. Curiously, the gun bans were enforced during some but not all weekends.

"Methodologically, it was wonderful, because it provided us with all types of days or weekends where there was an intervention," said Andrés Villaveces, the CISALVA study author who is now research assistant professor of epidemiology at the University of North Carolina at Chapel Hill. On the days when the ban was enforced, Villaveces found a 14 percent reduction in homicide rates.

"That translated into hundreds of deaths prevented," says Villaveces.

With these data in hand, Gutiérrez and her colleagues were able to spread the policies to other cities. They started with big cities like Medellín and Bogotá. Gradually, she and her collaborators convinced authorities in smaller cities and towns to enact similar policies. The results are clear. Colombia has cut its murder rate by a third in the past 10 years. Part of the decline, researchers say, is a result of the country's peace process, which has curbed bloodshed in some areas. But CISALVA's campaign also gets credited for contributing to the drop. Bogotá's murder rate is a fraction of what it used to be. Now it's half that of Washington, D.C., and about



Juan Carlos Puyana, architect of the Colombian partnership, with the Cali hospital in the background

the same as Phoenix's.

Colleagues describe Gutiérrez as warm, undaunted by problems she might face, and among the most energetic people they know. She says having data helped her convince local officials to go along with CISALVA's recommendations.

"When you show them that these interventions can show results, you have them on your side. You have an ally with them," she says.

Gutiérrez sees Colombia's problems as a series of solvable puzzles. Violence is still the country's number one public health problem. Gutiérrez and colleagues treat it in much the same way scientists might treat other problems. They monitor patterns and employ appropriate tools. In the domestic violence program, her tools were public awareness campaigns developed by major ad agencies. Her team also orchestrated the spread of a targeted message through churches and social service groups. Gutiérrez has worked in some of the country's "red areas," places where left-wing guerillas and right-wing paramilitary groups battle with each other and the army. To her, the young men caught up in the civil war are just "ordinary people, like you and me," people with problems to be solved, she says.

Gutiérrez, like García and Ordoñez, is an exemplar of what the Fogarty program is trying to promote—Colombians who can create homegrown solutions through research.

"To me, it would be awesome if, [in] these five years, we can train 10 people to do what Maria Isabel does, not only in Cali, but in

the rest of the country," says Puyana. "If we do that, we'd probably have a greater impact on health care than if we'd developed a new protein. At least in the reality of Colombian health care."

The son of a retired general in the Colombian Army, Puyana traveled widely as a boy, living in the United States and Chile before his family settled in Bogotá again when he was 10. He smiles when asked about growing up in Colombia's capital, recalling a childhood with few worries, before the escalation of the country's civil war. When he graduated from high school, he wanted to go into a field where he could help people, and medicine seemed the best way to do that.

After receiving his medical degree, he did his residency in general surgery at McGill University in Montreal, with the plan of returning to Colombia. At the end of his residency, he told his adviser he needed to go to the United States for trauma surgery training before returning home.

"He told me, 'If you go to the States, you'll never go back to Colombia.' Of course, he was right."

Puyana went off to Yale University and Pitt but stayed close to his classmates in Colombia, largely through his affiliation with the Pan American Trauma Society. Still, he felt some remorse about leaving his home.

"The Colombians were waiting for me. And I kind of stood them up," he says. "When [the Fogarty application] came on my desk, I said, 'This is it.'"

He and Andrew Peitzman, professor of surgery and director of trauma and surgical critical care at Pitt, applied for the Fogarty grant in the summer of 2005. By the spring of 2006, they learned they would receive \$150,000 a year for five years. Timothy Billiar, the George V. Foster Professor and chair of the Department of Surgery, is the grant's principal investigator. Puyana and Peitzman oversee the day-to-day operations of the program.

The American-born, -bred, and -trained Peitzman has traveled extensively in Latin America but visited Cali for the first time this fall. He describes that first visit to a Colombian trauma room as "humbling."

"Colombian doctors can operate circles around us," he says. "Taking our trauma experience to them in Colombia is like taking coal to Newcastle."

