

# NYU LANGONE HEALTH MAGAZINE

SPECIAL ISSUE  
FALL 2020

**HOW  
WE  
SAVED  
LIVES:**  
**138**  
DAYS  
ON THE  
FRONT  
LINE



APR



THE BIG BUILD  
THE SOUND OF 3,257,412  
HANDS CLAPPING  
HOW FAMILY CONNECT BRIDGED THE GAP  
LIFE AFTER LIFE SUPPORT  
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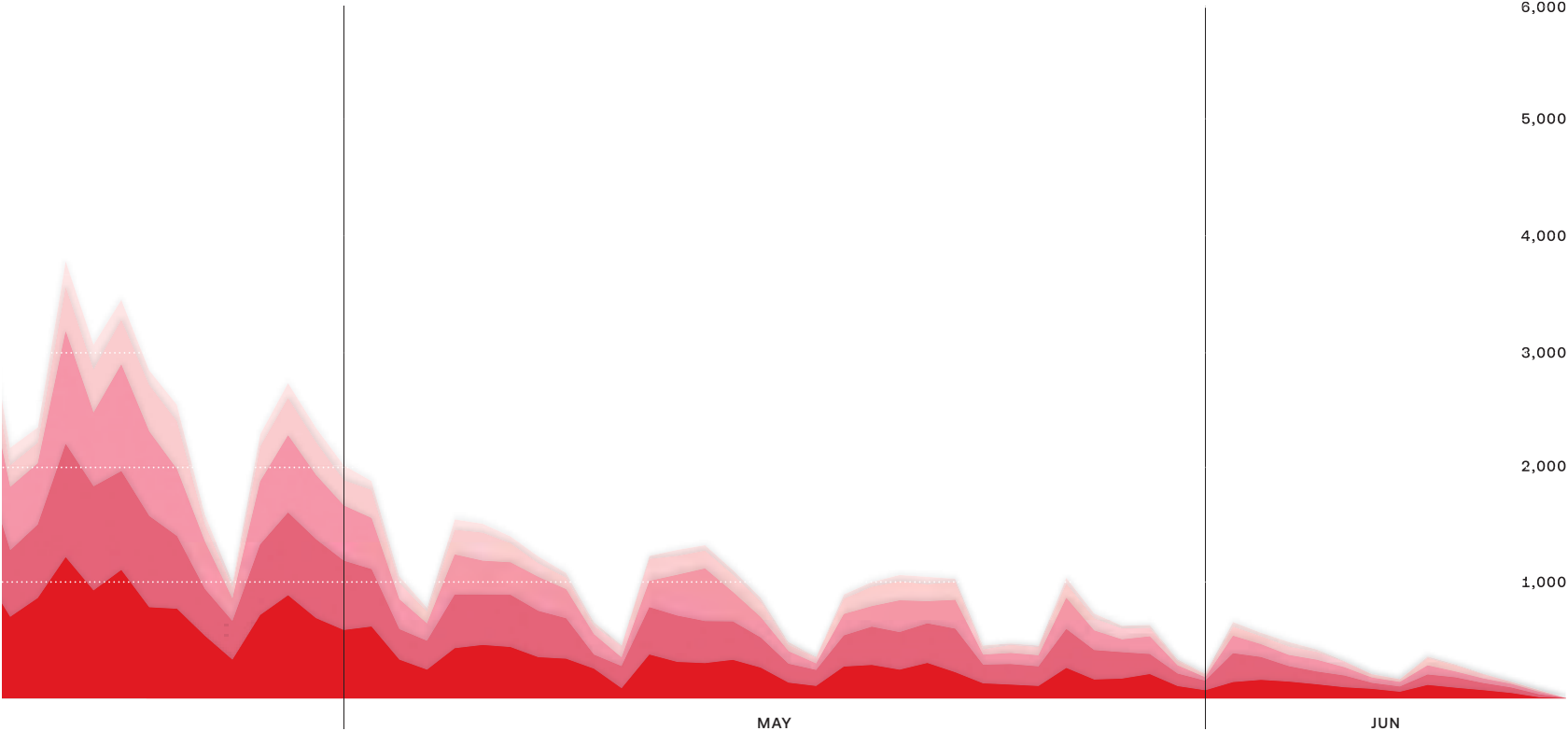
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**ON THE COVER:** APRIL 4, 2020: JACQUELINE NUÑEZ, A NURSE IN EMERGENCY MEDICINE AT NYU LANGONE, JOINS NEW YORKERS IN SALUTING HER FRONTLINE COLLEAGUES. PHOTOGRAPH BY NINA BERMAN/NOOR/REDUX.





December 31

MANHATTAN TIMES SQUARE

# GOODBYE, 2019. HELLO, COVID-19.

A historic stand against sudden calamity reveals the immutable strength of our community.

On December 31, 2019, revelers gathered in Times Square to ring in a new year and a new decade, unaware that 2020 would also bring a new normal. At the same time the crowd was dispersing around 1:30 a.m. on January 1, on the other side of the globe, Chinese health authorities issued an ominous report. They were investigating 27 cases of a mysterious viral pneumonia in Wuhan, the most populous city in central China. Several days later, *The New York Times* noted that “there is no evidence that the new virus is readily spread by humans, which would make it particularly dangerous.” But the world would soon learn otherwise. To date, COVID-19, as the novel coronavirus was named, has claimed the lives of more than 900,000 people worldwide.

The World Health Organization declared COVID-19 a pandemic on March 11. Two weeks later, New York City, with 5% of the world’s cases, became the newest epicenter. In the months that followed, the outbreak led to more than 56,000 hospitalizations. Over 7,000 of those patients were cared for at NYU Langone Health’s four hospitals. The time line presented in this issue chronicles the swift, dramatic impact of the crisis on our institution and the valiant response of our entire community.

“What concerned us was not knowing the extent of the outbreak,” recalls Michael →









Phillips, MD, chief hospital epidemiologist. “What reassured us was that we had a solid plan.” Fritz François, MD, chief medical officer and patient safety officer, refers to the key elements of that plan as “the 5Ts”: tools, teams, triage, therapies, and throughput (see page 39). But he attributes NYU Langone’s impressive performance, in equal measure, to the commitment affirmed by Robert I. Grossman, MD, Dean and CEO, at the outset. “Each of us rising to the best that is in us—whatever our role—has literally become a matter of life or death,” Dean Grossman told the NYU Langone community. “The institution will do whatever it takes to save lives and defeat COVID-19.”

Throughout Dr. François’ stewardship, he translated Dean Grossman’s pledge into his own form of inspiration, challenging frontline clinicians and behind-the-scenes staff alike to “think differently, perform boldly, and excel spectacularly.” NYU Langone’s 40,000-plus employees took his words to heart. Empowered by leadership—and battle tested by other calamities—people from every corner of the institution not only stepped forward, but also stepped up their game. When Mark Pochapin, MD, director of the Division of Gastroenterology and Hepatology and Sholtz/Leeds Professor of Gastroenterology, asked for reserves from other departments to support what he called “the COVID-19 army,” one volunteer responded: “At dawn we ride.”

Amid the sacrifice and suffering, small battles were won. Physicians innovated ways to improve outcomes and save lives. Nurses retrained on a dime, redeploying to units that care for acutely or critically ill patients. Therapists used clever strategies to relieve their patients’ distress and speed their recovery. Researchers collaborated on investigational trials for promising therapeutics and vaccines. Supply Chain staffers tracked down scarce supplies of personal protective equipment. Teams from Real Estate Development and Facilities added more than 600 acute care beds, 200 critical-care beds, and 100 Emergency Department bays in short order. Medical students volunteered to assemble face shields and update family members on the status of their loved ones. “Things that we thought would take months or years took hours or days,” notes Andrew Brotman, MD, executive vice president, vice dean for clinical affairs and strategy, chief clinical officer. “It’s a lesson to all of us that we have the capacity to innovate and respond when given the opportunity and when focused.”

By late March, the streets and sidewalks of Times Square were utterly desolate, but New Yorkers gathered elsewhere with their noisemakers for a different kind of celebration. At 7:00 p.m. each evening, they took to their windows, balconies, rooftops, or front steps, and they clapped and cheered and banged pots and pans to salute the hospital workers who gave their all to help others survive. Applause came in other forms as well. “If you need a hospital,” wrote one grateful NYU Langone patient, “this is where you need to be.”







Photograph by **Todd Heisler**/The New York Times





**“Calamity presents people with choices that are as clear as choices ever get. You can surrender to discouragement ... or you can pick yourself up and vow to come out stronger than you were before.”**

**ROBERT I. GROSSMAN, MD, DEAN AND CEO**

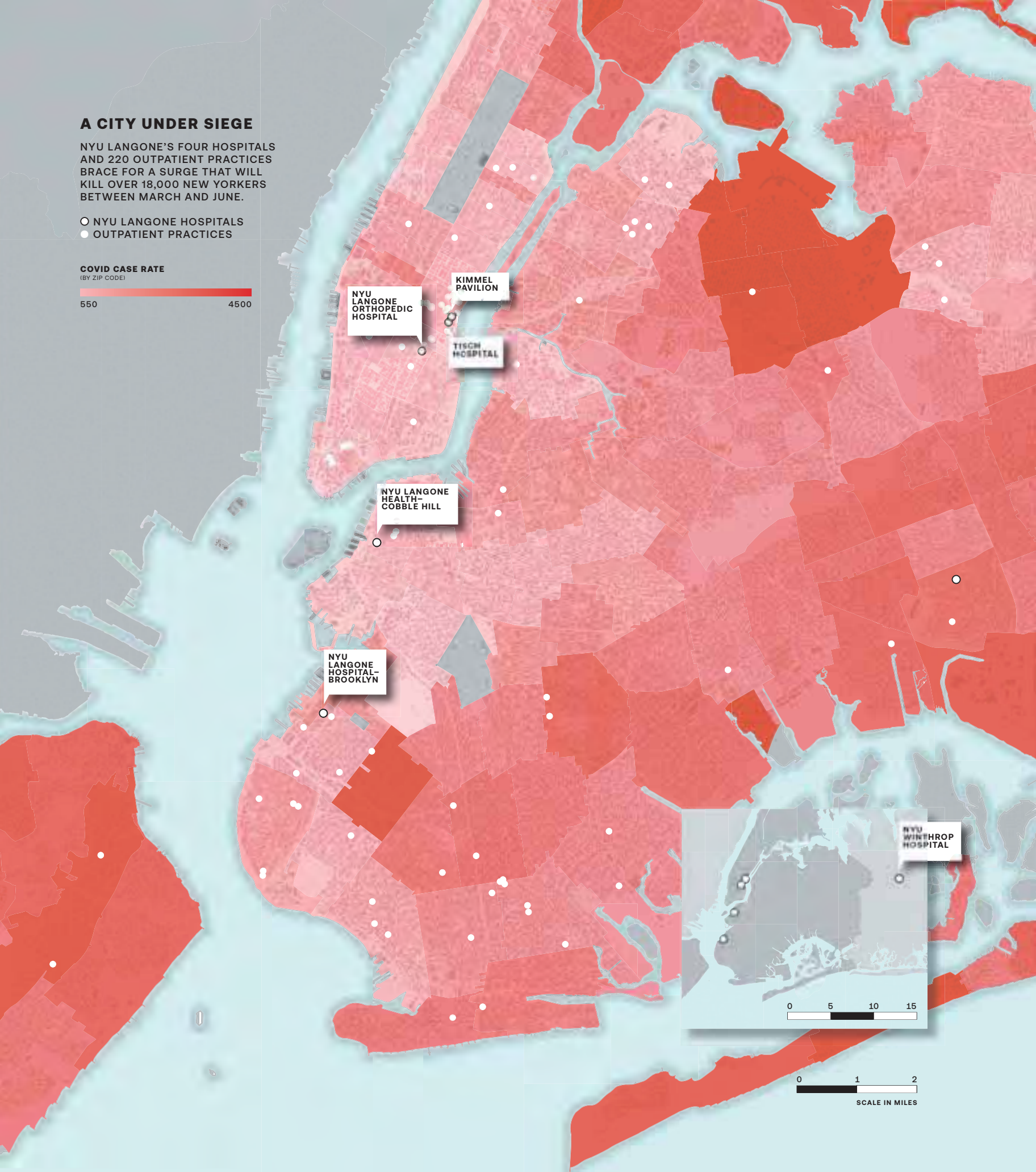
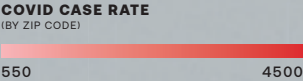
# Jan.



**A CITY UNDER SIEGE**

NYU LANGONE'S FOUR HOSPITALS AND 220 OUTPATIENT PRACTICES BRACE FOR A SURGE THAT WILL KILL OVER 18,000 NEW YORKERS BETWEEN MARCH AND JUNE.

- NYU LANGONE HOSPITALS
- OUTPATIENT PRACTICES





JAN

FEB

MAR

APR

MAY



January 2020: Funeral workers in Wuhan.

CHINATOPIX VIA AP; DANIEL LEAL-OLIVAS/AFP VIA GETTY IMAGES





January 7

WUHAN, HUBEI PROVINCE, CHINA

## An “Unexplained Pneumonia”

When Chinese health authorities first reported an outbreak of a “pneumonia of unknown origin” emerging from Wuhan, global health experts had a collective flashback. The dominant symptoms of fever and labored breathing sounded a lot like SARS, the novel respiratory disease that swept the globe in 2003 and killed nearly 800 people. Kelly McKinney, director of NYU Langone’s emergency management, makes the connection right away. “We assess every potential threat,” he says, “and as soon as we heard about what was happening in Wuhan, how quickly the outbreak was moving, we knew this was going to be a problem.”

A photograph of a Public Health England poster. The poster is white with red and black text. It reads: "A new infection has been detected in Wuhan, China (Novel Coronavirus)". Below this, it says: "If you have been to Wuhan, China, in the 14 days and develop ANY of these symptoms, contact a healthcare professional". There are four circular icons with blue figures: "Cough", "Sore throat", "Fever", and "Difficulty breathing". To the right of the icons, there is more text: "If you are currently experiencing symptoms in the airport, please..." and a phone number "020 8745...". A person wearing a white face mask is partially visible in the foreground on the right.

January 8

MANHATTAN KIMMEL PAVILION

FEB

MAR

APR

MAY

A fictitious newsreel produced for a simulated disaster drill in January.



## Making the Most of #Fakenews

A disaster simulation, complete with headlines, helps leadership brace for the adrenaline of crisis.

At 8:30 a.m., some 70 leaders of NYU Langone Health, including Dean and CEO Robert I. Grossman, MD, gather inside a seventh-floor conference room to absorb the breaking news on a 20-foot video screen. A deadly virus that causes fever, cough, and shortness of breath is spreading quickly in New York City, including at Tisch Hospital and NYC Health + Hospitals/Bellevue. A phone rings over the speaker, followed by a recorded announcement detailing the institution's alert system. Kelly McKinney, NYU Langone's director of emergency management, announces that he is activating the institution's Emergency Operations Plan to deal with the emerging crisis.

He asks Chief Hospital Epidemiologist Michael Phillips, MD, and Chief Medical Officer and Patient Safety Officer Fritz François, MD, to brief the group on what needs to happen next. Top of their list: isolating patients with suspected infection, arming staff with PPE, and institution-wide broadcasts.

Believe it or not: This is only a drill. Every year, McKinney, who has served as the deputy commissioner for the NYC Emergency Management Department, runs what he calls a tabletop exercise to tackle potential crisis scenarios. Past drills have dealt with an active shooter, a cyber attack, and an explosion. This year, inspired by the news of a mysterious pneumo-

nia in China, McKinney has chosen a contagious respiratory virus. "We had been discussing what was going on in Wuhan and what might happen if the spread was uncontained," says McKinney, "so we knew this was a timely drill."

Good fortune and good preparation tend to go hand in hand. Immersing the Executive Leadership Group in the scenario and enlisting them as active problem solvers will steel them for the challenges ahead. "The idea is to let chaos fill the room and then work together to create order," says McKinney. "The approach helps everyone process what a crisis looks like when you're in the middle of it."



January 21

EVERETT,  
SNOHOMISH COUNTY,  
WASHINGTON

## First US Case Confirmed

The US announces its first confirmed case of 2019-nCoV, a man in his 30s in Washington State who had traveled to the Wuhan region.



January 23

WUHAN, HUBEI PROVINCE, CHINA

## 58 Million under Lockdown

With 571 confirmed cases and 17 deaths reported in Wuhan, the Chinese government imposes a lockdown of the city's 11 million people and, within days, the rest of Hubei, effectively quarantining 58 million people. Residents are ordered not to leave their homes, except to pick up medications and groceries. Checkpoints ensure compliance, including the use of masks in public. The massive quarantine experiment—unprecedented in modern times—lasts 76 days and proves a model for reducing infection rates that will soon be adopted worldwide. “These public health interventions made a huge difference,” says Michael Phillips, MD, NYU Langone Health’s chief hospital epidemiologist. “With no biomedical innovations, no vaccine, and no proven medications when the pandemic hit, they were the only tools we had to prevent transmission in the community.”

“

Make no mistake. This is an emergency in China, but it has not yet become a global health emergency. It may yet become one.”

**Tedros Adhanom  
Ghebreyesus**

DIRECTOR GENERAL,  
WORLD HEALTH ORGANIZATION

JANUARY 23

A security guard outside  
the Huanan Seafood Wholesale  
Market in January.



JAN

FEB

MAR

APR

MAY



**Dr. Michael Phillips, chief hospital epidemiologist, visits NYU Langone Hospital–Brooklyn.**



January 23

MANHATTAN,  
NYU INFECTIOUS DISEASE  
ASSOCIATES

# Forewarned and Forearmed

A hospital epidemiologist consults his trusted crystal ball—experience.

On January 23, just as Chinese authorities are closing off the city of Wuhan after 17 of its citizens have succumbed to the coronavirus, the World Health Organization announces that the situation does not yet qualify as a public health emergency of international concern. “Now is not the time,” it reports. “It’s a bit too early.” But Michael Phillips, MD, NYU Langone’s chief hospital epidemiologist, isn’t taking any chances. Having once served as deputy commissioner for emergency management at New York City’s Department of Health and Mental Hygiene, he understands all too well that being forewarned means being forearmed.

“Seeing that long buildup to the Wuhan outbreak was lurking in the back of our minds,” Dr. Phillips recalls. “Our concern was that we were in for a similar scenario.” What also weighed on his mind was that the flu season was at its peak, which would make it particularly challenging to diagnose the cause of a patient’s respiratory infection. “We were trying to stay in front of this, as close as we could, realizing that we were making some assumptions that weren’t necessarily true,” says Dr. Phillips.

One of Dr. Phillips’ colleagues at the Department of Health was Kelly McKinney, who once again works at his side, now as director of NYU Langone’s Department of Emergency Management. “Kelly was saying that this was going to be massive,” notes Dr. Phillips. “I think we appreciated that there was a range of possibilities, but I don’t think we fully appreciated how massive it was going to be.” What was apparent to Dr. Phillips, however, was the potential magnitude of the threat to NYU Langone’s staff. During a conference

call with one of Supply Chain Management’s primary vendors, he learned that all the N95 respirator masks that afford optimal protection for clinicians came from one place: Wuhan.

Anticipating that N95s would be in short supply—and knowing that hospital outbreaks of other highly contagious infections, namely SARS and MERS, were traced to high-risk respiratory procedures performed on undiagnosed patients—Dr. Phillips launched a multipronged initiative to shore up NYU Langone’s defenses. He advised anesthesiologists, emergency medicine physicians, and other clinicians to wear an N95 during intubations or pulmonary procedures. He arranged for N95s to be fit-tested to ensure optimal protection (see page 57). And in the waiting rooms of the Emergency Departments, Dr. Phillips introduced a high-tech disinfection tool that uses an electrical current to charge particles in liquid disinfectants, which creates an atomized spray that clings to surfaces for at least 24 hours.

“Dr. Phillips knew what was going to happen before it happened,” says McKinney, “so he had us working on precautions in 25 different places.”

Dr. Phillips says that “precaution” is the right word. In late January, he notes, NYU Langone didn’t have in-house testing yet, so there was no way to know whether our hospitals had any cases of COVID-19. “All my preconceived notions have been shattered by this virus,” Dr. Phillips acknowledges. “But by being humbled, it allows you to think a little bit more openly. We’re trying to learn as much as we can from the past few months to prepare for what’s coming.”

January 25

MANHATTAN, NYU INFECTION  
PREVENTION AND CONTROL

## The Four Stages of a Pandemic

During a particularly bad flu season several years ago, so many patients filled the hospitals of NYU Langone Health that clinicians kept asking Michael Phillips, MD, chief hospital epidemiologist, “What level are we at?” But there was no system in place to designate the status of the institution’s response, so Dr. Phillips created one. He devised this four-tiered structure that conveys how an outbreak is affecting NYU Langone and how the institution is responding. “The response levels make it clear that we’re proceeding according to plan,” he says. During the COVID-19 crisis, NYU Langone peaked at Level 3 status.

### LEVEL 1

Transmission is occurring outside our area, but no confirmed patients in New York City.

### LEVEL 2

A small number of confirmed cases are cared for in NYU Langone hospitals, using existing airborne isolation rooms.

### LEVEL 3

The number of cases in NYU Langone’s system exceeds the capacity of existing airborne isolation rooms. Additional isolation units open to accommodate the surge.

### LEVEL 4

The capacity of the surge respiratory isolation units is exceeded.

“

All my preconceived notions have been shattered by this virus. But being humbled allows you to think a little bit more openly.”

**Michael Phillips, MD**

CHIEF HOSPITAL EPIDEMIOLOGIST



JAN

January 26

MANHATTAN  
BASEMENT  
OF GREENBERG  
HALL

FEB

MAR

APR

MAY



**Kelly McKinney, director  
of emergency management,  
in the Situation Room.**



## First Person

# I Hope for the Best and Plan for the Worst. It's My Job.

Kelly McKinney is no stranger to crises. As the former deputy commissioner for the New York City Emergency Management Department, he oversaw the city's response to blizzards, explosions, fires, and hurricanes. Still, none of these events—not even Sandy—came close in scale and scope to the pandemic. Here, he recounts his experience in the room that served as headquarters for NYU Langone Health's daily response.

It's 7:00 a.m., and I'm in the Situation Room preparing for disaster, what else. Our first COVID-19 cases are still more than a month away, but here, there's already a sense of urgency. I call myself a catastrophist. I can see the worst-case scenario in any situation—and see what's coming.

Chief Epidemiologist Dr. Michael Phillips sees it, too. He's a former investigative epidemiologist from the Centers for Disease Control, and he's way out in front of the crisis. At 7:15 a.m., I'm on the phone with him and his team from Infection Prevention and Control. They share what they've learned about the outbreak in China and its implications for clinical care, for the health and safety of staff, and for our facilities.

We'll do this every day at the same time for as long as it takes. Dr. Phillips' intelligence briefings become our crystal ball. He started worrying about the N95 shortage about six weeks before anybody else, and we began stockpiling the masks and planning a conservation strategy very early on.

At 8:00 a.m., my team syncs up for the day. The Situation Room is still quiet, but later, it will buzz with people. Social distancing will soon change that, but for now, it remains NYU Langone Health's physical command center for pandemic planning—a space where teams and resources come together, in person and virtually, to meet a common goal. It's where we transform strategy into action.

At 9:00 a.m., we kick off the most important huddle of the day: an enterprise-wide conference call, known as the Incident Briefing, during which 100 NYU Langone leaders from across the institution share updates. Today's call is short, but as the pandemic heats up, the call will cover increasingly pressing issues: Where are cases surging? Do we have any equipment shortages? Staffing changes? Communication pain points?

The goal is to align department managers and gather intelligence so the institution can quickly pivot its resources, workflows, and facilities. Time is yet another limited resource in this crisis, so the call lasts 30 minutes, not a minute longer.



JAN

FEB

MAR

APR

MAY

**“There was no roadmap for this.”**

JACQUELYN MARCUS, VICE PRESIDENT FOR  
SUPPLY CHAIN MANAGEMENT

# Feb.

NUMBER OF  
PATIENTS

1,200

1,100

1,000

900

800

700

600

500

400

300

200

### STEALTH INVASION

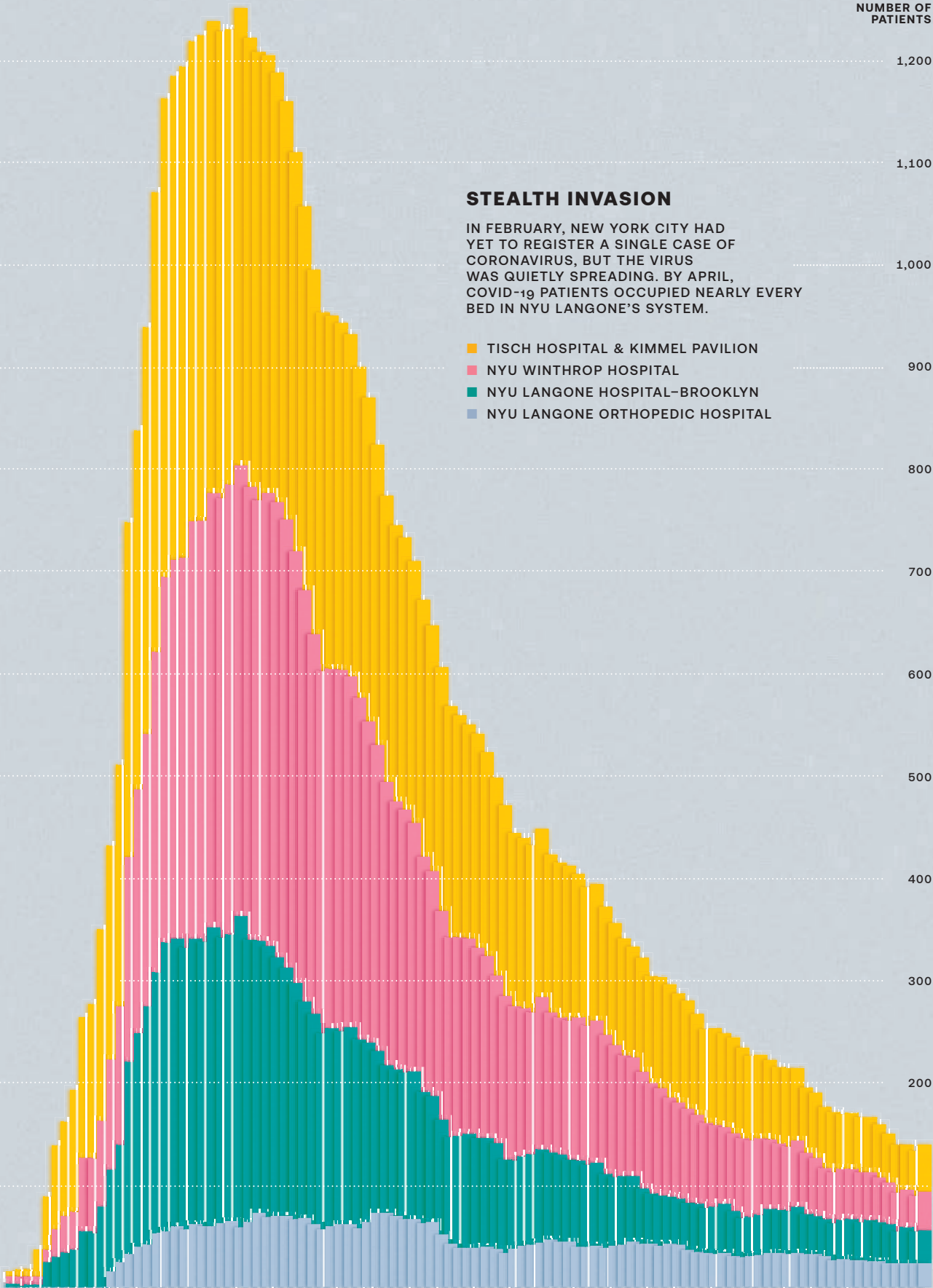
IN FEBRUARY, NEW YORK CITY HAD YET TO REGISTER A SINGLE CASE OF CORONAVIRUS, BUT THE VIRUS WAS QUIETLY SPREADING. BY APRIL, COVID-19 PATIENTS OCCUPIED NEARLY EVERY BED IN NYU LANGONE'S SYSTEM.

TISCH HOSPITAL & KIMMEL PAVILION

NYU WINTHROP HOSPITAL

NYU LANGONE HOSPITAL-BROOKLYN

NYU LANGONE ORTHOPEDIC HOSPITAL



JAN/FEB

MAR

APR

MAY

JUN



February 4

NEW YORK, NEW JERSEY, CONNECTICUT,  
AND PENNSYLVANIA

## Return of the Housecall



In early February, only a few dozen patients a day took advantage of NYU Langone Health's Virtual Urgent Care service, having scheduled video visits with board-certified specialists in the Ronald O. Perelman Department of Emergency Medicine. Fast forward six weeks and daily patient volume jumps 30-fold.

The program's medical director, Viraj Lakdawala, MD, wasn't all that surprised. Not only was the flu season well under way, but COVID-19 loomed large. "We saw a lot of well patients who were simply worried that they may have been exposed to the virus," recalls Dr. Lakdawala, clinical associate professor of emergency medicine.

By March 19, what had felt like a major surge just two weeks earlier was suddenly eclipsed by a skyrocketing number of patient visits in a single day: 839. Virtual Urgent Care was further expanded. All told, more than 200 physicians trained in telemedicine were brought on board, with appointments available 24/7. By March 25, the number of video visits for a single day peaked at 853.

By enabling patients to be evaluated at home, Virtual Urgent Care not only reduced exposure and transmission, but also eased the burden on overtaxed Emergency Departments and conserved personal protective equipment. "This was the first epidemic we've faced with digital health tools at our disposal," notes Paul Testa, MD, assistant professor of emergency medicine and chief medical information officer. "As a containment tool, telemedicine is ideally suited to this public health crisis because it so closely parallels the primary form of therapy—isolation and self-quarantine."

February 6

MANHATTAN, NYU LANGONE HEALTH  
EXECUTIVE SUITE HCC 15

## An Early Call to Curb Travel Helps Save Lives

We now know that the novel coronavirus arrived in New York City long before the first case was confirmed on March 1, and that asymptomatic carriers can readily spread the disease. But Robert I. Grossman, MD, NYU Langone Health's Dean and CEO, seemed to know these things before everyone else. Back in January, he surmised that the virus was already likely spreading undetected in the city. Further, he rejected the common wisdom of infection control experts that only patients with a fever, cough, and labored breathing could be infectious. "Dean Grossman has the vision to see things others don't, including asymptomatic spread," notes Michael Phillips, MD, chief hospital epidemiologist.

From the beginning, Dean Grossman placed a high priority on containing the virus and preserving the health of staff for the critical, and inevitable, fight ahead. One way to achieve that was by curtailing travel to high-risk areas. "Dean Grossman recognized early on that travel restrictions could serve as a containment tool," explains Steven Galetta, MD, the Philip K. Moskowitz, MD Professor and chair of the Department of Neurology. "By doing its part to limit the spread of infection right from the start, NYU Langone undoubtedly saved many lives even before patients arrived at our hospitals."

“

Telemedicine is ideally suited to this public health crisis because it so closely parallels the primary form of therapy—isolation and self-quarantine.”

Paul Testa, MD

CHIEF MEDICAL  
INFORMATION OFFICER

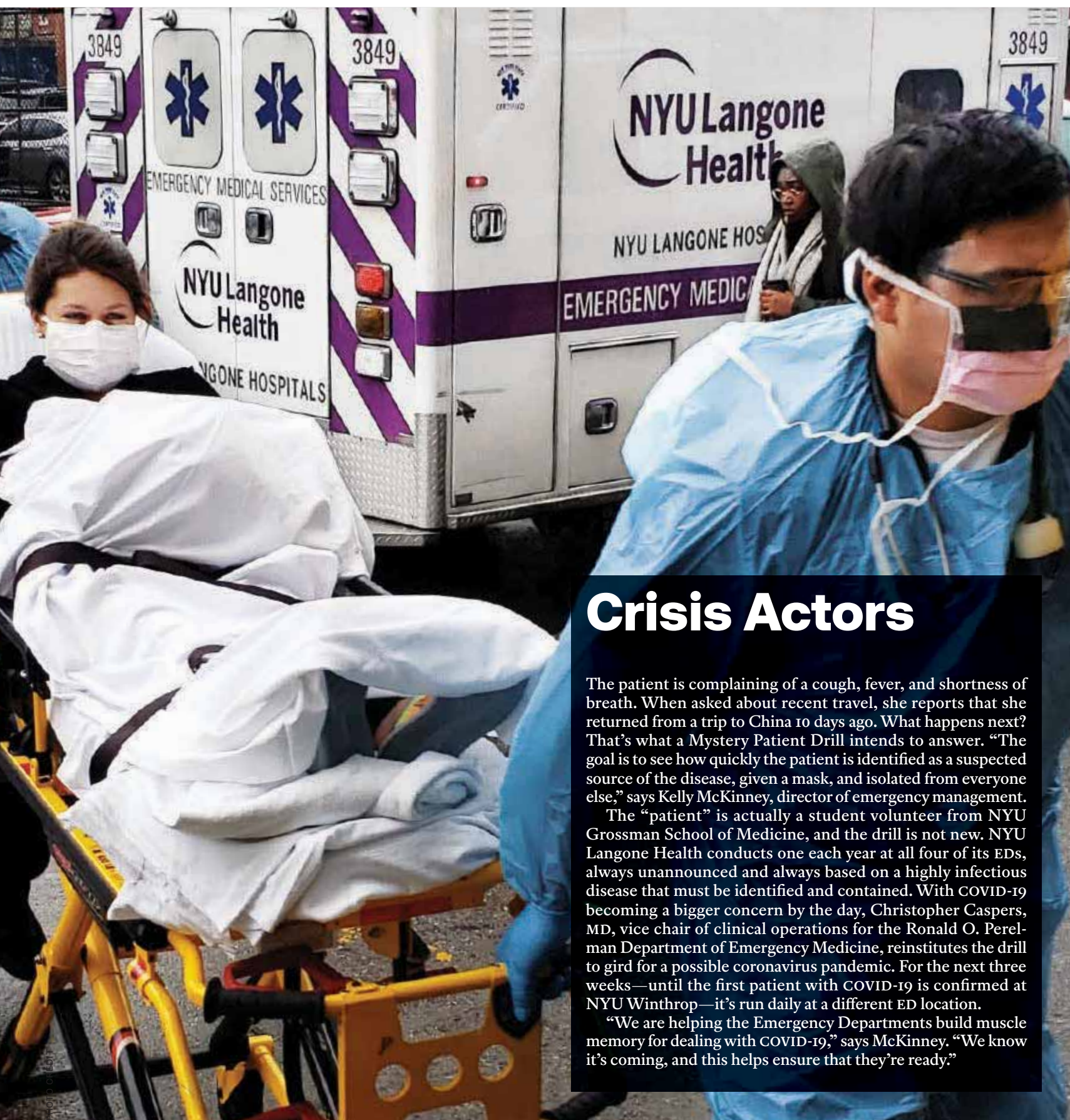
February 12

MANHATTAN  
RONALD O. PERELMAN  
CENTER FOR  
EMERGENCY  
SERVICES

A volunteer plays a sick patient to help the Emergency Department prepare for a real pandemic.

KELLY MCKINNEY





## Crisis Actors

The patient is complaining of a cough, fever, and shortness of breath. When asked about recent travel, she reports that she returned from a trip to China 10 days ago. What happens next? That's what a Mystery Patient Drill intends to answer. "The goal is to see how quickly the patient is identified as a suspected source of the disease, given a mask, and isolated from everyone else," says Kelly McKinney, director of emergency management.

The "patient" is actually a student volunteer from NYU Grossman School of Medicine, and the drill is not new. NYU Langone Health conducts one each year at all four of its EDs, always unannounced and always based on a highly infectious disease that must be identified and contained. With COVID-19 becoming a bigger concern by the day, Christopher Caspers, MD, vice chair of clinical operations for the Ronald O. Perleman Department of Emergency Medicine, reinstitutes the drill to gird for a possible coronavirus pandemic. For the next three weeks—until the first patient with COVID-19 is confirmed at NYU Winthrop—it's run daily at a different ED location.

"We are helping the Emergency Departments build muscle memory for dealing with COVID-19," says McKinney. "We know it's coming, and this helps ensure that they're ready."



JAN

February 26

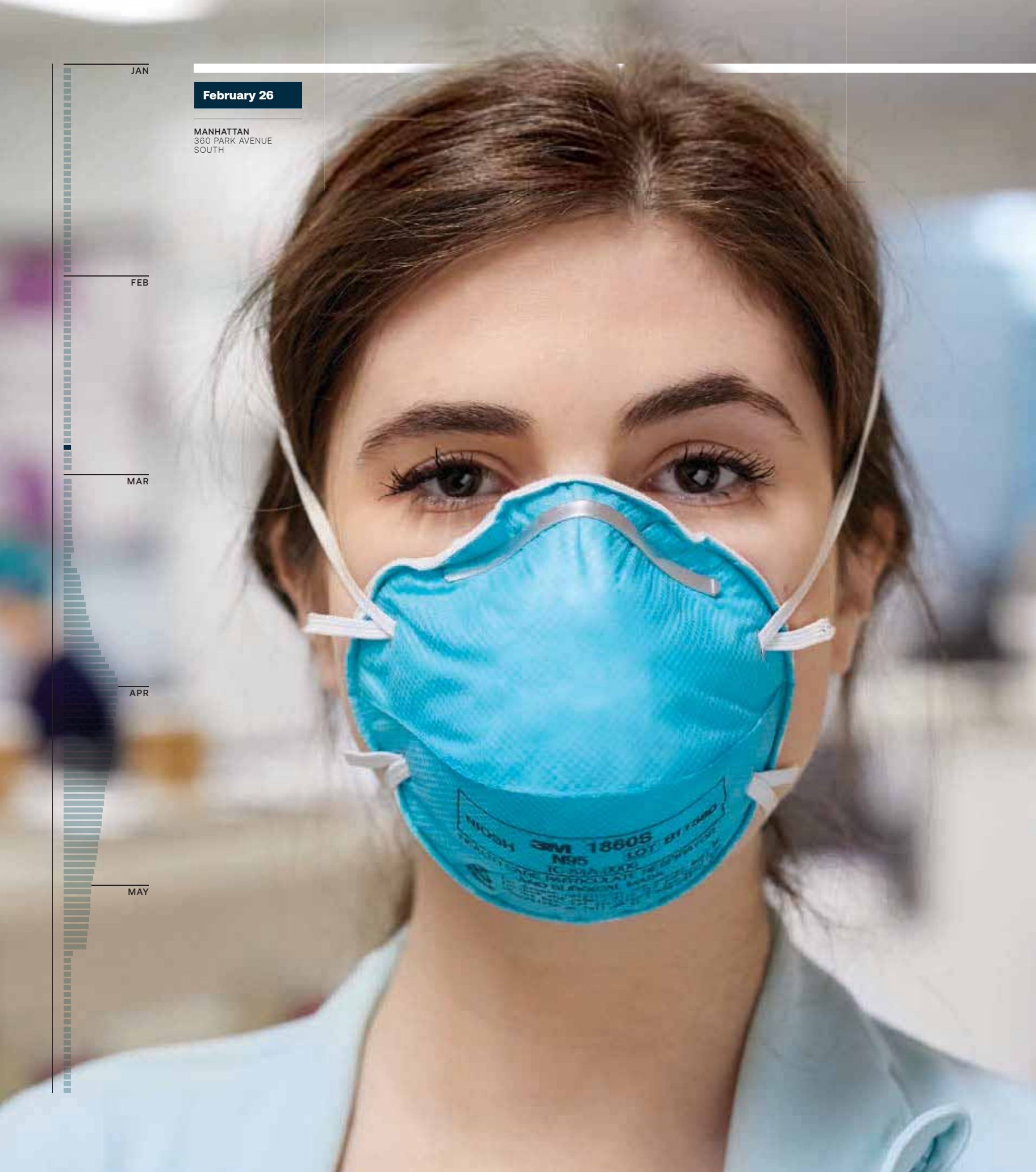
MANHATTAN  
360 PARK AVENUE  
SOUTH

FEB

MAR

APR

MAY



# The New Body Armor

Behind the front lines, another army worked tirelessly to shield patients, clinicians, and staff from COVID-19.

PHOTOGRAPHS BY DEVON JARVIS

By mid-January, as the world learned that a mysterious virus was starting to overwhelm Wuhan, China, NYU Langone Health's leadership recognized that the threat was double-barreled. Eventually, the virus might well arrive in New York City, and if it did, sufficient quantities of the personal protective equipment, or PPE, needed to shield patients and frontline workers, might not. With 70% of the world's PPE manufactured in Wuhan, critical shortages resulting from disruptions or delays could prove just as dangerous as the virus itself.

The challenge of managing an inventory of PPE falls to Supply Chain Management, whose staff of more than 400 has been called upon to source, procure, distribute, and replenish ever-more-scarce items at an ever-faster rate. Jacquelyn Marcus, vice president for supply chain management, who joined NYU Langone last year, came with extensive experience in consumer-packaged goods, where diversification of sources minimizes service disruptions. She soon learned, however, that for decades hospitals have used a very different model. Rather than stockpiling supplies, they tend to order merchandise through a single distributor for just-in-time deliveries and immediate use.

COVID-19 turned that model upside-down virtually overnight, creating an insatiable global demand for clinical body armor such as N95 respirators, face shields, and isolation gowns. Ordinarily, Supply Chain purchases 99.8% of its PPE through one medical distributor. But the pandemic imposed tight restrictions on hospitals based on their historical usage of supplies. With its allocation from the distributor down to 9.25%, Supply Chain had to locate other sources. Fast. "There was no roadmap for this," says Marcus.

Recognizing as early as January that supply disruptions would jeopardize patient and staff safety, Daniel Widawsky, executive vice presi-

dent and vice dean, chief financial officer, had one key question for Mark Pollard, vice president for hospital operations: "What are the top 12 things that will be in highest demand?" Clinical leaders identified such essentials as exam gloves, IV fluids, catheters, and disinfectant wipes. "Without wipes, for instance, clinical spaces can't function," notes Marcus. "We looked at about 120 different items, and we made some proactive purchases that put us in a much better position."

Marcus and her team had to find suppliers that met not only FDA requirements, but also NYU Langone's quality specifications, as substandard and counterfeit PPE began to flood the market. "We pulled products from every corner of the Earth," says Widawsky. "We were always one step ahead, always looking around the corner. It came down to agility, execution, and muscle." By choosing vendors strategically and spreading out orders, Marcus explains, Supply Chain "didn't have to put all of its eggs in one basket." Before products were distributed, they were inspected by Infection Prevention and Control and Environmental Health and Safety. "We weren't going to compromise safety," says Marcus.

Many of the lessons learned are guiding Supply Chain's management team as they reshape their long-term strategy. "We've worked really hard to find factories outside of China," says Marcus, "so our landscape now includes multiple sources." Partnering with Real Estate Development and Facilities, Supply Chain has tripled its warehouse capacity to 150,000 square feet, enabling three to six months of critical supplies to be stockpiled. If need be, PPE can be transported to our hospitals the same day it's needed. All told, Supply Chain received more than 1,500 leads for products, but only 34 made the cut. "We had no fraudulent supplies and zero quality or safety issues," says Marcus, "which is something we're all really proud of."

To ensure that PPE—like this N95 respirator worn by Nina Sacks, RN—met quality and safety standards, products were inspected by the Departments of Infection Prevention and Control and Environmental Health and Safety before they were distributed.