But he notes that without clinical trials, it will be impossible to prove to a skeptical scientific community that a given Colombian

In addition to training Colombian surgeons here, Pitt docs are offering in-country instruction. In November, 58 general and trauma surgeons from Colombia, Brazil, and elsewhere gathered in Cartagena, Colombia, for TRAINEER's first such seminar, which explored clinical and basic science research methodologies. (Puyana was particularly happy to see people still in their seminar seats at 8 p.m. on a Friday instead of seeking out one of the Caribbean town's many fine restaurants.) Since the seminar, Puyana has been contacted by several young surgeons who want to learn more.

Eventually, TRAINEER organizers would like to offer online instruction in Spanish to reach a broader audience and mentor graduates of the program remotely.

"We may see things they're doing in Colombia that make sense that might be translated here," says Hank Weiss, a Fogarty participant who is director of Pitt's Center for Injury Research and Control and a PhD

most satisfying thing."

He hopes the Fogarty will have a snowball effect, both sparking Colombians' interest in research and sparking worldwide interest in research by Colombians.

The first two trainees are scheduled to arrive this summer, including Andrés Rubiano, a neurosurgeon.

Rubiano says he would like to develop better prehospital care for brain injuries. To do that, he needs to show the Colombian government why it's important, just as Gutiérrez has done so successfully with CISALVA programs. "If you want to change any of the government policies about trauma care, you need to be really prepared and show them good data," says Rubiano, who will enroll in Pitt's Master of Science in Clinical Research program. He'll begin coursework this summer in biostatistics, research design, and computer-based data analysis.

Rubiano's hospital, in the city of Neiva, sees patients from a broad swath of Colombia's rural South, including an area the size of Switzerland with a lot of rebel activity. He treats brain injuries from motorcycle accidents, gunshots,

machetes, and an occasional bomb. Relying on treatment protocols developed in the United States, where trauma patients receive care within minutes, is of little use in Neiva, he says. His typical patient arrives two to four hours into an injury.

"Here in Colombia, clinicians work a lot with research from other countries, but the population here is different, the context is different," says Álvaro Sánchez, a 28-year-old MD pursuing a master's degree in epidemiology in Cali. He'll also arrive this summer as a Fogarty trainee and pursue the master's degree in clinical research at Pitt. His summer course load will look a lot like Rubiano's.

When he returns home, Sánchez would like to design injury-prevention studies appropriate to Colombia. A U.S. study on, say, treating firearm injuries, would have little efficacy in Colombia, where ambulance service is sporadic. As in other parts of the country, most of his patients wait hours, not minutes, before getting medical attention.

"We need more information from our own situation, not from other countries," he says. ■

Jessica Mesman Griffith contributed to this story.

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approach might be of benefit elsewhere.

"The best of the best studies are clinical studies that are randomized, blind, in level-1 trauma centers, with big enough patient samples, and good statistics," Peitzman says. "In order for us to change anything that we do, that's the kind of data that people want."

Colombian doctors have loads of experience, Puyana confirms, but their medical school training is usually more vocational and pragmatic than training here. In terms of research, they may not be versed in "the ability to ask the right questions," he says, or in developing the methods to figure out the best way to approach a research problem.

With a cadre of Pitt mentors, Fogarty trainees will have the support and the ability to create a database to track, for example, all the penetrating heart wounds they treat over the course of a year. They will learn how to design a proper clinical trial and apply the right statistical methods to the results. They will know how to write and present research papers.

Once a trainee's studies in Pittsburgh are complete, the program will give the doctors minigrants to help them start their own studies in Colombia.

associate professor of neurological surgery.

The Bogotá Bag is a perfect example.

When surgeons at a Bogotá hospital could not close the swelling abdomen of a severely traumatized patient, they cut open a plastic I.V. bag and sutured it directly to the skin. It saved his life. After hearing about this, star trauma surgeon Kenneth Mattox at Baylor College of Medicine in Houston, developed the Bogotá Bag in clinical trials in the United States. Now the technique is widely used during treatment of abdominal compartment syndrome.

Fogarty participants shake their heads when they report the end of the story:

American doctors now teach Colombians how to use the Bogotá Bag.

Puyana describes his work with Fogarty as the "most important project he has ever done."

"Right now," he says, "I have an NIH grant. I work with the DOD and study combat casualties. That's helping a lot of people. But I didn't stay there [in Colombia] with Alberto and stay up nights caring for people. Being able to bring something back to Colombia at this stage of my life is the