## STAYING AHEAD OF THE CURVE

How NYU Langone Health Weathered a Catastrophic Disruption to Its Supply Chain to Keep Staff and Patients Safe



### I. CONSERVATION

## We Made the Most of What We Had

### Deltaplus Respiratory Mask

With no end in sight to the surge, NYU Langone established a strategy to make the most of a limited supply of respirators. For example, the Deltaplus respiratory mask, imported from Brazil, didn't provide a tight enough seal to serve as an alternate N95 respirator, but it provided good protection for exposure outside the patient setting. In mid-March, it was distributed to staff who didn't provide direct patient care. Even though the Deltaplus couldn't serve as an N95 respirator, it went a long way toward making it possible to conserve N95s. "It was our ace in the hole," says Jacquelyn Marcus, vice president for supply chain management.



## II. WAREHOUSING

### **We Supplemented Just-in-Time Deliveries with Just-in-Case Reserves**

#### **Sensicare Ice Blue Powder-free Nitrile Exam Gloves**

Without extensive warehousing facilities to stockpile PPE and other supplies, NYU Langone has traditionally relied on just-in-time deliveries. Even items used in large quantities, such as disposable nitrile exam gloves (NYU Langone orders 109,154,760 pairs annually) did not pose a storage problem because they were quickly put to use. But with the worldwide pipeline for hospital supplies paralyzed, NYU Langone adopted a new strategy. “The way hospitals acquire supplies hasn’t changed in 30 or 40 years,” says Daniel Widawsky, executive vice president and vice dean, chief financial officer. “Going forward, we’re doing things differently.” Partnering with Real Estate Development and Facilities, Supply Chain has tripled its warehouse capacity to 150,000 square feet—enough space to stockpile three to six months of critical supplies.





### III. FUNCTIONALITY

## We Found the Right Gear for the Right Job

### Maxair Controlled Air Purifying Respirator

By the time COVID-19 reached New York City, even those who still had many questions about the virus knew two things for sure: it was highly contagious and potentially lethal. For high-risk procedures that spray infectious droplets, clinicians would need maximum protection. This helmet-like respirator—used by some in place of an N95 mask before shaving became mandatory for those with beards—fit the bill. By making facial expressions visible, the device helps clinicians provide much needed comfort to patients and enables translators to communicate more easily. The controlled air purifying respirator was one of the toughest items to acquire, notes Jacquelyn Marcus, vice president for supply chain management. “Although we used a small number of these respirators, they proved to be a helpful protective device for certain staff.”



#### IV. EXACTING

## **We Kept Fraudulent Products Out of Our Inventory**

### **3M Particulate Respirator 9210**

When the FDA cleared industrial respirators like this one for healthcare use on March 2, it expanded the number of N95s that became available. But other masks that were subpar or downright fraudulent had already started to populate the international market. “We had a lot of offers that didn’t work,” explains Daniel Widawsky, executive vice president and vice dean, chief financial officer. “We canceled a ton of orders.” To screen out unacceptable products, Supply Chain established a rigorous vetting process, working closely with the departments of Infection Prevention and Control and Environmental Health and Safety. “They were amazing,” says Jacquelyn Marcus, vice president for supply chain management. “We never distributed anything that wasn’t 100% inspected.”





#### V. AGILITY

## **When One Door Closed, We Found Another to Open**

### **3M Particulate Respirator 8210**

The more intense worldwide competition for PPE became, the more nimble Supply Chain had to become. “We were always trying to be one step ahead, always looking around the corner,” explains Daniel Widawsky, executive vice president and vice dean, chief financial officer. “It came down to agility, execution, and muscle.” For example, when the raw materials from China used in many N95 respirators became unavailable, NYU Langone turned to 3M’s 8210, an industrial respirator approved by the FDA for use in healthcare that could be manufactured quickly in America. “Things were tight and flying off the shelf,” says Jacquelyn Marcus, vice president for supply chain management. “We were making decisions minute by minute, around the clock.” Action was swift, to be sure, but never hasty. Supply Chain received more than 1,500 leads for products, but only 34 made the cut.



## VI. RESOURCEFULNESS

### **If We Couldn't Find It, We Made It Ourselves**

#### **DIY Face Shields**

At the height of the crisis, clinicians caring for patients with COVID-19 used between 20,000 and 30,000 face shields each day, so Supply Chain had to rely on multiple manufacturers worldwide. Even with such aggressive efforts, “we weren’t getting face shields in fast enough,” recalls Jacquelyn Marcus, vice president for supply chain management. “So we thought, ‘Wouldn’t it be great if we started making them ourselves?’” Many members of the NYU Langone community stepped forward, fashioning homemade shields like this one. Students from NYU Grossman School of Medicine, for example, turned out some 30,000 shields, assembled from off-the-shelf parts (see page 54). This do-it-yourself spirit also sprang up as volunteers improvised other items in critically short supply, notably hand sanitizer and COVID-19 testing media.





## VII. ADVANCE PLANNING

### **When Doctors Gave Us their List of Essentials, We Listened**

**Halyard Fluidshield Particulate Respirator 46867**

In January, Supply Chain wasted no time ascertaining the hospitals' supply needs as the outbreak in Wuhan began to hinder the city's PPE factories. "We said to our clinical leaders, 'What would be the top things you would need to do your job?'" recalls Jacquelyn Marcus, vice president for supply chain management. They identified such essentials as exam gloves, IV fluids, catheters, and disinfectant wipes. Michael Phillips, MD, chief hospital epidemiologist, added N95 respirators to the list because, as an infectious disease specialist, he knew they would play a vital role in keeping clinicians safe should the virus hit New York City. When Supply Chain ordered a large shipment before allocations were restricted, Richard Kraft, director of logistics, inventory, and distribution, thought to himself, " 'We're more than set.' " But in the coming weeks, usage of N95s increased to 26 times the norm.

A blue isolation gown is shown hanging against a brown background. The gown is made of a crinkled, translucent material and is tied at the waist with a blue cord. The left sleeve is visible, showing the cuff.

#### VIII. CONSTANT CONTACT

## We Were One with Our Clinical Teams

### Isolation gown

Supply Chain was integral to NYU Langone's strategy for preparing for COVID-19, explains Fritz François, MD, chief medical officer and patient safety officer. "We met with the team every day to assess our workflows, our current level of PPE, and our anticipated burn rate," he says. "Burn" is an apt word. At the peak of the outbreak, between 20,000 and 25,000 isolation gowns like this one were distributed to NYU Langone's hospitals on a daily basis. "People were truly thinking outside the box, trying to anticipate the next need so that we didn't skip a beat," recalls Richard Kraft, director of logistics, inventory, and distribution. The result, says Daniel Widawsky, executive vice president and vice dean, chief financial officer, was that "decisions were being made in hours and days, not weeks or months. Everybody was reachable 24/7."





## IX. EXPERIENCE

### **We Had the Right Talent with the Right Expertise**

#### **3M Earloop Procedure Face Mask 1820**

Several weeks into the outbreak Supply Chain ran critically short of earloop isolation masks like this one, as they were being distributed to all employees throughout the hospitals who did not provide direct patient care. The shortage didn't last long, however, because Jacob Navarro, director of freight management, expedited domestic and international shipments of the masks to NYU Langone. Navarro is one of several staff with experience outside the healthcare industry whom Jacquelyn Marcus, vice president for supply chain management, had recently hired to build a best-in-class supply chain operation. Navarro's expertise in international transportation logistics was particularly valuable when overseas transportation routes were disrupted. He coordinated third-party vendors to facilitate shipments of PPE on chartered flights from Shanghai, China. "The combination of staff with healthcare expertise and those with experience in other industries really enabled us to navigate this crisis," says Marcus.



#### X. VIGILANCE

## **We Seized Every Opportunity to Maximize Safety**

### **Omni Face Shield**

For clinicians who provide direct care to patients with COVID-19, a face shield is as vital a piece of equipment as an N95 respirator because it protects the eyes from droplet spray. But face shields provide an additional benefit in that they also guard N95 masks against contamination. By serving as one item of PPE that protects another, face shields came to play a key role in Supply Chain's conservation efforts. Though face shields are designed to be disposable, they were carefully preserved. Wiped with a disinfectant after each use, they could be worn multiple times before their plastic shields became cloudy. "As a society, we've gotten very used to disposing of things," says Tommy Psoras, product manager for supply chain management, "but in reality you don't always need to."





## XI. INSTINCTS

### **We Trusted Ours**

#### **3M Particulate Respirator 1860**

Prior to shortages, 3M's 1860 respirator was one of the standard N95 models provided to NYU Langone clinicians. As of June, it was unavailable as China stopped exporting the raw materials required for its manufacture. Amid fierce worldwide competition, buyers sometimes had only an hour to decide whether to place a million-dollar order. They learned to listen between the lines. "Buying is an art as much as a science," explains Jacquelyn Marcus, vice president for supply chain management. "You just get a sense about someone by how they answer your questions."

## ESSENTIAL GEAR, ESSENTIAL NUMBERS



# 109,154,760

PAIRS OF RUBBER GLOVES ISSUED ANNUALLY

**“It was a remarkable behind-the-scenes effort. Heroic, in fact. Supply Chain kept us ahead of the game.”**

**Fritz François, MD**

NYU LANGONE'S CHIEF MEDICAL OFFICER AND PATIENT SAFETY OFFICER

# 105,236

FACE SHIELDS ISSUED BETWEEN MARCH 1–JUNE 1

# 572,914

N95 MASKS ISSUED BETWEEN MARCH 1–JUNE 1

Clinicians store their N95 masks in breathable paper bags, as advised by the Centers for Disease Control and Prevention, to help prevent contamination.

**“We need to treat N95 respirators like narcotics. I foresee real problems with having enough when we really need them.”**

**Michael Phillips, MD**

NYU LANGONE'S CHIEF HOSPITAL EPIDEMIOLOGIST

# 1,000,249

ISOLATION GOWNS ISSUED BETWEEN MARCH 1–JUNE 1

**“Traditionally, healthcare gets most of its supplies through distributors, but the distributors couldn't support us. So we had to find a whole new vendor base.”**

**Matthew Gaumer**

SOURCING FOR SUPPLY CHAIN MANAGEMENT

**“We were always able to procure supplies through one channel or another to make sure everybody had what they needed, when they needed it.”**

**John Pfeifer**

SENIOR DIRECTOR OF LOGISTICS FOR SUPPLY CHAIN MANAGEMENT



JAN

FEB

MAR

APR

MAY

**“After the lockdown, we went from  
fundamentally zero virtual visits a day  
to a peak of 7,000 a day.”**

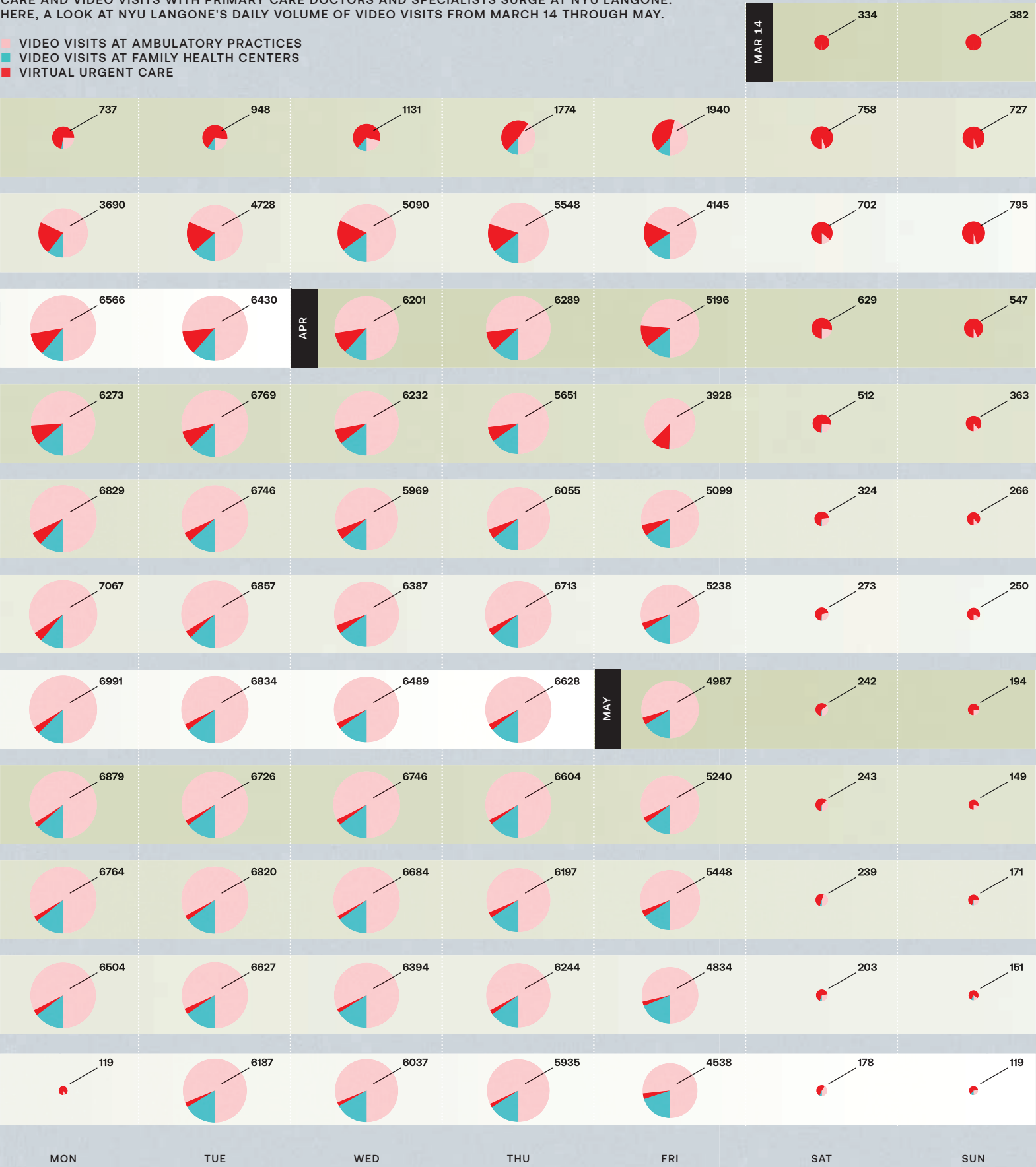
**ANDREW BROTMAN, MD, VICE DEAN FOR  
CLINICAL AFFAIRS AND STRATEGY**

# Mar.

THE VIRTUAL FRONT

AS NEW YORKERS ISOLATE TO SLOW THE SPREAD OF THE VIRUS, THE USE OF VIRTUAL URGENT CARE AND VIDEO VISITS WITH PRIMARY CARE DOCTORS AND SPECIALISTS SURGE AT NYU LANGONE. HERE, A LOOK AT NYU LANGONE'S DAILY VOLUME OF VIDEO VISITS FROM MARCH 14 THROUGH MAY.

- VIDEO VISITS AT AMBULATORY PRACTICES
- VIDEO VISITS AT FAMILY HEALTH CENTERS
- VIRTUAL URGENT CARE





JAN

March 2

NEW YORK CITY

## NYU Langone Elevates to Level 2

New York State confirms its first case—a 39-year-old Manhattan woman employed as a healthcare worker who recently visited Iran. NYU Langone elevates its response to Level 2, but Michael Phillips, MD, chief hospital epidemiologist, notes that “while this patient met the criteria, probably thousands of others were also infected by then.”

FEB

MAR

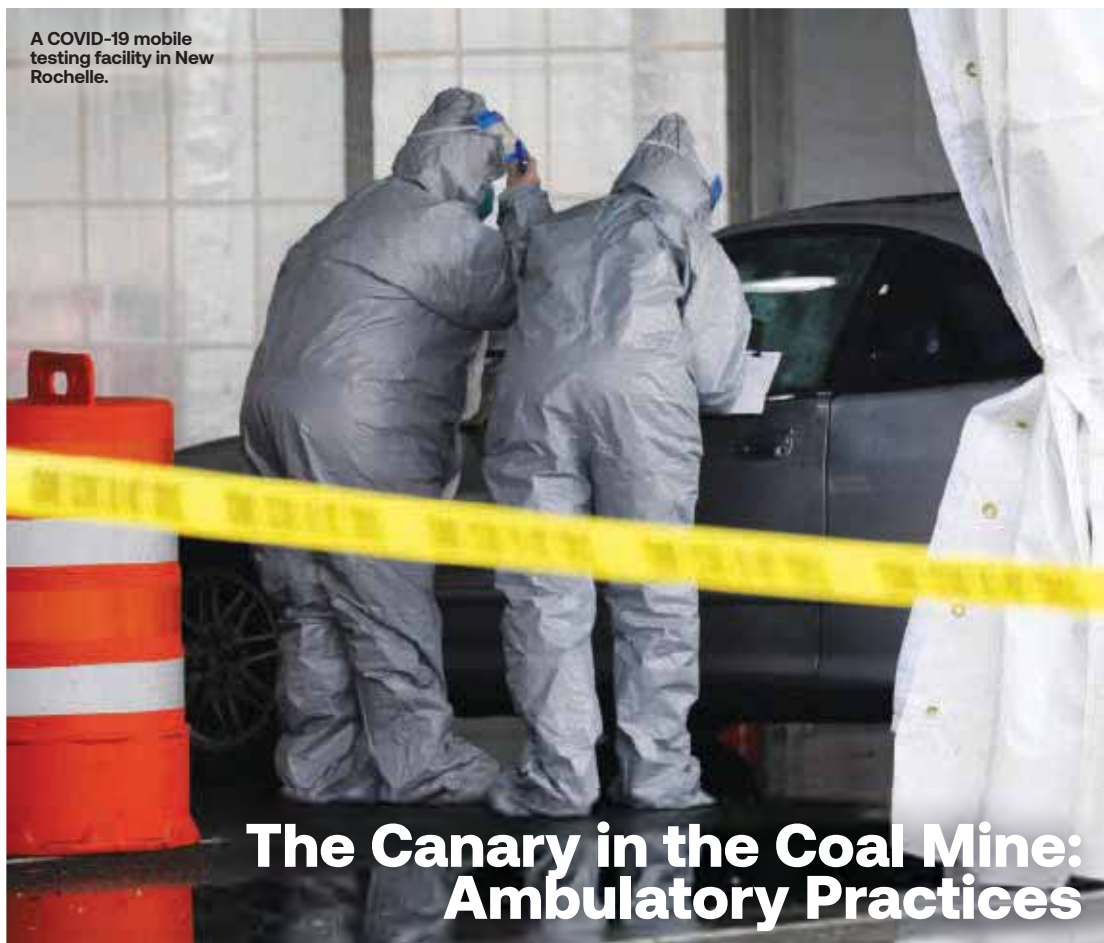
APR

MAY

March 3

NEW ROCHELLE, WESTCHESTER COUNTY, NEW YORK

A COVID-19 mobile testing facility in New Rochelle.



## The Canary in the Coal Mine: Ambulatory Practices

“

In this kind of an outbreak, it's the ambulatory care sites, not the emergency departments, that see cases first. That's where we're going to be looking very carefully to detect a second wave.

**Michael Phillips, MD**

CHIEF HOSPITAL EPIDEMIOLOGIST

Two days after the first case of COVID-19 is reported in New York State, a second one is confirmed. An attorney in his 50s who lives in the Westchester city of New Rochelle is hospitalized in serious condition. But this case is far more worrisome to health authorities because the source of the infection is unknown, leading them to label the episode the first instance of community spread in the region.

In the coming days, more than 50 cases are traced to the man. Government officials place some 100 families under self-quarantine after learning that they were exposed to the man in late February. On March 12, a containment zone is established within a one-mile radius of the synagogue he attended. The patient remains hospitalized for several weeks before returning home. “I’m sure this was one of many community transmissions,” notes Michael Phillips, MD, chief hospital epidemiologist. “It’s just that this one was documented.”

During this period, NYU Langone Health’s ambulatory care sites saw three times as many patients complaining of fever and cough. “In this kind of an outbreak, it’s the ambulatory care sites, not the emergency departments, that see cases first,” says Dr. Phillips. He explains that while his title is “hospital epidemiologist,” the crisis has made him rethink his role within an expansive, integrated health system. Now that he sees NYU Langone’s 350-plus ambulatory sites as the collective canary in the coal mine, “that’s where we’re going to be looking very carefully to detect a second wave.”

SPENCER PLATT/GETTY IMAGES

March 5

MINEOLA, NASSAU COUNTY, NEW YORK GARDNER PAVILION 2, NYU WINTHROP HOSPITAL

## First Person

# I Was the First Patient Hospitalized for COVID-19 on Long Island

**Two days before New York declares a state of emergency, Miguel Chamaidan, a 42-year-old physical therapy aide from Uniondale, finds his way to NYU Winthrop Hospital and becomes not only the first patient on Long Island to be hospitalized for COVID-19, but also the first person in NYU Langone Health's system. Chamaidan's case is the beginning of an extraordinary surge: by late June, NYU Winthrop alone will treat more than 1,650 people for COVID-19. Here's Miguel's story.**

I wake up one morning with body aches, chills, and a fever. I stay in bed for two days before dragging myself to the doctor. A flu test comes back negative, but then I start having trouble breathing. My wife, Glendy, drives me to NYU Winthrop Hospital in the middle of the night. I work as a physical therapy aide at another medical center, and I don't want my coworkers to find out about my illness.

I'm handed a mask and given a chest scan. I have pneumonia in both lungs. I'm moved to a private room and given oxygen. Dr. Erica Ferrara tests me for the novel coronavirus. I haven't been out of the country so I'm surprised when the result comes back positive. My first thought is, "How? Where?" I run a car service in my spare time, so it's possible that I caught it from one of my customers. But I'll never know.

Glendy tests positive for the virus, too. Even though she has no symptoms, she can't go home and risk infecting our three kids. When she tells me that she saw our house on the TV news, I barely react. I am out of it. I am on six liters of oxygen, which I know, from my job, is a lot. Removing the

nosepiece to walk to the bathroom feels like I ran a marathon. My oxygen level drops, and I hear a nurse calling on the loudspeaker: "Miguel, are you okay!?" I keep thinking, "Why am I having such a tough time with a virus that is supposed to be hardest on the elderly?" Having type 2 diabetes increased my risk factor, but as Dr. Ferrara tells me, many people with no preexisting conditions are getting very sick, too.

Dr. Peter Spiegler, the chief of pulmonology, has me spend as much

time as possible lying on my stomach to help me breathe. The nurses are wonderful, walking me around the room several times a day and offering encouragement. Finally, after 17 days, I go home and quarantine upstairs. Our kids are a great help, leaving meals for Glendy and me outside the door—and they never get sick.

My battle with coronavirus has been uncomfortably public. But at this point, I don't care. What matters is that I'm one of the lucky ones.



Patient Miguel Chamaidan at NYU Winthrop Hospital

## The First of Many Firsts

Shortly after Miguel Chamaidan's case, patients flood into NYU Langone's other inpatient facilities, as the tsunami of New Yorkers with COVID-19 swells to 37,000 within three weeks. By June, NYU Langone had evaluated more than 21,000 patients for the illness.

### NYU WINTHROP HOSPITAL

**Date:** March 5

**First Case:** A 42-year-old man with fever, body aches, and shortness of breath (see story at left).

### TISCH HOSPITAL

**Date:** March 10

**First Case:** A 66-year-old man experiencing shortness of breath.

### NYU LANGONE HOSPITAL-BROOKLYN

**Date:** March 11

**First Case:** A 55-year-old woman with a cough and respiratory symptoms.

### COBBLE HILL EMERGENCY DEPARTMENT

**Date:** March 11

**First Case:** A 35-year-old woman with shortness of breath is evaluated at this freestanding ED, and then transported to NYU Langone Hospital-Brooklyn.

### NYU LANGONE ORTHOPEDIC HOSPITAL

**Date:** March 23

**First Case:** A 46-year-old man is transferred from Tisch, the first of many convalescing patients relocated to free up hospital beds for more acutely ill patients.



JAN

March 10

MANHATTAN,  
TISCH HOSPITAL

## COVID-19 Wave Hits Manhattan

Thirty-six cases are reported in New York City. One of them, a 66-year-old man complaining of shortness of breath, becomes the first COVID-19-positive patient admitted to Tisch Hospital on the main campus.

FEB

MAR

APR

MAY

Dr. Fritz François, chief medical officer and patient safety officer, has been battle-tested for leadership. Over the years, he has led a medical team on a humanitarian mission to earthquake-ravaged Haiti (his birthplace), joined colleagues as they braved 9/11 and Hurricane Sandy, and directed the response to a major fire that broke out in the Kimmel Pavilion as it was under construction.



March 13

MANHATTAN  
TISCH HOSPITAL,  
NYU LANGONE HEALTH

# Our Pandemic Playbook, Explained

As COVID-19 bears down on New York City, the number of patients presenting to NYU Langone's ambulatory care sites and Emergency Departments with severe respiratory infections begins to surge. Several days after the World Health Organization declares COVID-19 a global pandemic, Governor Andrew Cuomo makes a dire prediction. "I see a wave, and the wave is going to break on the health care system," he said. "And I am telling you . . . it is going to be a tsunami."

One of the administrative leaders responsible for coordinating NYU Langone's planning for and response to outbreaks is Fritz François, MD, chief medical officer and patient safety officer. As Dr. François tours the clinical units during those first days of the crisis, he senses a surprisingly sanguine mood. "There is a lot of uncertainty, but there's a certain calm, too," he says. "We've been planning for many weeks, so now it's simply a matter of executing our playbook. We're ready."

Dr. François says the goal was to stay ahead of the epidemiological curve, and that it was made possible by the dedication of NYU Langone's entire staff. "I was very confident about our execution," he says. "There's a spirit here that makes people rise to the challenge in unbelievable ways. Resiliency is part of our DNA. When I see such skilled, talented people perform, it's not surprising—it's inspiring."

To the extent that anyone could prepare for a virus that is, as it turns out, full of surprises, NYU Langone devises a strategic game plan, leaving as little as possible to chance. Dr. François refers to it as "The Five Ts."

**Tools** "These are the things that are going to protect our staff," says Dr.

François, "so they're critical." To ensure that everyone on the frontlines had the PPE they needed, he worked closely with the Supply Chain Management team. His most urgent questions: What do we need, and how much? When, where, and how will we use these items? How long will they last, and how can we conserve and replenish them?

**Teams** "Who we needed was as important as what we needed," says Dr. François. In clinical areas such as the Emergency Departments, intensive care units, acute care units, and respiratory therapy units, experts collaborated to anticipate how many specialists would be required and how their care would be integrated.

**Triage** Key to our workflow plan was transporting patients to an infection-controlled hospital room as soon as their initial evaluation was completed. "All the triaging steps had to be mapped out," he says, "from the patient's initial assessment and testing to the path from the ED to a designated bed."

**Therapies** "We had to decide which therapies we would use for acutely ill patients," Dr. François explains. In addition to oxygen therapy and antivirals, he says, other promising treatments under investigation include convalescent plasma and monoclonal antibody therapy. "We wanted to make sure that appropriate candidates had access to these trials, so close collaboration was needed between the clinical units and the clinical-trial programs."

**Throughput** "A key to our strategy," Dr. François explains, "was to make more beds available for acutely ill patients by transferring convalescing patients to NYU Langone Orthopedic Hospital, which had beds available because it was not performing surgeries during the crisis."

March 15

NEW YORK CITY

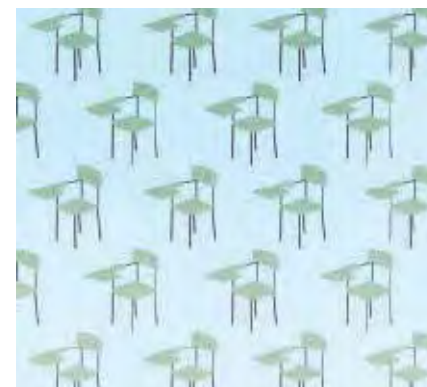
## Pencils Down

For days, Mayor Bill de Blasio has resisted a growing chorus calling for New York City schools to shutter, concerned about the impact on 1.1 million students—and parents who need to keep reporting for work. However, with 329 COVID-19 cases in the five boroughs and widespread predictions of a spike, he accedes, announcing a system-wide K-through-12 shutdown.

NYU Langone Health's Department of Human Resources takes immediate action to avoid a staffing shortage caused by a disruption of child care, adding 10 days to the Emergency Backup Care benefit through Bright Horizons.

Still, with child-care centers closing in the area and a shortage of caregivers willing to travel to employees' homes, a broader-based solution is needed. Within one day after schools close, Human Resources' leadership team activates Crisis Care Backup, a temporary benefit program that allows employees working on the front lines to locate and hire their own caregiver and receive reimbursement up to \$100 per day. The program, which had not been activated since Hurricane Sandy, proves invaluable: more than 2,000 staff members use the benefit, enabling them to stay on the job. "We tried to make it as easy as possible for staff who are also parents or who had an adult to care for at home," says Margaret Meagher, senior director of benefits.

Meagher also works closely with Bright Horizons to ensure that staff with children under age five can continue to access care at the NYU Langone Health Child Care Center at One Park Avenue. The center remains open throughout the pandemic thanks to vigilant adherence to new practices, including an additional daily deep cleaning, reduced class size, and the use of surgical masks by all staff.





JAN

March 16

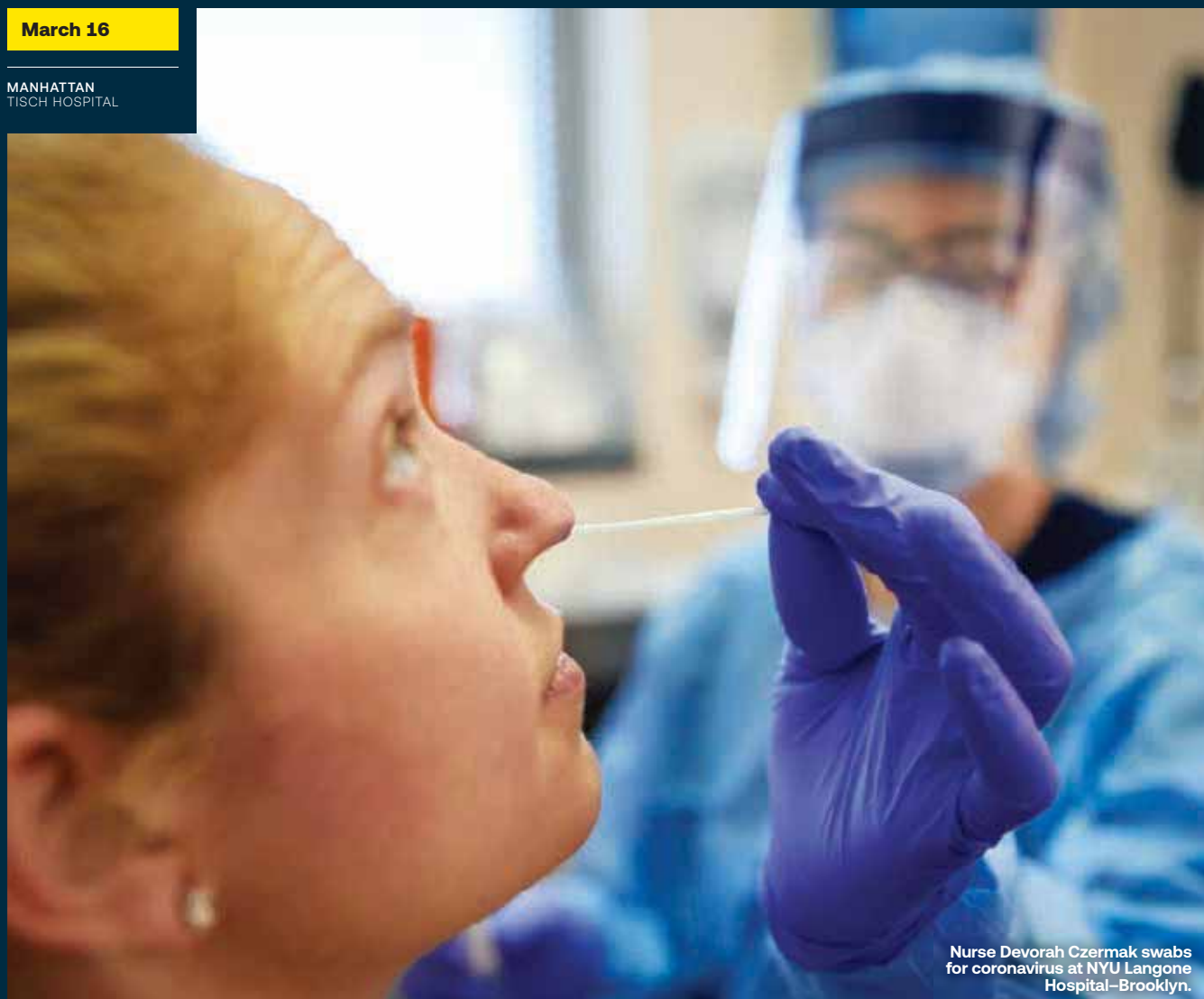
MANHATTAN  
TISCH HOSPITAL

FEB

MAR

APR

MAY



Nurse Devorah Czermak swabs for coronavirus at NYU Langone Hospital—Brooklyn.

## Acing the Test When It Matters Most

COVID-19 testing in the US is a tale of false starts that thwart the strongest medical tool we have for tracking the spread of the virus. With suspected cases on the rise, hospitals are forced to wait up to two weeks for test results, a delay that poses a dangerous roadblock for clinical care. But the tide turns quickly at NYU Langone Health. On Friday, March 13, when Roche Pharmaceuticals receives emergency-use authorization from the FDA for its new coronavirus test, NYU Langone is one of only two academic medical centers in New York City with the lab equipment and expertise required for processing it.

That evening, Maria Aguero-Rosenfeld, MD, director of clinical laboratories, assembles a team to validate the system, as well as a small army of PhDs, residents, and other volunteers trained

to run the tests. By Monday morning, NYU Langone is ready to flip the switch on its own high-volume COVID-19 testing center—housed in a converted bike room adjacent to the Ronald O. Perelman Center for Emergency Services—and start testing hundreds of patient samples a day, returning results within 24 hours.

The new high-speed capability is a game changer. When Dean and CEO Robert I. Grossman, MD, tours the facility, he extends his gratitude to the volunteers and hails the launch as “an extraordinary effort.” With the similar sites that open days later at NYU Langone Hospital—Brooklyn and NYU Winthrop Hospital, the enterprise can soon conduct up to 2,400 tests a day—enough to meet the needs of patients, employees, and first responders. (By the end of July, the total tally

Dr. Maria Aguero-Rosenfeld peers inside the Roche cobas 6800, a diagnostic system that uses real-time polymerase chain reaction technology to process up to 1,440 COVID-19 tests within 24 hours.



will exceed 140,000 tests.)

As new testing systems become available, NYU Langone employs a rigorous validation process to weed out poor performers. “We refused to compromise on accuracy,” says Joan Cangiarella, MD, vice chair of clinical operations for the Department of Pathology. The two systems in play—the Roche cobas 6800 and the Cepheid GeneXpert—can detect just a few hundred viruses per milliliter of sample. That level of sensitivity means that even asymptomatic carriers who may have a low viral load won’t test negative. “Our tests are also very specific,” notes Dr. Aguero-Rosenfeld. “Patients won’t test positive when they’re actually negative.”

When shortages of testing reagents and nasal swabs threaten to stall the work flow, employees step up with ingenious workarounds and DIY solu-

tions. NYU Langone procures swabs from non-COVID-19 test kits, while the Office of Science and Research follows a published “recipe” for the solution that protects the integrity of the samples. “We had hundreds of volunteers,” says Dr. Cangiarella, “and their enthusiasm, despite the presence of a contagious disease, was truly impressive.”

NYU Langone’s clinical laboratories continue to pursue more innovative testing capabilities. In October, the team hopes to roll out a 3-in-1 test for respiratory syncytial virus (RSV), flu, and COVID-19. Also under consideration is a rapid saliva test for inpatients with suspected COVID-19 infections. “It’s been nonstop learning since March,” says Dr. Aguero-Rosenfeld. “We are fortunate to have the support of leadership, and the resources to get the job done.”





March 16

MANHATTAN, NYU LANGONE HEALTH  
EXECUTIVE SUITE HCC 15

Admissions were among the 25 metrics tracked daily on the COVID-19 Dashboard, helping clinicians like Michael Abejo, RN, a nurse at NYU Langone Health-Cobble Hill, monitor the outbreak's impact.



## The COVID Dashboard

With all three of NYU Langone Health's hospitals filling fast with COVID-19 patients, Dean and CEO Robert I. Grossman, MD, calls for a digital surveillance tool to monitor and map daily clinical trends across the health system. "Dean Grossman recognized that without reliable data, you're flying blind," recalls Fritz François, MD, chief medical officer and patient safety officer. "If you can't measure something, you can't improve it."

Dr. François immediately develops a template with Samuel Levine, director of operations and resourcing, who helps spearhead a collaboration with clinical and operational leaders across the institution to develop a customized COVID-19 dashboard—an extension of the electronic dashboard already in place to track institutional performance measures. "Evidence-based decisions would

be based on these numbers," Levine says, "so they had to be current, correct, and validated."

By 10:30 p.m., within eight hours of the dean's initial request, the first iteration of the new COVID-19 dashboard is sent to the Executive Leadership Group. Highlighting 9 metrics that will eventually expand to 25, it tracks daily changes in admissions to the Emergency Departments and ICUs, intubations and ventilations, bed capacity, and other key indicators of how the outbreak is impacting NYU Langone. Dean Grossman considers the assessment tool such an exemplary model for how academic medical centers can inform epidemiology that he shares it with the federal government. "We couldn't just react," explains Dr. Grossman. "We had to stay ahead of the crisis. The dashboard enabled us to see trends and patterns in real time. It kept us agile."

“

**We couldn't just react. We had to stay ahead of the crisis. The dashboard enabled us to see trends and patterns in real time. It kept us agile."**

**Robert I. Grossman, MD**

DEAN AND CEO, NYU LANGONE HEALTH

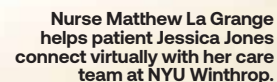
NEW YORK CITY

Mayor Bill de Blasio issues an executive order on March 16 mandating that hospitals and ambulatory service centers suspend elective surgeries to free up hospital beds. One week later, Governor Andrew Cuomo announces a similar policy, directing hospitals to identify elective procedures. “We defined them as medically necessary procedures that the physician and patient agree can be safely delayed for 90 days,” explains Andrew Brotman, MD, executive vice president, vice dean for clinical affairs and strategy, chief clinical officer. NYU Langone canceled and rescheduled more than 9,000 surgeries (90% of its normal volume).

ALBANY, NEW YORK  
STATE DEPARTMENT OF  
FINANCIAL SERVICES

The public health crisis prompts a broad expansion of insurance coverage for video visits with doctors, and New York State adopts an emergency regulation waiving copays for in-network video appointments. Practically overnight, telemedicine becomes the primary way for patients to consult with their physicians. NYU Langone's Medical Center Information Technology team expands the platform developed for its Virtual Urgent Care to the institution's Faculty Group Practices, enabling patients with an NYU Langone MyChart account to "see" their doctors on a smartphone or tablet. Within three weeks, more than 2,000 primary care physicians and specialists are participating, and up to 6,000 patients have nonurgent video visits every day. "I knew it was going to be a useful tool during COVID-19, but I never anticipated the volume of visits we've gotten," says Andrew Rubin, NYU Langone's vice president for clinical affairs and ambulatory care.

The rapid rise of video visits doesn't surprise Paul Testa, MD, NYU Langone's chief medical information officer, who foresees a hybrid of in-person and video visits moving forward. Still, he is amazed by the almost universally positive feedback from patients and physicians alike. "Our doctors tell us how seamless video visits are to conduct," says Dr. Testa, "and that they provide a valuable clinical experience."





## An All-Volunteer Army Reports for Duty

Internist Caren Behar, MD, hasn't worked in a hospital setting for 20 years. But when an email arrives on March 22 asking for clinicians in her ambulatory network to volunteer to care for inpatients with COVID-19, she instantly recognizes that her skills will be valuable, so she answers the call to duty. "COVID-19 in hospitalized patients is very different from what we see in the outpatient setting," says Dr. Behar, medical director of the Joan H. Tisch Center for Women's Health, one of NYU Langone Health's largest faculty group practices. "I wanted to better understand the disease across the spectrum of severity."

NYU Langone offers the highest level of acute care across a broad range of subspecialties. But when New York becomes the newest epicenter of the pandemic, the institution must, for the first time, marshal its deep and diverse clinical expertise to tackle a single life-threatening disease: COVID-19. The sudden, radical transformation imposes tremendous burdens on some specialists, while sidelining others. One week after the outreach to the faculty group practices, the chairs of the Departments of Medicine and Surgery issue similar calls for reinforcements. "Just tell us when," responds one physician, expressing a sentiment shared by many.

All told, more than 1,300 physicians and 500 nurse practitioners and physician assistants sign up to care for patients in one way or another. "Quite a few clinicians reached out in advance of our call for help," recalls Bruce Polsky, MD, chair of the Department of Medicine at NYU Winthrop Hospital. "I was gratified by their generosity, but not surprised. Our culture is one of a can-do spirit." Joseph Weisstuch, MD, chief medical officer of NYU Langone

Hospital-Brooklyn, adds that even the impressive numbers tell only part of the story. "What they don't convey," he says, "is the extraordinary commitment of those who stepped forward without being asked, volunteering to work countless shifts, often at night." The outpouring of support prompts Mark Pochapin, MD, director of the Division of Gastroenterology and Hepatology, who directs the recruitment effort, to remind his colleagues that "we are all in this battle together." Brian Bosworth, MD, chief of medicine at Tisch Hospital, who manages the deployment at Tisch Hospital and the Kimmel Pavilion, notes that the wartime analogy is fitting. "We always had two teams of reserves ready to go at a moment's notice," he explains, along with 10 acute care beds and 10 ICU beds on standby.

To care for the more than 7,000 patients admitted to NYU Langone's hospitals, primary care physicians and specialists alike step forward from every corner of the institution, including 230 from faculty group practices. The Department of Orthopedic Surgery, whose faculty becomes widely available when elective surgeries are suspended, contributes one-third of the non-Medicine attendings. Members of the Department of Radiology, many of whom are also idle, represent the lion's share of the 150 physicians recruited for the Family Connect Program (see page 76), who partner with medical students from NYU Grossman School of Medicine to provide families of patients with daily updates on their loved ones.

To enlarge the pool of potential volunteers, NYU Langone makes several allowances for clinicians. Pediatric specialists from Hassenfeld Children's Hospital are permitted to partner with their colleagues in adult medicine to



Dr. Irina Belinsky, Dr. Joel Schuman, Dr. Vaidehi Dedania, and Dr. Zachary Elkin, all physicians in the Department of Ophthalmology, enlisted in the COVID-19 Army during the height of the pandemic.

care for inpatients under age 30. Some 130 board-eligible fellows are granted hospital privileges. Fifty-two members of NYU Grossman School of Medicine's class of 2020 are awarded diplomas more than one month early so that they can assist house staff (see page 74).

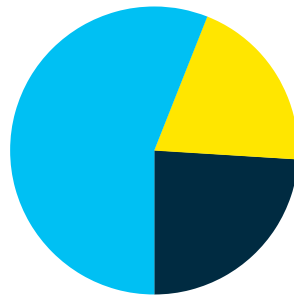
Depending on their experience and expertise, some physicians are assigned as either primary or supplemental attendings. Teamwork becomes paramount. Department chairs work side-by-side with first-year residents. When the nursing staff at NYU Langone Hospital-Brooklyn becomes



## The COVID-19 Army—By the Numbers

More than 1,800 NYU Langone clinicians volunteered to help care for hospitalized COVID-19 patients. Here, a closer look at the reinforcements by hospital.

### TISCH HOSPITAL AND KIMMEL PAVILION



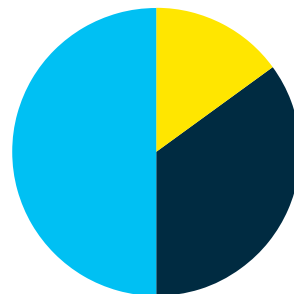
■ ATTENDINGS . . . . .	561
■ RESIDENTS . . . . .	198
■ NURSE PRACTITIONERS AND PHYSICIAN ASSISTANTS . . . . .	238

### NYU LANGONE HOSPITAL-BROOKLYN



■ ATTENDINGS . . . . .	112
■ RESIDENTS . . . . .	51
■ NURSE PRACTITIONERS AND PHYSICIAN ASSISTANTS . . . . .	69

### NYU WINTHROP HOSPITAL



■ ATTENDINGS . . . . .	300
■ RESIDENTS . . . . .	88
■ NURSE PRACTITIONERS AND PHYSICIAN ASSISTANTS . . . . .	209

overextended, surgeons, interventional cardiologists, and anesthesiologists pitch in to ensure that patients are receiving adequate levels of oxygen. As the demand for Virtual Urgent Care appointments soars, about 50 physicians from various specialties bolster the Ronald O. Perelman Department of Emergency Medicine (see page 18).

“This was an all-hands-on-deck moment,” says Steven B. Abramson, MD, vice dean for education, faculty, and academic affairs and chair of the Department of Medicine, “and a COVID-19 army emerged to meet it.”

March 22

NEW YORK CITY  
NYU LANGONE HEALTH

## The Cure for Calamity? Aligned Leadership.

Amid the pandemic, a public health crisis collides with a communication crisis. At the helm of four hospitals and hundreds of ambulatory practices, Robert I. Grossman, MD, dean and CEO, convenes twice-daily meetings to cut through the noise and align executive leadership on the day’s most pressing issues. The meetings, held remotely, tap boots-on-the-ground intel from the clinical heads of each hospital, along with leadership from facilities; supply chain; infection control; strategy; testing; research; information technology; communications; ambulatory practices; and local health officials.

Combined with the newly launched COVID-19 dashboard (see page 42), the briefings help NYU Langone Health mount a unified response to the surge. Among the direct benefits are expanded testing capacity, expedited relief funding, fortified staffing on the frontlines, and real-time reporting of clinical data.

“The executive leadership meetings centered the day at 7:30 a.m.,” says Mary Enquist, MPH, vice president for strategy, planning, and business development. “We reviewed new insights about the progression of the disease, as well as specific cases, and aligned on resources, approaches, and initiatives. The coordination made a huge difference in our ability to respond to the crisis quickly and efficiently.”



My GI fellow friends, news flash: Many of us in NYC are being deployed to gen med floors/ICU. Might need to re-connect with that internist deep inside you all. I’m off to ICU (soonish?) 🤔

**@MaureenWhitsett**

GASTROENTEROLOGY FELLOW, NYU LANGONE HEALTH  
MARCH 21



March 23

MANHATTAN  
NYU LANGONE HEALTH  
SCIENCE BUILDING

# Researchers Rise to the Challenge

Where did the novel coronavirus come from? How does it spread? How do we fight back? NYU Langone turns to its elite team of scientists for answers to the pandemic's most pressing questions—and there are many.

It's mid-March and the COVID-19 tsunami has begun washing over New York City with terrifying force. Even though the virus has already overwhelmed Wuhan and walloped northern Italy and Spain, its speed and devastation take New Yorkers by surprise. "We knew very little about it, and it hit hard very suddenly, so it was really all hands on deck," says Judith Hochman, MD, senior associate dean for clinical sciences and the Harold Snyder Family Professor of Cardiology at NYU Langone Health. Medical researchers and clinicians are simultaneously caring for desperately ill patients, scouring reports for new information, and rapidly assembling their own clinical trials to learn all they can about the virus and disease.

NYU Langone had persevered through Hurricane Sandy in 2012. But the slow-motion disaster of a poorly understood pandemic besieging New York presents an entirely new challenge. "There was something very different about this, and that was the unknown," says Dafna Bar-Sagi, PhD, vice dean for science and the Saul J. Farber Professor of Biochemistry and Molecular Pharmacology at NYU Langone. "The circumstances were unprecedented."

So, too, is the response. By the end of June, NYU Langone launches or joins 14 trials investigating a range of potential therapies. The health system's hospitals alone eventually evaluate over 25,000 patients for COVID-19. Amid the emergency, a shared sense of responsibility and teamwork help NYU Langone achieve an astonishing output of virus-related research findings.

Among the most noteworthy advances emanate from NYU Langone's

Vaccine Center, directed by Mark J. Mulligan, MD, the Thomas S. Murphy, Sr. Professor of Medicine. In April, the National Institutes of Health selects the Vaccine Center to be among 10 vaccine trial and evaluation units, and Dr. Mulligan and colleagues help launch a major clinical trial of a vaccine candidate developed by the pharmaceutical company AstraZeneca. In a separate collaboration, the Vaccine Center tests four vaccine candidates made by Pfizer and BioNTech, and the successful trial paves the way for a massive international trial of 30,000 volunteers.

"We're making efforts to enroll people with higher than average risk for COVID-19 infection—racial and ethnic minorities, frontline workers, first responders, and essential workers," Dr. Mulligan says. "It's a privilege to be part of what will hopefully be a solution to this horrible pandemic."

Another positive step involves a treatment: NYU Langone researchers launch a trial testing an experimental drug called remdesivir and find that hospitalized patients who receive it recover faster than those who do not. Based on the data, the FDA gives remdesivir an emergency-use authorization as a COVID-19 treatment.

Kerry Dierberg, MD, hospital epidemiologist and infectious diseases section chief at Bellevue Hospital, leads the remdesivir trial at NYU Langone and Bellevue, which are among the 68 international sites that together enroll more than 1,000 patients. "For me, it was pretty remarkable to see how quickly people mobilized to facilitate research amid an outbreak," she says. The crush of new cases, lack of existing therapies,



Adriana Heguy, PhD,  
director of the Genome  
Technology Center.





## 81 Days, 17 Trials, and Endless Questions—NYU Langone's Historic Research Rush

MARCH 16

### Does Hydroxychloroquine Measure Up?

An observational study evaluates the potential of the antimalarial drug hydroxychloroquine to prevent COVID-19 among healthcare workers at high risk of exposure. The clinical trial, led by H. Michael Belmont, MD, professor of medicine, aims to give the drug on an off-label basis over 90 days to 300 NYU Langone frontline employees who request it as a potential prophylactic. The effort allows researchers to systematically compare their health to those of 50 healthcare workers who do not request the drug.

MARCH 28

### What Can We Learn from the Blood, DNA, and Tissue of COVID-19 Patients?

To bolster NYU Langone's COVID-19 clinical and basic research efforts, the Center for Biospecimen Research and Development begins collecting and banking viral, blood, DNA, and tissue samples from patients and quickly releasing them to research groups. By the first week of July, the center has collected nearly 40,000 samples from about 6,500 hospitalized patients and distributed them to a range of efforts to improve clinical tests, inform clinical trials, and enable new discoveries.

MARCH 30

### Can Remdesivir Speed Recovery?

A team led by Kerry Dierberg, MD, MPH, assistant professor of medicine, helps launch a multisite clinical trial funded by the National Institute of Allergy and Infectious Diseases evaluating the therapeutic potential of the experimental drug remdesivir against COVID-19. Based on early results suggesting that remdesivir shortens recovery time and may improve survival, the FDA issues an emergency-use authorization for the drug on May 1, marking the first approved treatment for the disease. Dr. Dierberg and colleagues publish their initial findings from the Adaptive COVID-19 Treatment Trial on May 22 in the *New England Journal of Medicine*.

APRIL 1

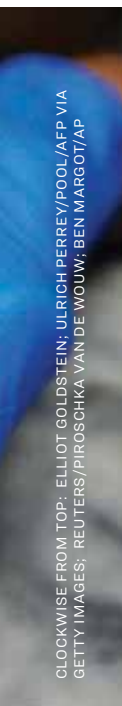
### Can Hydroxychloroquine Outperform a Placebo?

In collaboration with the University of Washington Medical Center in Seattle, Anna Bershteyn, PhD, assistant professor of population health, coordinates with New York City health investigators to launch another hydroxychloroquine clinical trial. The trial, designed to assess whether the drug can prevent COVID-19 in people with a close contact who has tested positive, subsequently expands to additional sites in a bid to enroll 2,000 volunteers.

APRIL 6

### Can a Gout Medication Mitigate Lung Damage?

Binita Shah, MD, assistant professor of medicine, helps launch a multisite clinical trial dubbed COLCORONA to determine whether the anti-inflammatory drug colchicine, long used to treat gout, can prevent hospitalizations, lung complications, and death in COVID-19 patients. Backed by funding from the National Heart, Lung, and Blood Institute, the trial aims to enroll 6,000 patients in a study of whether colchicine might minimize disease severity by dampening an aggressive immune response. →



A person recovered from COVID-19 donates blood plasma.

CLOCKWISE FROM TOP: ELLIOT GOLDSTEIN; ULRICH PERREY/POOL/AFP VIA GETTY IMAGES; REUTERS/PIROSCHA VAN DE WOUW; BEN MARGOT/AP



JAN

FEB

MAR

APR

MAY



Amy Rapkiewicz, MD, associate professor of pathology at NYU Winthrop Hospital, discovered extensive clotting in deceased COVID-19 patients. "We might have expected it in the lungs," Dr. Rapkiewicz says. "But we found it in almost every organ that we looked at in our autopsy study."



Mark Mulligan, MD, director of the Vaccine Center, speaks at an NYU Langone Town Hall on COVID-19 in March. He now leads one of 10 sites nationwide selected to serve as Vaccine and Treatment Evaluation Units responsible for testing COVID-19 vaccines (see page 94).

and surprising revelations about how the disease spreads and attacks patients add to the extreme research challenge. Amy Rapkiewicz, MD, associate professor of pathology at NYU Winthrop Hospital, reports a particularly sobering moment in the midst of performing her third COVID-19-related autopsy. That thorough postmortem examination, on April 3, reveals blood clots throughout the patient's body. "Every single organ was filled with clots," she says. "It was really startling because I just didn't expect that degree of involvement."

Dr. Rapkiewicz publishes a study that suggests COVID-19 cases are often hard to manage because the damage can extend well beyond the lungs and include features like unusual microclots in the heart and other organs. "Doing the autopsies and seeing the different pathologies in these organs will help in defining how we look at this disease and how we treat it," Dr. Rapkiewicz says.

#### **Pulling Together to Save Lives**

As the cases mount, other surprises emerge. Jennifer Lighter, MD, an epidemiologist at Hassenfeld Children's Hospital, says researchers in China had cited older age, diabetes, and cardiovascular disease as the main risk factors for a more severe course of disease. She and

colleagues, though, notice that many of NYU Langone's younger COVID-19 patients requiring intubation are obese. The researchers' retrospective study finds that for patients younger than 60, obesity is a significant risk factor—a finding that is now included in the CDC's list of risk factors.

Like other investigators, Dr. Lighter juggles multiple responsibilities, such as keeping the health system up-to-date on fast-changing clinical guidelines and clinical trial data. "Everybody pulled together and helped in every way they could," Dr. Lighter says. "It was really beautiful to witness and be a part of."

Researchers and clinicians work 24/7 to document new symptoms and complications, process tissue and blood samples, and develop new clinical trials. Investigators write protocols from scratch and obtain FDA permission to enroll patients. "We've never seen things move this fast," Dr. Hochman says. "It was truly remarkable."

The Office of Science and Research's Clinical Research Support Unit and the Clinical and Translational Science Institute help with trial development, coordination, and training. The Division of Biostatistics aids in designing the studies and trials and in analyzing the resulting observational data, while the DataCore platform and staff, based

APRIL 9

#### **When Did the Virus Begin Spreading in New York City?**

NYU Langone researchers discover that the novel coronavirus likely began circulating in New York by mid-February, weeks earlier than thought, and that travelers had brought the virus mainly from Europe, not Asia. The group sequences the full set of genetic information in coronavirus samples from more than 1,000 infected patients. Adriana Heguy, PhD, director of the Genome Technology Center; Matthew Maurano, PhD, assistant professor of pathology; and Matija Snuderl, MD, associate professor of pathology, lead the effort. The genetic surveillance can help determine whether new cases are related or represent independent chains of transmission.

APRIL 9

#### **Is Obesity a Risk Factor?**

NYU Langone scientists publish a study concluding that obese patients under age 60 are twofold more likely to be hospitalized and nearly fourfold more likely to require critical care than those who are not obese. Jennifer Lighter, MD, associate professor of pediatrics, and Michael Phillips, MD, chief hospital epidemiologist, lead the retrospective study of 3,600 patients. A separate study of nearly 5,300 NYU Langone patients, led by Leora Horwitz, MD, associate professor of medicine and of population health, reaches similar conclusions about the significant COVID-19 risks associated with obesity.

APRIL 10

#### **Who Will Lead the Vaccine Effort?**

The National Institute of Allergy and Infectious Diseases selects NYU Langone's Vaccine Center to join its national network of 10 Vaccine Treatment and Evaluation Units. The network offers a vital resource in preparing for and rapidly responding to infectious diseases of public health importance (see page 94).

APRIL 14

#### **Which Treatments Can Dampen Extreme Inflammation in the Lungs?**

NYU Langone launches a multisite randomized trial for clazakizumab, a genetically engineered antibody that can regulate the immune system and potentially moderate its response to the SARS-CoV-2 virus. One hypothesis suggests that for life-threatening COVID-19 infections in which patients develop lung failure, the investigational therapy might help tamp down a potentially deadly consequence of an overactive immune reaction to the coronavirus. The trial, led by Bonnie Lonze, MD, PhD, assistant professor of surgery, and Robert Montgomery, MD, professor of surgery, seeks to enroll 180 patients.

APRIL 24

#### **Do Experimental Therapies Cause Fatal Heart Arrhythmias?**

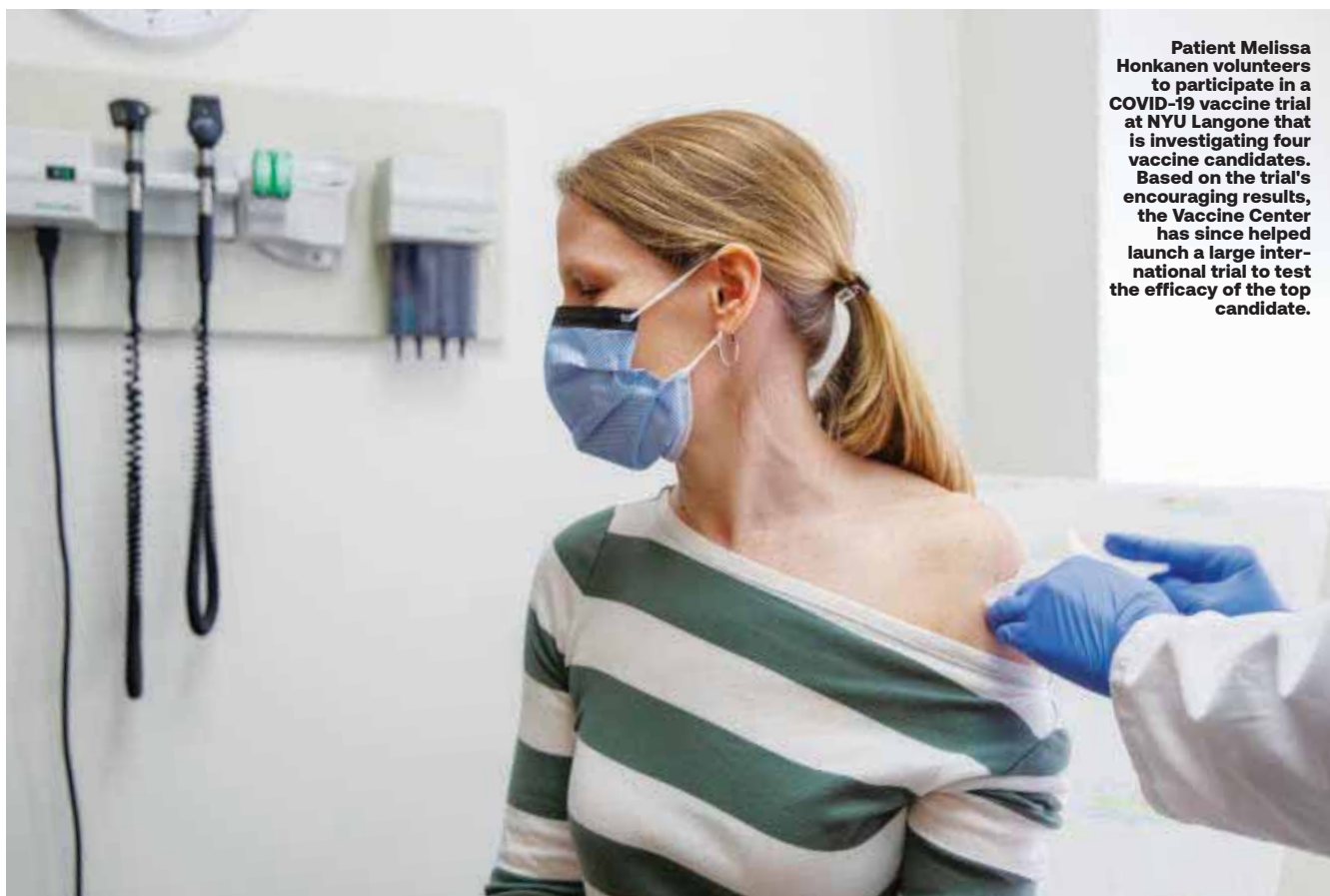
A study in *Nature Medicine* finds that patients treated with hydroxychloroquine and the antibiotic azithromycin take longer to recharge their heart's electrical impulses between heartbeats, an abnormality known as a prolonged QT interval. The study, which follows 84 patients, finds a severely prolonged QT interval in 9 patients, suggesting that the drug combination may increase the risk for heart arrhythmias and sudden cardiac death. Lior Jankelson, MD, PhD, director of the Inherited Arrhythmia Program at NYU Langone's Cardiac Electrophysiology and Heart Rhythm Center, co-leads the study with the Center's director, Larry Chinitz, MD.

APRIL 24

#### **Which Medications Best Prevent Blood Clots in COVID-19 Patients?**

Jeffrey Berger, MD, associate professor of →





**Patient Melissa Honkanen volunteers to participate in a COVID-19 vaccine trial at NYU Langone that is investigating four vaccine candidates. Based on the trial's encouraging results, the Vaccine Center has since helped launch a large international trial to test the efficacy of the top candidate.**

in the Information Technology Department, allow researchers to build new databases for their clinical studies and to gather, store, understand, and share a huge volume of information.

Staff who had been working on non-COVID-19-related trials train and redeploy to assist with the new efforts. The medical center's science review committees and institutional review boards, tasked with assessing and approving the scientific basis and safety of the new clinical trials, meet on nights and weekends to accommodate all of the emergency requests.

Medical ethicists help the researchers think about how to prioritize the trials and expand access to care. With overlapping eligibility criteria, investigators have to decide which patients might be best suited for which trials, and how to divide the hospital floors accordingly. "We realized that there had to be a seamless coordination between the people caring for the patients and the people designing the clinical trials," Dr. Bar-Sagi says.

At the height of the surge, nearly every floor of Kimmel Pavilion has been

reconfigured into a COVID-19-specific intensive care unit. A meticulous attention to detail keeps the medical center from running out of beds and allows healthcare workers and staff to focus on safely delivering patient care and improving care through clinical research.

#### **The Case for a Deep Research Bench**

Beyond the heroic individual efforts, Dr. Hochman and Dr. Bar-Sagi attribute the success to deep investments in research infrastructure. "We were critically dependent on the infrastructure to pull all of this together," Dr. Hochman says. "Every element contributed."

On March 28, NYU Langone's Center for Biospecimen Research and Development begins collecting and banking viral, blood, DNA, and tissue samples from hospitalized patients. Iman Osman, MD, the Rudolf L. Baer Professor of Dermatology and associate dean for translational research support, says the extraordinary effort must prioritize the care of patients who are seriously ill. "The other challenge to adjust to was the unprecedented volume," Dr.

Osman says, citing the need to quickly scale up to handle hundreds of samples per day. By the first week of July, the center has collected nearly 40,000 samples from almost 6,500 patients.

"We were immediately distributing specimens for research that could feed directly into clinical care," Dr. Osman says. Some go to help improve and validate clinical tests. Other samples go to the Genome Technology Center, where nine researchers sequence the viral RNA from more than 1,000 patients in two months. "We turned around on a dime and took existing infrastructure, such as the sequencers and the robots in my lab, to work exclusively on the COVID-19 samples," says Adriana Heguy, PhD, professor of pathology and director of the Genome Technology Center.

Dr. Heguy recalls watching in horror as the coronavirus swept through Italy's Lombardy region, where some of her relatives live. As cases begin appearing in New York, her own research confirms her fears that authorities were paying too much attention to travel from China and not enough to the many flights still



Vials for COVID-19 testing at NYU Winthrop

arriving from Europe. “My thought was that I was watching a train wreck that was coming toward us,” she says.

Around the world, scientists have sequenced the SARS-COV-2 genome from patients and added it to a central database. Based on new mutations as the virus spread, researchers can compare similarities among outbreaks in successive locations. The result is something like a family tree that shows the relationship among viral isolates around the world, allowing researchers to see how COVID-19 is spreading. “It’s like making a subway map,” Dr. Heguy says.

She and colleagues add more than 860 SARS-COV-2 sequences to the international database. Their analysis, conducted in collaboration with Matthew Maurano, PhD, assistant professor of pathology, and Matija Snuderl, MD, associate professor of pathology, suggest that the virus has been circulating in New York since at least mid-February—much earlier than initially thought. Their data show that most of the circulating coronavirus came from Europe, not from China, and reveals at least 88 independent chains of transmission in New York.

NYU Langone’s secure Biosafety Level 3 Lab, a federally regulated facility

for studying potentially lethal microbes that spread through inhalation, likewise plays a critical role. Virologists and microbiologists partner with Dr. Mulligan and other researchers to accommodate the new COVID-19 studies, allowing the collaborators to investigate whether the coronavirus can enter specific cells in the body and how it reacts to antibodies and experimental drugs. The valuable research findings are a testament to the early and sustained investment in infrastructure, “before we recognized that it would be so needed,” Dr. Bar-Sagi says. “It was incredible to watch it being used for the very purpose that it was built.”

Dr. Hochman says the huge effort has left the medical center far better prepared for the next COVID-19 surge or pandemic. The experience, she says, has also underscored the importance of worldwide collaboration. Completing clinical trials and securing badly needed answers may require close coordination among multiple centers in different countries. “We have the advantage of having a superb track record in leading multi-institutional trials, so people have asked us to lead some of these collaborations,” Dr. Bar-Sagi adds. “It’s going to take many people working together to get it done.”

medicine and of surgery, leads a randomized trial to determine the optimal dose of anticoagulation drugs to reduce the risk of blood clots in hospitalized COVID-19 patients. The study, specifically testing prophylactic versus therapeutic doses of the FDA-approved medications heparin and enoxaparin, subsequently expands to Bellevue Hospital and the Manhattan VA Medical Center. The National Institutes of Health later adapts the trial as part of a broader plan to accelerate COVID-19 therapeutic interventions (called ACTIV IV).

APRIL 29

#### Does Blood Plasma from COVID-19 Survivors Speed Healing?

A team led by Mila Ortigoza, MD, PhD, instructor of medicine and of microbiology, in collaboration with Montefiore Health System and Albert Einstein College of Medicine, launches a clinical trial to investigate whether blood plasma donated by volunteers who have recovered from COVID-19 can treat patients infected with the virus. The trial secures funding from the National Center for Advancing Translational Sciences.

MAY 1

#### Are Blood Pressure Meds Safe for COVID-19 Patients?

In a study with fellow cardiologist Judith Hochman, MD, Harmony Reynolds, MD, finds that four common types of high blood pressure medication do not increase the risk of patients contracting COVID-19 or of developing more severe disease. The observational study of more than 12,000 patients, published in the *New England Journal of Medicine*, offers reassurance that the millions of Americans on medications to lower their high blood pressure can safely continue taking their prescribed drugs.

MAY 4

#### Can a Vaccine Protect Healthy Volunteers from the Virus?

Mark Mulligan, MD, director of the Vaccine Center, begins enrolling healthy volunteers in a randomized multicenter clinical trial in collaboration with Pfizer and BioNTech to test whether four experimental vaccine candidates can “teach” the immune system to recognize and attack the novel coronavirus. The vaccines include viral RNA—a newer technology—that encodes proteins more likely to trigger an effective immune response (see page 94).

JUNE 1

#### Can Antibody Therapy Treat COVID-19?

A team led by Mark Mulligan, MD, director of the Vaccine Center, becomes one of the first worldwide to begin treating patients as part of a multicenter phase 1 clinical trial to test whether an experimental antibody therapy called LY-CoV555 can safely reduce the severity of COVID-19 among hospitalized patients. For a separate trial funded by the National Institutes of Health, Dr. Mulligan is investigating the potential of the same antibody, developed by Eli Lilly and biotechnology firm AbCellera, to prevent infection.

JUNE 25

#### How Do Blood Clots Contribute to COVID-19 Mortality?

A study based on seven autopsies of COVID-19 patients who died at NYU Winthrop Hospital finds extensive blood clots in the patients’ lungs, heart, liver, kidneys, and other organs, suggesting that abnormal clotting may play a role in the disease process. The study, led by Amy Rapkiewicz, MD, autopsy director at NYU Winthrop, suggests how the clots can lead to respiratory failure, a heart attack, stroke, or even kidney failure.



March 23

MANHATTAN NYU LANGONE ORTHOPEDIC HOSPITAL

## No Bones about It: A Hospital Steps Up



Martin Weinstein recovers from COVID-19 at NYU Langone Orthopedic Hospital.

On March 23, NYU Langone Orthopedic Hospital (LOH) admits five patients from the main campus in Manhattan—the first cohort of 463 patients recovering from COVID-19 who will be transferred from Tisch Hospital, Kimmel Pavilion, and NYU Winthrop Hospital. As the surge intensifies, LOH becomes increasingly vital to the institution's strategy to free up as many beds as possible for the most acutely ill and safely transition recovering patients to their homes or long-term-care facilities.

"Since nursing homes and skilled nursing facilities really weren't available, LOH—due to the suspension of elective surgeries—was a place where we could tend to patients who no longer required minute-to-minute care," explains Andrew Brotman, MD, executive vice president, vice dean for clinical affairs and strategy, chief clinical officer.

As a hospital that normally provides specialized surgical care, LOH adopted a radically different role during the COVID-19 crisis. But it was a welcome one, according to Joseph Zuckerman, MD, the Walter A. L. Thompson Professor of Orthopedic Surgery and chair of the Department of Orthopedic Surgery. "For us," he says, "it meant caring for a very different patient population than we were accustomed to, which we were ready to do."

One of Dr. Zuckerman's first steps was to have patients with orthopedic emergencies at the Ronald O. Perelman Center for Emergency Services transferred to LOH so that emergency medicine specialists could devote their full attention to acutely ill patients. Five floors of LOH were dedicated to patients with COVID-19: four floors with clinical units and one designated for rehabilitation. "After a long hospital stay, patients become deconditioned, so they usually need some kind of therapy before they can return home or be transferred to a long-term-care facility," explains David Dibner, senior vice president, Musculoskeletal and Rusk Rehabilitation.

The team at LOH that cared for patients with COVID-19 included 56 attending physicians from the Department of Orthopedic Surgery—the most volunteers of any department outside the Department of Medicine—and some 400 nurses and clinical staff. All received intensive training in the care of medical patients. "Everybody stepped up and went in full tilt," says Dr. Zuckerman. "It was a very big transition, but we started gearing up within 24 hours of the request from leadership."

March 25

BAY RIDGE, BROOKLYN

First Person

## I Had a Double Mastectomy during the Pandemic

Stay-at-home-mom Anna Cheng, 37, of Brooklyn, looked forward to 2020 when all three children would be in school by the fall and she planned to return to work in the insurance industry. A diagnosis of breast cancer during the very peak of COVID-19, when 19,000 New Yorkers were hospitalized, complicated her outlook. Here's Anna's story.

Around the first week of March, I felt a lump on my left breast. I had just canceled my son's eighth birthday party. A lot of people were still relaxed about the coronavirus, but I am Asian, and I'd heard what happened in China. I waited a couple of days to see if the lump would go away with my period. But it didn't. The city was closing down by then, so I had to hunt to find a place for a mammogram.

The radiologist told me the scan looked "highly suspicious," and he booked a biopsy right away. He said, "Go home, do some research, and find the best surgeon you can." That's what I did. We live in a small home in Bay Ridge with my husband's grandfather, who is 100 years old. Everyone was there—three kids (ages eight, five, and three) starting the homeschooling, my husband working in the dining room. I pulled together a list with 10 reputable breast surgeons. One name stood out: Dr. Deborah Axelrod, director of clinical breast surgery and community outreach at Perlmutter Cancer Center.

I liked Dr. Axelrod right away. She was warm and kind. I liked the Center, too. It's one of only 50 cancer centers nationwide designated as comprehensive by the National Cancer Institute. That made me feel more confident about receiving care during the worst of the surge.

March 25

TRISTATE AREA, NYU LANGONE INPATIENT UNITS

## We Gave Tablets to All of Our COVID Patients. Why That's a Big Deal.

With visitors temporarily barred from the hospital, family members lack an easy way to see their loved ones, who might be sedated or too weak to operate their mobile device. Clinicians face their own conundrum: balancing the need to check in on acutely ill patients with the risk of exposure. "Entering and exiting rooms consumes two precious resources: time and PPE," says Paul Testa, MD, NYU Langone Health's chief medical information officer and an emergency medicine doctor.

Enter the digital wizards of MCIT—the Medical Center Information Technology team. Within days, they mount tablets on stands and place them in patient rooms throughout the institution, enabling doctors to perform rounds virtually. "Many nurses leverage the ability to make video calls to check in on sedated patients," says Mike Mainiero, senior director of digital strategy and innovation.

The team also collaborates with Apple to recode FaceTime for a healthcare setting, adding privacy features and eliminating callbacks so that one device can be used in multiple locations. More than 400 iPads (sanitized after each use) are distributed across every NYU Langone inpatient facility so that staff members can facilitate virtual visits. "When patients see a familiar face, hear a familiar voice, they respond however they can," says Katia Sokoloff, senior director of patient experience at NYU Langone Hospital–Brooklyn. "The calls comfort everyone involved, including the staff."

Anna Cheng, seen here with one of her three young children.

When discussing my diagnosis—invasive ductal carcinoma—Dr. Axelrod told me I was a good candidate for surgery and encouraged me to keep a positive outlook. She said, "Stay strong. We'll get through it together."

Then, I heard that I would need a PET scan, another biopsy, CT scans, and to see an oncologist for genetic tests, I thought, "Oh, no! I can't be traveling around. Not now. It's so stressful." But Dr. Axelrod's team took care of everything. They even doubled up my appointments so I didn't have to make so many trips. It took away some of the stress.

When the genetic tests revealed the BRCA2 mutation, Dr. Axelrod and I agreed to take an aggressive approach and remove everything. I have three little ones, and I want to be around for them. On a video chat before the operation, Dr. Axelrod reassured me of my excellent prognosis. For a faster recovery, I decided against reconstructive surgery. The kids were under so much

stress already, stuck in the house, not seeing their friends, doing virtual learning. Why add to that?

My husband couldn't go with me to the hospital, which I understood. At the time of the procedure, it was just me and the staff—I felt like a VIP. The nurses introduced me to everyone in the operating room and started the IV. Then, Dr. Axelrod came in and held my hand as I drifted off. That helped a lot. It was my first surgery, and I was afraid. When I woke up, she had already called my husband to tell him that everything went well.

When I look back, it seemed so inconvenient to have a diagnosis of cancer during the pandemic. We were prepared for the worst, but we haven't had a hiccup. I didn't have to bump into anyone else at my appointments, and the staff went to extreme measures to keep me safe. Plus, the whole world was grieving, too. If I had to have cancer, I can't think of a better time.

“

**Post-COVID, we will evolve this video capability. Families will still want to video-connect to loved ones in inpatient settings, no matter where they might be.”**

**Michael Mainiero**

SENIOR DIRECTOR OF DIGITAL STRATEGY AND INNOVATION



March 25

MANHATTAN CAMPUS  
SMILOW MULTIPURPOSE ROOM

# Face Shield Shortage? Not on Their Watch.

The clear plastic guards that protect clinicians and other frontline staff from COVID-19 droplets are in short supply globally, so NYU Langone Health acts locally. Emergency Management and Enterprise Resilience, in partnership with NYU Grossman School of Medicine students, finds simple step-by-step instructions for assembling the personal protective equipment. Robert Shupe, the senior director of central sterile processing, and his team procure a stockpile of plastic sheets, foam, elastic bands, glue guns, and staples from a variety of suppliers, while third-year students Christopher Kuhner and Dina Lévy-Lambert solicit volunteers. With the support of Linda Tewksbury, MD, NYU Grossman School of Medicine's associate dean for student affairs, students answer the call, buying parts that haven't yet arrived from local supply stores. Sackler Institute of Graduate Biomedical Sciences students join them in working 12-hour shifts in teams of 10. Naturally, there is a learning curve. The students produce 300 shields on their first day of work, but their daily output soon jumps fivefold. In all, they produce 30,000 shields in one month, stopping production once the institution's need is fully met. "These students embody the values of NYU Grossman—empathy, humanism, using their knowledge and skills to advance the care of patients," says Steven Abramson, MD, executive vice president and vice dean for education, faculty, and academic affairs. "They pitched in like it was a war effort—which, in a way, it was."







Face-shield assembling volunteers included (above) Philip Carlucci, Chimeka Ezie, William Schreiber-Stainthorp, Nora Alwash, Chris Kuhner, and Julia Chesler; at right, from top, are Savannah Pearson-Ayala, Norah Alwash, Zoë Norris, and Julia Chesler





# Ventilators: We've Got a Plan for That.

On March 29, NYU Langone Health receives 55 additional ventilators from New York State for patients with COVID-19 who require mechanical respiratory support until their lungs can recover well enough to function on their own. A dire shortage of ventilators nationwide has dominated the headlines for weeks, and five days before these reinforcements arrive, Governor Andrew Cuomo projects that New York state alone will need 30,000 of the lifesaving devices.

In advance of the surge, NYU Langone's leadership had deep discussions about a strategy for optimizing care for patients who require respiratory support when ventilators are in short supply. One highly controversial protocol, approved for emergency use days earlier by the State of New York, calls for splitting ventilators among patients. But the risks are steep, including potential cross-contamination and the inability to individualize the ventilator settings. "Many institutions had moved to a model where they would split ventilators or allocate them based on age, comorbidities, or other criteria," says Robert J. Cerfolio, MD, MBA, professor of cardiothoracic surgery and chief of hospital operations. But splitting ventilators, he notes, should be the very last option because it requires nearly identical compliance from both patients' lungs to ensure that each person receives adequate oxygenation and ventilation.

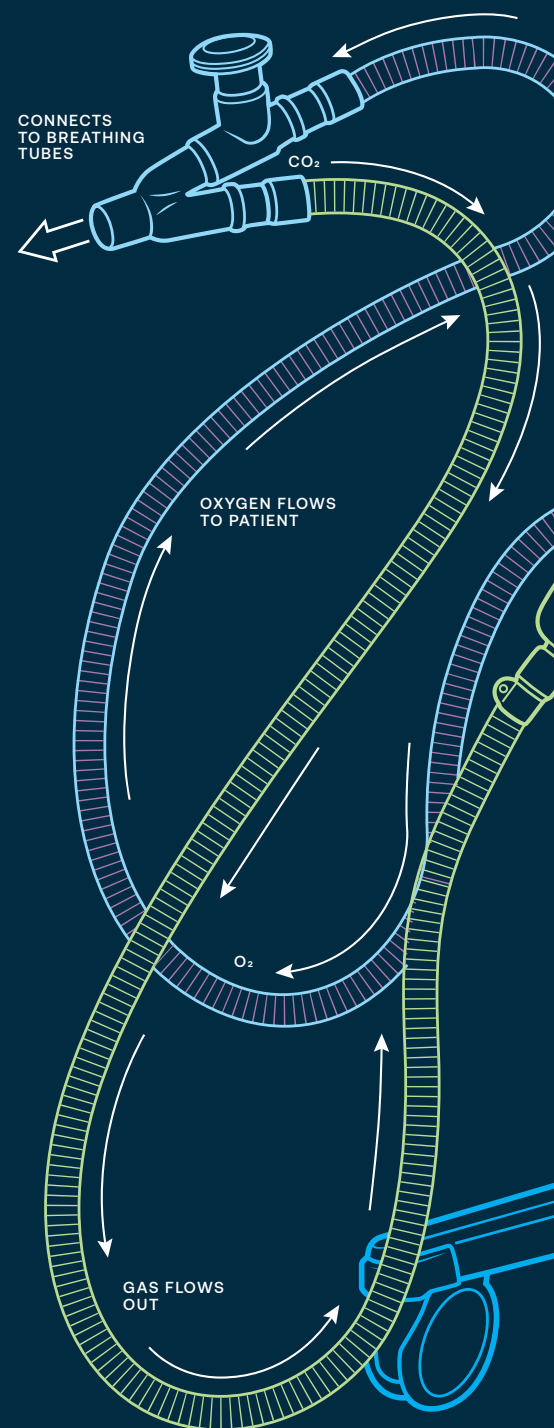
"We felt very strongly that we should not allocate or split ventilators," says Fritz François, MD, chief medical officer and patient safety officer. "We needed to explore other

options." He explains that for some patients, noninvasive techniques, such as high-flow oxygen therapy—in which the rate at which a patient receives oxygen is dramatically increased—provide appropriate respiratory support and ensure that ventilators are available for those who can't survive without them. Moreover, he felt that prematurely enacting a policy of allocating ventilators—a decision process made by a committee far removed from bedside care—would go counter to one of NYU Langone's bedrock principles of clinical care. "We believe that the clinician who is caring for a critically ill patient is best able to make an assessment and decision. We let doctors be doctors."

NYU Langone's thoughtful approach to ventilator use became well aligned with the lessons intensivists learned as they treated more and more patients with COVID-19. "Over time, we recognized that a ventilator isn't the best option for all of these patients," explains Mark Nunnally, MD, director of adult critical care service. "Instead of intubating patients early on, we managed them with high-flow oxygen therapies, providing progressive support until they were unable to maintain a satisfactory oxygen level."

Even at the peak of the surge, only 58% of NYU Langone's ventilators were in use. "The fear of not having enough did keep me awake at night," says Dr. Nunnally. "But we were able to stay ahead, even in the darkest moments. And for some patients, the brightest moment came when they recovered so well that they could be weaned off the ventilator."

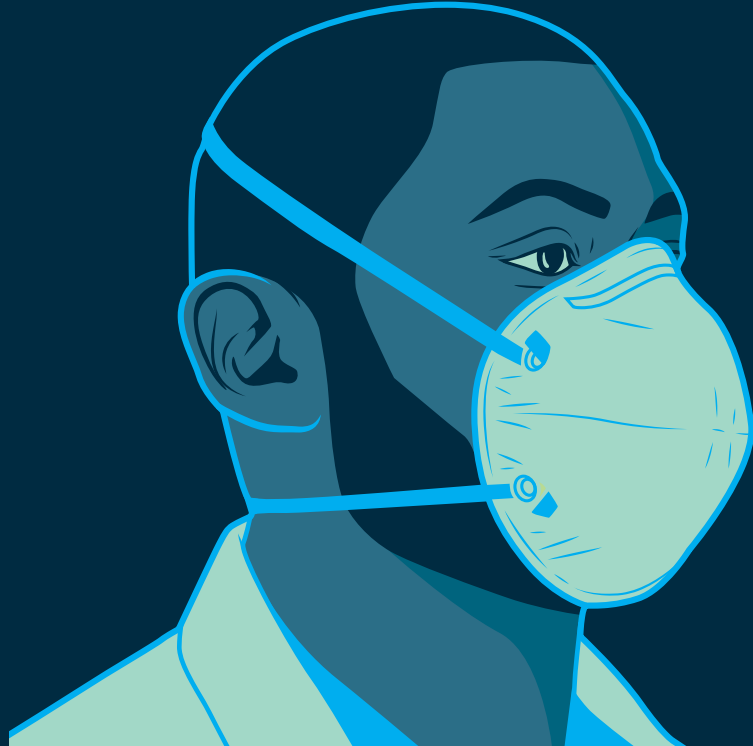
## How a Ventilator Works



March 30

NEW YORK CITY

## N95 Fit Testing: We've Got a Plan for That, Too.



With respirators, as with so much in life, it's all about finding the right fit. As N95s and other tight-fitting respirators become increasingly scarce (see page 20), it becomes ever more challenging for NYU Langone Health to provide the right respirator for every kind of face, ensuring a proper seal to protect those who work in patient areas from the airborne virus. By March 30, the need for widespread fit-testing becomes urgent, so a schedule is established for each hospital. Environmental Health and Safety (EH&S) tests and selects the respirators, a key step because not all products marketed as "N95" respirators meet the established standards. EH&S partners with Occupational Health Services, which performs the testing. In most cases, the test involves spraying a bitter- or sweet-tasting solution that simulates an infectious agent into a hood worn by the masked employee. The person is asked to perform eight maneuvers. If they can taste the agent, it means the seal is inadequate, and the respirator must be readjusted or another model must be tested. By the end of the surge, NYU Langone performed over 18,000 fit tests. "With this virus," says Marta Figueroa, PhD, senior director, Environmental Health and Safety, "it's critical we get this right."

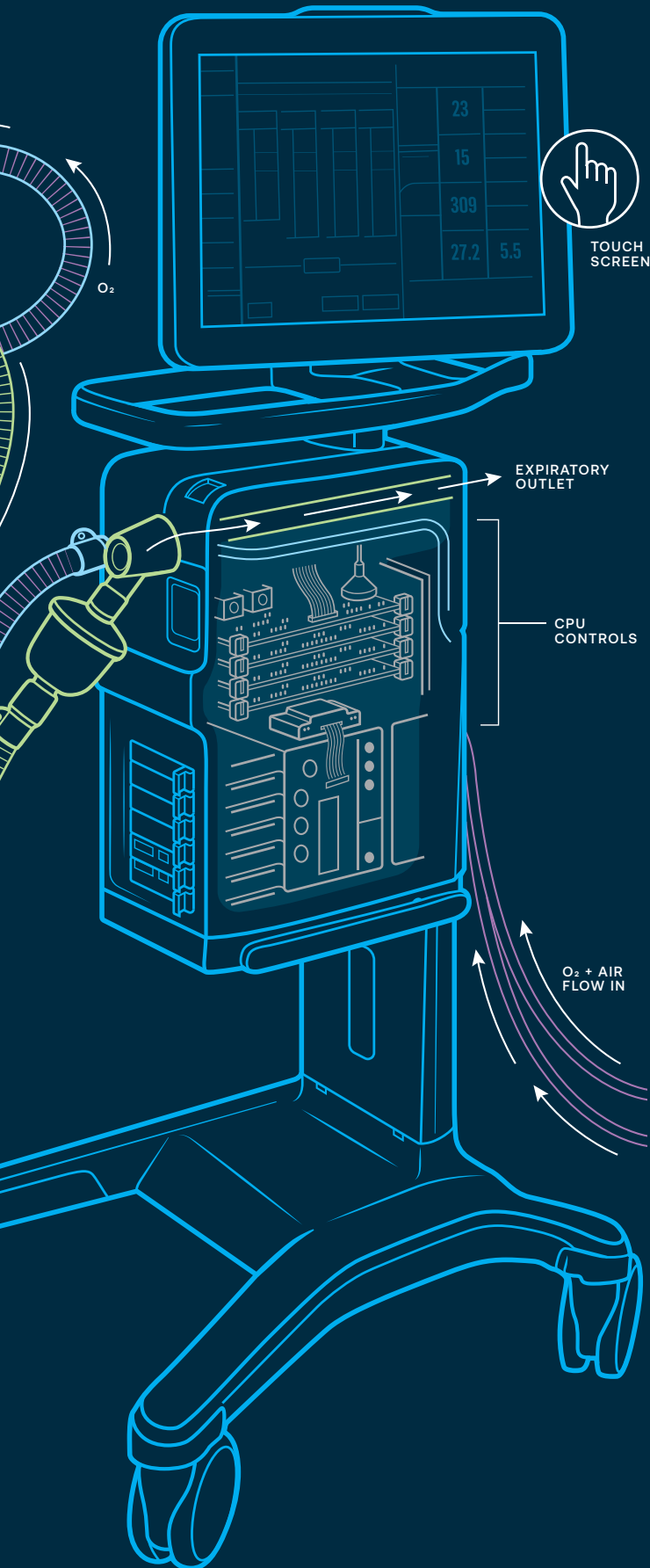
### Fit for Duty: How to Wear an N95 Mask

#### DO:

- Don your N95 before putting on glasses or head coverings
- Place the top strap at the crown of your head, and the bottom strap along your neck
- Conduct a seal check each time you don your N95
- Use a face shield to protect your N95

#### DON'T:

- Wear an N95 if you haven't passed a fit test
- Put anything between the straps and your head
- Place the top strap low on your head
- Place both straps together
- Criss-cross the straps





March 30

MINEOLA, NASSAU COUNTY, NEW YORK  
NYU WINTHROP HOSPITAL

## A Pop-Up Emergency Room Saves the Day

As coronavirus cases stream into the hospital, NYU Winthrop transforms its observation floor, endoscopy suite, and same-day surgery areas into COVID-19 inpatient facilities. However, the Emergency Department (ED), even after an expansion, is running out of real estate, with as many as 155 patients treated and 87 admitted in a single day. To make room, NYU Langone's Real Estate Development and Facilities team thinks outside the building, constructing an 1,800-square-foot tent adjacent to the emergency room entrance for evaluating those with less-severe respiratory symptoms. "We desperately needed an auxiliary area to house these patients," says Marc Adler, MD, NYU Winthrop's chief medical officer.

Assembled in five days, the structure employs negative pressure to reduce viral spread and has climate control, plumbing, and an emergency power system. "You don't feel like you're in a tent. You've got walls, chairs, all the equipment, and a regular floor, so it's very comfortable," says Barry Rosenthal, MD, chairman of the Department of Emergency Medicine.

Despite gale-force winds that force an evacuation one evening, the tent proves a highly reliable safety valve for the ED. Several days later, a second tent with room for 24 more patients goes up. "The numbers were still rising, and we needed to be prepared," says Dr. Adler. But as social distancing takes effect, the curve flattens just as the structure is completed, and it's never used. The first one remains in daily use until early May, by which time, ED volume has dropped by half. "That tent was essential for getting us through the crisis," says Dr. Adler.

“

The numbers were still rising, and we needed to be prepared. That tent was essential for getting us through the crisis.”

**Marc Adler, MD**

CHIEF MEDICAL OFFICER,  
NYU WINTHROP HOSPITAL



NYU Winthrop's auxiliary tents helped relieve overcrowding in the adjacent ED.

CHARLES GAERTNER

March 31

BROOKLYN  
NYU LANGONE  
HOSPITAL—  
BROOKLYN

First Person

## I Thought I Knew Long Days. Then Came COVID.

Tracey-Ann Knight, RN, served as nurse manager for the 40-bed COVID-19 inpatient unit at Augustana Center. She recounts her experience during the pandemic.

I've worked at the hospital since 1999, and in all that time, I never stepped foot in Augustana until they began converting it. During my daily walk-throughs, I saw the patient rooms transform before my eyes. By the time patients started streaming in, you'd never have guessed that the unit was ever less than first-rate. In fact, it was a great place to work. The rooms were spacious, and we had a large lunchroom the staff went crazy over, a pantry, and a separate linen area. I got to know every inch of the place during the next five weeks, making sure my team had the supplies and support they needed. Every day, I'd run back and forth across the bridge to the main hospital, as I continued to manage my medical surgical unit and responded to respiratory emergencies. To say it was challenging is an understatement. There are no set hours in a global crisis like this. I'd arrive at 6:30 a.m., leave at 8:30 p.m., go home, take a shower, sleep, and then do it all over again. It was like an out-of-body experience. Fortunately, I had nurses who were instrumental in assisting me with my main unit, 5500. Somehow, I got through it. Somehow, we all did.

Tracey-Ann Knight at Augustana Center, with ducting used to convert inpatient rooms to negative pressure.



JAN

March 31

BROOKLYN  
AUGUSTANA CENTER  
NYU LANGONE  
HOSPITAL-BROOKLYN

FEB

MAR

APR

MAY

“

Augustana allowed  
us to increase  
our capacity  
and made a huge  
difference in  
our ability to  
optimally care  
for our patients.”

Joseph  
Weisstuch, MD

CHIEF MEDICAL  
OFFICER, NYU LANGONE  
HOSPITAL-BROOKLYN



ELLIOT GOLDSTEIN

A photograph of a hospital room. In the foreground, there is a white and blue medical bed with a desk attached to it. The desk has a light-colored surface and a black frame. On the wall behind the bed, there are several medical monitors and equipment. The room has a white ceiling and walls. The title "A Next-Door Neighbor to the Rescue" is overlaid on the top right of the image.

# A Next-Door Neighbor to the Rescue

Pulmonary medicine  
and critical care  
doctor Tanzib Hossain,  
MD, at the converted  
Augustana Center.

When Lutheran Hospital became part of NYU Langone Health in 2015, the institution seized an opportunity to integrate and upgrade the care at the Brooklyn medical center. What leadership could not have envisioned was the essential role the Augustana Center, a decommissioned nursing home across the street from what is now known as NYU Langone Hospital–Brooklyn, would play during the COVID-19 crisis. “Augustana was unoccupied,” says Joseph Weisstuch, MD, the hospital’s chief medical officer. “Many ideas about how best to utilize the building were being considered, but nothing had been decided.”

The pandemic necessitates an accelerated and very different plan. Patients with COVID-19 stream into the hospital, comprising more than two-thirds of all inpatients and stressing the Emergency Department’s resources. Even with the conversion of two postanesthesia care units and a step-down unit to negative-pressure ICUs, and an inpatient rehabilitation unit into a 30-bed COVID-19 medical unit, space is running short. Augustana, which connects to NYU Langone Hospital–Brooklyn via a third-floor bridge, turns out to be a critical solution. The 9,000-square-foot main floor can be readily transformed into a respiratory screening area to treat patients at the ED who are likely to be sent home, and the third floor, which has 22 large patient rooms, all piped for oxygen, will become an additional inpatient facility. “Not having to install medical gas capability was a big plus,” says Miguel Cedenio, director of capital programs for NYU Langone Hospital–Brooklyn.

The Real Estate Development and Facilities (RED+F) team works around the clock, installing HEPA units for the negative-pressure rooms; adding emergency power; upgrading the electrical, plumbing, and lighting systems; and painting and plastering. Vision panels are added to patient-room doors, observational cameras are installed at nurse stations, and computers are linked to the hospital’s clinical system, Epic. Upon hearing about the scale of the project, one clinician is awed. “You’re doing the equivalent of refueling a jet plane in flight,” Debra McCarthy, the vice president of facilities management services for NYU Langone Hospital–Brooklyn, recalls him saying.

The screening center opens on March 17 and treats up to 180 patients in a day. Staff members direct patients with minor symptoms there, freeing up the ED for the seriously ill. Augustana’s third floor begins receiving acute care inpatients with COVID-19 two weeks later. Quickly, all 40 beds are filled. “Augustana allowed us to increase our capacity and made a huge difference in our ability to optimally care for our patients,” says Dr. Weisstuch. “RED+F did an unbelievable job making it fully functional—and making it look beautiful.”



JAN

FEB

MAR

APR

MAY

**“Through the efforts of our clinicians and researchers, we will emerge with a greater reason for optimism in the fight against COVID-19.”**

**STEVEN B. ABRAMSON, MD, VICE DEAN FOR EDUCATION,  
FACULTY, AND ACADEMIC AFFAIRS**

# Apr.

**25,662**  
TOTAL POTENTIAL COVID-19 CASES EVALUATED IN THE EMERGENCY DEPARTMENTS

**7,764**  
TOTAL COVID-19 CASES ADMITTED

**6,467**  
TOTAL CASES ADMITTED TO ACUTE CARE

**1,297**  
TOTAL CASES ADMITTED TO THE ICU

**2,629**  
TISCH HOSPITAL/KIMMEL PAVILLION

**2,187**  
NYU WINTHROP HOSPITAL

**1,651**  
NYU LANGONE HOSPITAL-BROOKLYN

**988**  
MORTALITIES

**5,203**  
INPATIENT DISCHARGES

**GOING WITH THE FLOW**  
BY THE END OF MAY, NYU LANGONE  
HAS EVALUATED OVER 25,000 PATIENTS  
FOR POTENTIAL CORONAVIRUS  
INFECTION. MORE THAN 85% OF THE  
7,764 PATIENTS IT ADMITS FOR CARE  
GO HOME.



JAN

April 1

MANHATTAN, BROOKLYN, LONG ISLAND  
NYU LANGONE  
HEALTH

FEB

MAR

APR

MAY

# The Big Build

How Real Estate Development and Facilities Added More Than 600 Hospital Beds in Unprecedented Time to Stay ahead of the Surge

By the first week of April, NYU Langone Health has embarked on a host of accelerated construction and renovation projects—creating, retrofitting, and repurposing to supply critically needed facilities to support frontline clinicians and accommodate a cresting wave of patients with COVID-19. Paul Schwabacher, PE, senior vice president for facilities management, Real Estate Development and Facilities (RED+F), recalls the words he had heard one week earlier that left a lasting impression. On March 23, with the number of cases in New York City doubling every three days, Governor Andrew Cuomo issued an executive order to the city's hospitals: "Find more beds. Use more rooms. You must increase your capacity by 50%."

But even more vividly, Schwabacher recalls the indelible images he had seen in late January: an army of cranes and laborers at work on a 1,000-bed hospital in Wuhan, China, built in 10 days. "Wow," I thought. "What if we have to do that?" says Schwabacher. "Is that going to happen here? It could, so we'd better get ready for it."

In the months that followed, RED+F—under the leadership of Executive Vice President and Vice Dean Vicki Match Suna, AIA—demonstrated that it was not only ready, but willing and able to do whatever was needed. "The challenges this pandemic presented were unprecedented, but I was confident we would handle anything it sent our way in the days, weeks, and months ahead," says Match Suna. "As a group, we in RED+F had already proven that we can overcome the most daunting



James Styles and Samantha Motley (third and second from right), both assistant project managers for real estate development and facilities, review plans for expanding the Emergency Department on the main campus with contractors.





“

This is all about creating the best and safest environments possible for our patients and our staff.”

**Vicki Match Suna, AIA**

EXECUTIVE VICE PRESIDENT AND VICE DEAN, REAL ESTATE DEVELOPMENT AND FACILITIES



JAN

FEB

MAR

APR

MAY

obstacles with dedication, teamwork, and determined action. I fully expected we were up to this trial as well.” As one project manager noted, “The feeling of pride was overwhelming. Not once did anyone ever use the word ‘No’ or say ‘I’m tired’ or ‘It’s not my job.’”

Although RED+F had been preparing for a potential outbreak since January, the urgency intensified as New York City became the new epicenter. In-house professionals specializing in engineering, design, and construction worked 24/7, alongside clinical leaders, to try to anticipate each emerging priority. “The idea was to stay ahead of the rush of incoming patients and not run out of space,” says Schwabacher. “The wave just kept growing, so we kept adding, adding, adding beds.”

By the first week of March, four critical-care beds had been designated in Tisch Hospital, but the need for an expanding number of units for patients in need of acute care was already apparent. Fritz François, MD, chief medical officer and patient safety officer, decided that the 12th floor of Kimmel Pavilion would house the first unit dedicated entirely to the care of patients with COVID-19. “This is what we have to do,” he told leadership teams from the hospital and RED+F, outlining key considerations. “We have 24 hours.”

Kimmel’s state-of-the-art single-bed patient rooms were easily reprogrammed as negative pressure spaces that could filter out airborne pathogens. But in more than 900 other patient rooms throughout NYU Langone’s hospitals, RED+F eventually had to convert ventilation systems and, in some cases, install physiological monitoring equipment, which was redeployed from many locations. “It was a huge push to get it all done,” says Schwabacher, “but we did.”

As the crisis unfolded, RED+F would be called upon again and again for its mechanical know-how, problem-solving savvy, and can-do spirit. NYU Lan-



gone’s EDs were not only expanded, but also reconfigured to create separate screening and isolation areas for patients suspected of being contagious. At NYU Winthrop Hospital, the ED became so overtaxed that RED+F erected an 1,800-square-foot negative pressure tent for evaluating patients with less-severe respiratory symptoms (see page 58). In all, 112 patient bays were added to our EDs. At NYU Langone Hospital–Brooklyn, two floors of the Augustana Center, a decommissioned nursing home across from the hospital, became an annex where patients were screened, assessed, or treated (see page 61). When NYU Langone was ready to open its first COVID-19 testing center,

RED+F converted a bicycle storage room in Kimmel Pavilion to a finished facility over one weekend (see page 40).

As for all those hospital beds mandated by Governor Cuomo, RED+F proudly met the governor’s goal, adding more than 600 acute care beds and 200 critical care beds. “To put those numbers in perspective,” says Schwabacher, “we created more than twice the number of beds in several weeks that it took us to create in Kimmel Pavilion over several years.” By staying ahead of the surge, NYU Langone was able to care for all of its patients with COVID-19, no matter how fast they arrived in the EDs or how many were admitted to the hospitals.

ELLIOT GOLDSTEIN





At the main campus, equipment arrives for the heating, ventilation, and air conditioning units for the overflow tent built outside the Emergency Department; right, assistant project manager Samantha Motley at work.





JAN

April 3

MANHATTAN

FEB

MAR

APR

MAY

# The Sound of 3,257,412 Hands Clapping

Every night at 7 p.m., New Yorkers embrace a community ritual started in Wuhan, China, and step outside to cheer on the city's hundreds of thousands of essential workers.





A firefighter hugs Samantha Giambalvo, a traveling nurse from Alabama who has been working in New York since April 6. Firefighters and residents regularly display gratitude for healthcare workers at NYU Langone Health amid the COVID-19 outbreak.









CLOCKWISE FROM LEFT: ANGELA WEISS/AFP VIA GETTY IMAGES; JONATHAN KOZOWYK; NOAM GALAI/GETTY IMAGES

Upper East Side residents applaud from their fire escapes and windows to show their gratitude to medical staff and essential workers on the front lines of the coronavirus pandemic.



A flyover tribute to healthcare workers by the Blue Angels and Thunderbirds; first responders and front-line workers salute the brave service each has provided throughout the crisis.



CLOCKWISE FROM TOP: FRED GRECO; NINA BERMAN/NOOR/REDUX; JONATHAN KOZOWYK



“

The clapping was emotional. Everyone was so worried and scared. I wanted to reassure them. I wanted to tell them it would be okay.”

**Jacqueline Nuñez, RN**

NURSE, EMERGENCY MEDICINE





April 3

MANHATTAN  
NYU GROSSMAN SCHOOL  
OF MEDICINEThe virtual ceremony for early graduates  
of NYU Grossman School of Medicine.

## Newly Minted Doctors Heed a Clarion Call

The first graduation ceremony for newly renamed NYU Grossman School of Medicine is unlike any in its 179-year history. With public gatherings forbidden, there is no celebration at Alice Tully Hall, and for the first time since World War II, students are embarking on their careers early. Nearly half of the fourth-year class—52 students in all—have volunteered to serve as doctors in NYU Langone Health's Department of Medicine or in the Ronald O. Perelman Department of Emergency Medicine. After a week of training that includes PPE donning and doffing, they will assist house staff in the care of patients with suspected or confirmed COVID-19, meeting a critical manpower need as the surge reaches its apex.

"Stepping forward as new physicians in the face of potential personal risk to aid their colleagues as part of the COVID army was inspirational," says Steven B. Abramson, MD, executive vice president and vice dean for education, faculty, and academic affairs. "They could have waited until July to begin their residencies. Instead, they joined colleagues at a critical moment in history."

Before embarking on four- to six-week tours of duty, the students officially become MDs during a 30-minute WebEx video conference on April 3. Near the end, they unmute their screens to recite a cacophonous Hippocratic Oath, then receive praise from leadership. "Our institution is so full of pride that you answered a clarion call," says Dean and CEO Robert I. Grossman, MD. "Medicine is the noblest profession, and each of you will add immeasurably to its stature." The commencement concludes with cheering, and a plan to reconvene with the rest of the class of 2020 for another virtual ceremony in late May.

“

**They could have waited until July to begin their residencies. Instead, they joined colleagues at a critical moment in history.”**

**Steven B. Abramson, MD**

EXECUTIVE VICE PRESIDENT AND  
VICE DEAN FOR EDUCATION, FACULTY,  
AND ACADEMIC AFFAIRS



April 4

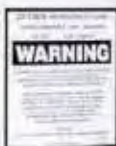
BROOKLYN,  
NYU LANGONE  
HOSPITAL—  
BROOKLYN



NO SMOKING  
OR  
OPEN FLAMES ALLOWED

OXYGEN  
U.S.P. (BY AIR LIQUEFACTION)  
REFRIGERATED  
LIQUID

5900043



NB3207

MANV250

At NYU Langone Hospital-Brooklyn, the building's narrow air pipes were replaced by wider ones to accommodate an augmented oxygen supply provided by rented bulk storage tanks.

## A Plan to Keep the O<sub>2</sub> Flowing

While the prospect of ventilator shortages dominates headlines, NYU Langone is quietly shoring up its supply of another dwindling resource: the oxygen that feeds ventilators and nasal cannulas. One ventilator typically requires a daily supply of 20 tanks of compressed oxygen. Prior to the outbreak, NYU Langone had installed a redundant piping system at its main campus to boost its oxygen capacity, but once the surge began, demand quickly outpaced supply. “We were using four times as much oxygen as ever before,” explains Paul Schwabacher, PE, senior vice president for facilities management, Real Estate Development and Facilities (RED+F). “Losing oxygen pressure is scary, and it was starting to drop.”

At the main campus in Manhattan and at NYU Winthrop Hospital, the remedy was to rent bulk storage tanks to augment oxygen reserves. But at NYU Langone Hospital-Brooklyn, the building's air pipes were too narrow to distribute an enhanced supply. Shutting down the entire system to install bigger pipes, even for a few hours, wasn't an option. But Patrick Barton, engineering supervisor, had an idea. By isolating certain portions of the building, the pipeline would be minimally disrupted by an installation. Says Richard Cohen, PE, RED+F's vice president for facilities operations: “It was an amazing case of outside-the-box thinking, the kind emergent situations require.”



## How 'Family Connect' Bridged the Gap



In early April, Katherine Hochman, MD, was self-quarantining after testing positive for COVID-19 when she decided to make the most of her isolation. So she turned her attention to a growing disconnect she had witnessed firsthand between physicians and the families of their patients. Ordinarily, clinicians update a patient's family regularly, but as the number of COVID-19-infected patients surged, "we were so busy caring for the acutely ill that we weren't able to do so with our usual rigor," recalls Dr. Hochman, who leads a team of hospitalists at Tisch Hospital. The need for such updates was all the more critical because bedside visitations were no

longer deemed safe. She also learned that many concerned families were calling the hospital for information about their loved ones. "It was a very big gap that needed to be filled," says Dr. Hochman, associate professor of medicine and associate chair for quality of care in the Department of Medicine. "So I said to myself, 'If I'm going to spend the next couple of weeks in isolation, how can I fix this?'"

Dr. Hochman devised a plan, and on April 6 launched a new program, Family Connect, to provide proactive daily updates to families of hospitalized patients throughout the crisis. Attending physicians at NYU Langone Health were paired with medical

students at NYU Grossman School of Medicine, and these two-member teams were assigned to all patients on the Manhattan campus. The first colleague she reached out to was Michael Recht, MD, chair of the Department of Radiology, whose physicians—largely and reluctantly sidelined by the focus on COVID-19—were eager to pitch in. Other department chairs followed suit. Before long, Dr. Hochman recruited a small army of volunteers: 151 attending physicians, some 100 medical students, 51 nurses, and 43 employees who came from various departments to staff the Patient and Family Resource Center, which fielded inquiries from family members.



As of June 15, the teams made 14,166 calls in support of 1,869 patients. The Family Connect nurse liaisons, who facilitated video calls between families and patients, played an instrumental role in keeping families updated. Family Connect inspired NYU Langone Hospital–Brooklyn and NYU Winthrop Hospital to develop their own versions of the program, which has become a model for other medical centers, as well.

“We were up and running in just five days,” explains Dr. Hochman. “The response from families was sheer appreciation and exuberance. And the project gave me focus and purpose at a time of great uncertainty.”

April 7

NEW YORK CITY

# 597

The daily COVID-19 death toll in New York City, recorded on April 7, marks the city’s deadliest day since the outbreak began. At NYU Langone Health, over 900 patients will have succumbed to the virus by the end of May. “Normally during this period, the number of deaths at our hospitals would have been around 50,” says Andrew Brotman, MD, chief clinical officer. “It was just astounding to everybody.” Mark Nunnally, MD, director of adult critical care services, says he admires his colleagues for the strength they mustered to cope with so much loss. “We ended up bending but not breaking,” he says. “But you do get the sense that each of us is going to be just a little bit different afterward.”



“

**I said to myself, ‘If I’m going to spend the next couple of weeks in isolation, how can I fix this?’”**

**Katherine Hochman, MD**

DIRECTOR, HOSPITALIST PROGRAM  
AT TISCH HOSPITAL, AND ASSOCIATE  
CHAIR FOR QUALITY OF CARE

April 7

MANHATTAN,  
NYU LANGONE  
HEALTH



## Surge Units on Steroids

As COVID-19 strikes New York City with full force, NYU Langone Health elevates its institutional response level, expanding surge spaces, redeploying staff, and marshaling resources to care for a heavy influx of acutely ill patients. “Level 3 is when our surge units are open. Level 4 is when our surge units are full. This period was like Level 3 on steroids,” explains Michael Phillips, MD, chief hospital epidemiologist. Several years ago, Dr. Phillips, director of infection prevention and control, devised the levels as part of a four-tiered structure intended to help the community understand how an outbreak is affecting NYU Langone and how the institution is responding (see page 13).

The rapid growth in the number of acutely ill patients meant that some nurses received just-in-time training before being reassigned to acute-care units. “The nurses were true heroes through all of this,” says Dr. Phillips. “They were spending the most amount of time with patients—in close contact—when there was so much uncertainty about infection. They were remarkable.”

NYU Langone never had to declare Level 4 status, Dr. Phillips explains, because leadership was able to keep creating units and adding beds above and beyond its base volume. “The fact that all of our hospitals are essentially one enabled us to respond in a very organized way across the entire system,” he says. “The Kimmel Pavilion was a particular asset because it was designed for a pandemic like this one, and it performed magnificently. We will forever be thinking about spaces and what sorts of engineering controls can we put in place for patient safety—features that may not yet appear in building codes, but they save lives.”



April 8

MANHATTAN  
TISCH HOSPITAL

# Life after Life Support

NYU Langone's success in treating dire cases of COVID-19 with a last-resort intervention rewrites the rules.

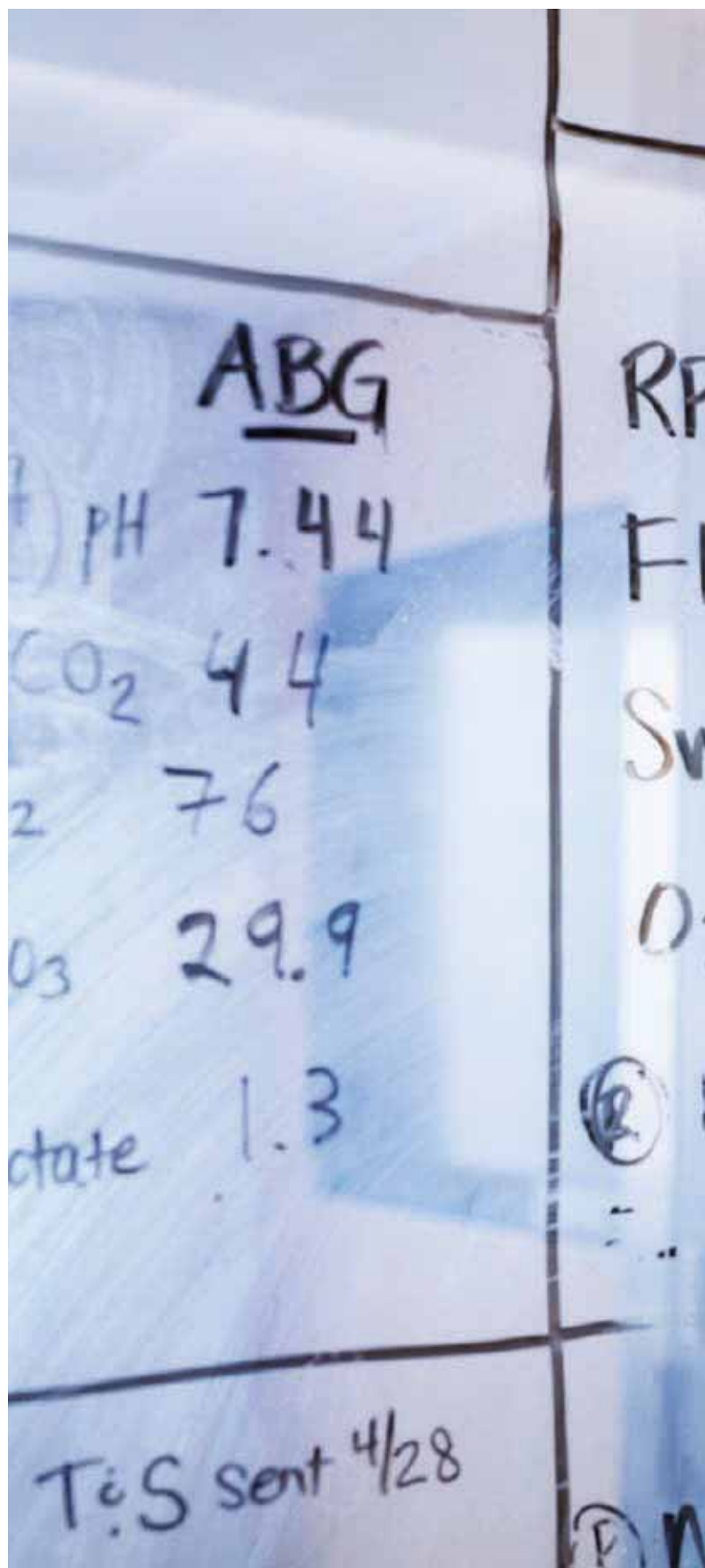
Today, Brian Hamdan, an 18-year-old high-school senior from Bronxville, NY, heads home after spending nearly a month in an intensive care unit at Tisch Hospital. Hamdan's recovery has been nearly as swift as his decline one month earlier from coronavirus. At one point, Hamdan's lungs were so ravaged by inflammation that they were unable to absorb the oxygen flowing from a ventilator, even when it was dialed to the highest settings. As his carbon dioxide levels began to spike, his doctors intervened early with a form of life support that does what the lungs no longer can: pumps oxygen into the blood while filtering out the excess CO<sub>2</sub>. The technique, a form of extracorporeal membrane oxygenation, or ECMO, serves as a mechanical gas exchanger, allowing the ventilator to be dialed down to a gentle setting so the lungs can heal.

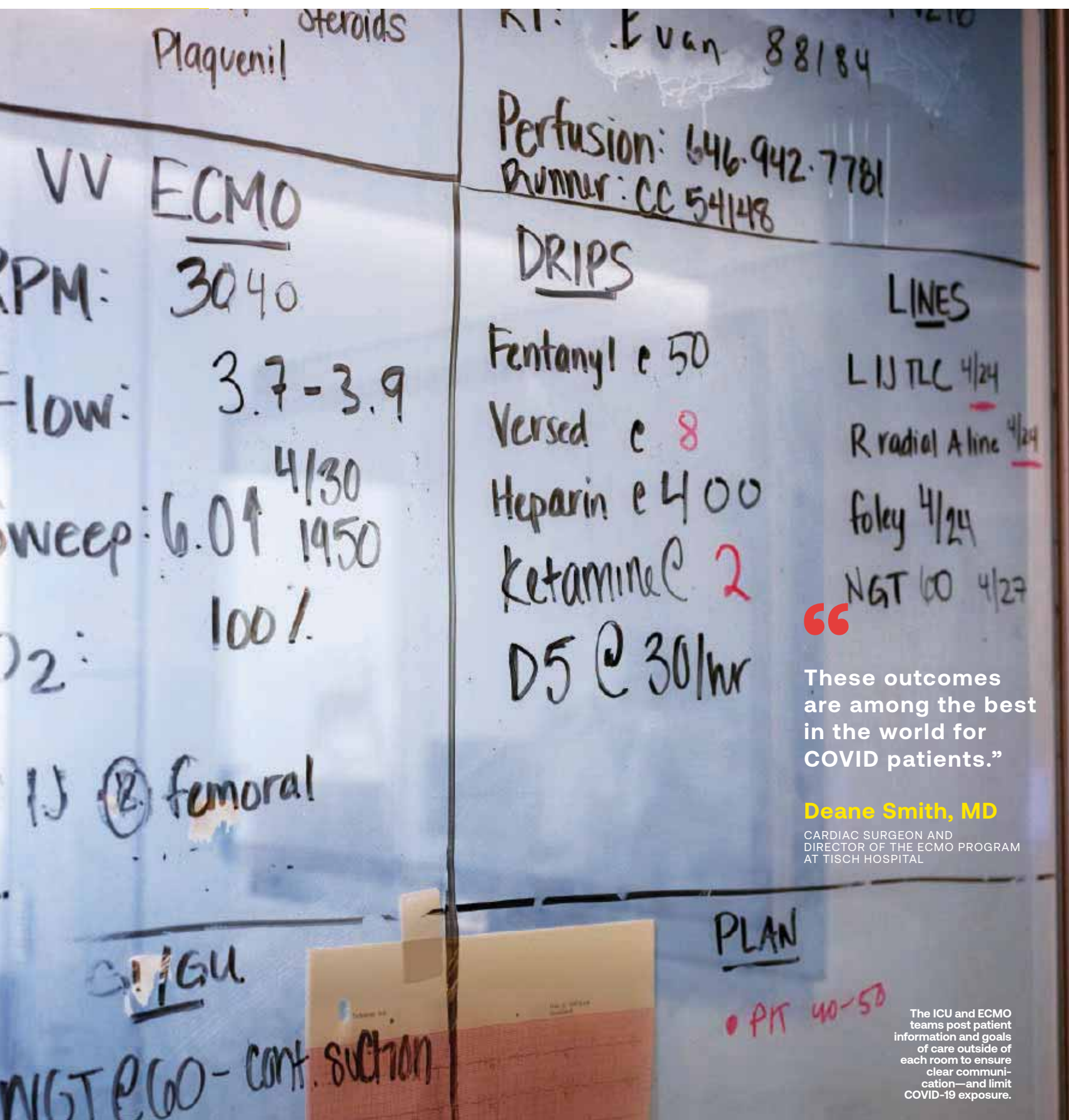
While ECMO was used with some success in 2009 to treat severe cases of H1N1, data on its usage in COVID-19 patients has been sparse, and mostly discouraging. One study of 17 patients reported a mortality rate of 94%. In stark contrast, NYU Langone's rate is under 4%, thanks in part to a multidisciplinary approach that favors early intervention. "The longer you're on a ventilator before ECMO, the worse the outcome," says cardiothoracic surgeon Zachery Kon, MD, surgical director of NYU Langone's Lung Transplantation Program. "The earlier we get to a patient, the better. Minimizing injury to the lungs from the ventilator is important."

Under ordinary circumstances, the ECMO team in Manhattan performs more than 80 procedures a year. About half of those are for patients with severe lung conditions. By mid-June, the team had already placed 30 COVID-19 patients on ECMO. Twenty-one patients had improved enough to come off the machine, and all but two patients have survived. What's more, none of the clinical staff developed symptoms or tested positive for COVID-19. "These outcomes are among the best in the world for COVID patients," says cardiac surgeon Deane Smith, MD, director of the ECMO Program at Tisch Hospital.

The ideal candidate, NYU Langone experts have found, has failed to respond to the ventilator and would stand a good chance of surviving if their lungs had time to heal. This often means younger patients whose organs remain healthy.

Taking the ECMO approach one step further, NYU Langone physicians have begun using the machine to filter out





“

These outcomes  
are among the best  
in the world for  
COVID patients.”

**Deane Smith, MD**

CARDIAC SURGEON AND  
DIRECTOR OF THE ECMO PROGRAM  
AT TISCH HOSPITAL

PLAN

• PIT 40-50

The ICU and ECMO  
teams post patient  
information and goals  
of care outside of  
each room to ensure  
clear communi-  
cation—and limit  
COVID-19 exposure.





Nurse practitioner Sarah Buckley reports on a patient on ECMO during morning rounds.



Bridget Toy, the program manager of ECMO & mechanical circulatory support, and Amy Emmarco, a mechanical circulatory support clinical resource nurse, trained 145 nurses in caring for patients on ECMO during the pandemic.

the cytokine proteins floating in blood that may spark an immune attack known as a “cytokine storm.” The filter has been used with some success to treat sepsis, but little is known about its potential benefits to COVID-19 patients. Nader Moazami, MD, surgical director of the Heart Transplant Program, received emergency clearance from the FDA to add an in-line filtration system to the ECMO machines at NYU Langone. He is collaborating with cardiothoracic surgeon Harvey Pass, MD,

to evaluate the cytokines associated with COVID-19 and to study gene expression in ECMO patients.

“This type of aggressive clinical approach, combined with sophisticated scientific analysis, can only be done in a major academic medical center,” notes Aubrey Galloway, MD, chair of the Department of Cardiothoracic Surgery. “Our team feels our current approach will have a real benefit for our patients—and we aim to have the scientific evidence to back it up.”

April 8

MANHATTAN  
TISCH HOSPITAL

First Person

## I Watched My 18-Year-Old Son Fight for His Life against COVID—via FaceTime

Today is the best day of the worst month in Brian Hamdan's life. After nearly a month in an intensive care unit at Tisch Hospital, the 18-year-old is finally going home to his family in Bronxville, New York. Here, Brian's mother, Teresa, shares what it was like to try to help her son battle a deadly case of COVID-19 from afar.

Before Brian got COVID, he was a healthy, busy high school senior. He was president of the student council, president of the honor society, very active in the drama club. He played on the national baseball team. To see him so sick with all of those tubes draped across his body was extremely hard. But the hardest part was not being able to be with him in the hospital. We received updates from Dr. Phyllis Kwok, our internist at NYU Langone Medical Associates in Bronxville, as well as the nurses and doctors at the hospital. Everyone was so gracious and helpful under pressure. But not being able to be there because of the virus made it so much more difficult.

When he was first put on the ventilator, it was such an effort for him to talk. He was so out of it. Then he received the tracheostomy, which connected the ventilator to a hole in his neck instead of a breathing tube that ran down his throat. That really helped him feel more comfortable. He called me and he just started talking. He had a big smile on his face. I said, “Brian, you're talking, I can't believe it! This is great!” He was so thirsty for a glass of ice water, so when they brought him a cup he got really emotional. He took a sip, and he was just really—I've never seen him like that. The emotion. Then they gave him applesauce, and he said,

“Mom, I’m eating applesauce! Can you believe it?” He was nearly in tears. Everyone was—even the nurse. He was so jubilant about these little victories.

But we had to get over quite a few bumps where he was just terrified, honestly. Who wouldn’t be? When his carbon dioxide levels began to spike, the doctor said he would go into cardiac arrest if we didn’t put him on a type of life support that would oxygenate his blood and remove the excess carbon dioxide. We made that decision fast.

I remember one night when Brian called me over video in a panic. I could see the fear in his eyes. He said, “Mom, I’m going to die.” I said, “No, you’re not. Where are you getting that from?” He said, “Everyone is dying all around me.” I said, “Well, you’re not everyone. First of all, you’re very young, you’re very strong. So that’s not you. Secondly, you have hundreds of people praying for you around the world. We’ll keep praying. You keep fighting.

Here’s my 18-year-old kid and I couldn’t even be there with him. I’d stayed on the phone just to be there with him even if he didn’t want to talk. One night, I drove to the hospital around 1:00 a.m. and sat in the lobby. I called Brian and I said, “I’m here. I can’t go up to the floor, but I’m going to sit here.” I needed to be near people who could get answers quickly if we needed them. But I really just wanted to give Brian assurance that I was physically nearby. I stayed until 8:00 a.m.

My husband and I were always nervous when the doctor called. Was it going to be good or bad news? When he called very early one morning, we braced ourselves. But I could hear something different in his voice. He said Brian’s numbers were phenomenal. Perfect, in fact. His chest X-ray was completely normal. We could tell the doctor was blown away—and so were we. Brian wouldn’t have made it without the life support and his phenomenal medical team. But it wasn’t just that. He has a will like nobody I know, and it really helped save his life.



ECMO circuits like this one helped Brian Hamdan recover from COVID-19.

## The ECMO Army

While the cost of an extracorporeal membrane oxygenation machine is only slightly more than a ventilator, the vast expertise and support staff required to operate it is beyond reach for many hospitals. In addition to physicians, ECMO patients require extensive monitoring by perfusionists, respiratory therapists, and critical care nurses. Here’s a look at a typical ECMO team.

### BEFORE THE PROCEDURE

- ▶ 1 Critical care specialist (intensivist), who evaluates the patient as a candidate for ECMO

### DURING THE PROCEDURE

- ▶ 2 Cardiothoracic surgeons (to reduce the amount of time each of them needs to stay in the room, one inserts a cannula into the right femoral vein while the other inserts a cannula into the right jugular vein)
- ▶ 1 cardiothoracic fellow, who assists the cardiothoracic surgeons
- ▶ 1 perfusionist, who operates the ECMO machine, troubleshoots mechanical problems, and manages titration, adjusting the flow (rate) and sweep (gas exchange)

### AFTER THE PROCEDURE

- ▶ 1 bedside critical care nurse with special training in ECMO, who manages the medications and alerts the perfusionist as needed
- ▶ Nurse practitioners and physician assistants, who circulate, helping to manage patient care



JAN

April 11

MANHATTAN, BROOKLYN  
& LONG ISLANDStay home if  
possible, even if  
you are healthy.

Visit nyc.gov for more info

Fast COVID-  
19 testing  
results help  
frontline  
workers stay  
on duty.

## Now Serving New York's Finest and Bravest

The novel coronavirus hits New York City's first responders especially hard. Even as much of the city shelters in place, police officers are exposed as they patrol the streets, while firefighters serve as medical responders as 911 calls break records. Both forces pay the price: 6,000 members of the NYPD and more than 2,800 members of the FDNY—one-sixth of each department—have called in sick, and more than 30 policemen have died from COVID-19. In response, NYU Langone Health opens its testing centers in Manhattan, Brooklyn, and Long Island to New York City police sergeants and firefighters who have been on medical leave due to COVID-19 symptoms or exposure. The results arrive within 24 hours. "If they have a negative diagnosis and are ready and waiting to return to work, we can help them get back to the front lines sooner," says Nicole Dittmar, assistant vice president for ambulatory care and optimization.

“

**If they have a negative diagnosis and are ready and waiting to return to work, we can help them get back to the front lines sooner.”**

**Nicole Dittmar**

ASSISTANT VICE PRESIDENT FOR AMBULATORY  
CARE AND OPTIMIZATION

April 11

UNITED STATES

## US Passes Italy in Deaths

The death toll in the US reaches 20,506, surpassing Italy as the country with the most coronavirus fatalities. New York City bears the brunt of this dire milestone with daily death tolls approaching 800. "We kept wondering when it would stop," says Jacqueline Nuñez, a nurse in NYU Langone's Department of Emergency Medicine. "I've been a nurse for 11 years, and I've seen a lot of sad things. But this is by far the saddest."

April 13

MANHATTAN,  
KIMMEL PAVILION

# Ground Zero: The Lungs

Thoracic surgeons and pulmonologists play a vital role in caring for patients with COVID-19 on ventilators.

By the second week of April, the number of critically ill patients with COVID-19 at NYU Langone Health reaches its peak. Among those in the first row of the front lines are the pulmonologists and thoracic surgeons, who perform bold interventions to help patients in severe respiratory distress. “They implemented several key clinical strategies that greatly improved outcomes,” notes Aubrey Galloway, MD, the Seymour Cohn Professor of Cardiothoracic Surgery and chair of the Department of Cardiothoracic Surgery.

One important contribution was an innovation that sprang from Luis Angel, MD, an interventional pulmonologist who is medical director of lung transplantation, and Zachary Kon, MD, a cardiothoracic surgeon who is surgical director of lung transplantation. Most patients with COVID-19 who were admitted to NYU Langone’s intensive care units were placed on mechanical ventilation. To say that experience is unpleasant is an understatement. First, the hookup requires the insertion of a breathing tube snaked down the patient’s throat, which is anchored inside by an inflatable cuff. The choking sensation is so strong that patients require heavy sedation to prevent them from yanking the tube out.

Complicating matters, some COVID-19 patients require ventilation for weeks. In these cases, doctors would typically recommend a tracheostomy to connect the ventilator tubing to a surgically created opening in the windpipe, bypassing the mouth and throat. This configuration is far more comfortable for the patient and requires less sedation but unfortunately isn’t an option for critically ill COVID-19 patients who cannot be easily moved to an operating room.

The alternative is a bedside procedure known as a percutaneous tracheostomy, in which tubing is inserted through a small puncture at the base of the neck—no surgery required. But even this minimally invasive innovation has raised red flags among pulmonologists because it creates aerosolized spray that can infect healthcare workers.

Enter Dr. Angel’s ingenious workaround. The dangerous spray results when doctors snake a camera down the breathing tube to guide them during the procedure. To make room for the camera, they traditionally deflate the cuff that holds the tube in place—a move that permits infectious aerosolized droplets to escape. “Instead of placing the bronchoscope inside the breathing tube, I go alongside it,” Dr. Angel explains. “That way, the cuff is always inflated and nothing is aerosolized.” This variation on percutaneous tracheostomy has been performed successfully on more than 200 patients and has become the institution’s new standard of care for intubated patients.

Another example of the exceptional care NYU Langone has provided to patients with COVID-19 is the contributions of its thoracic surgeons, led by Michael Zervos, MD, chief of the thoracic surgery service at Tisch Hospital and Kimmel Pavilion, who collaborated with colleague Costas Bizakis, MD. COVID-19 can trigger a severe inflammatory response that fills the lungs with thick, tenacious secretions that often obstruct the airway, leading to oxygen deficiency. To remove these fluids, Dr. Zervos and his team performed frequent “toilet bronchoscopies” on patients on ventilators, some intubated and others having had percutaneous tracheostomies. A bronchoscopy involves inserting a long scope into the lungs to suction out

sputum, essentially unclogging them. The procedure, Dr. Zervos explains, improves oxygenation and helps prevent bacterial infections.

While bronchoscopy provides immediate and potentially lifesaving relief for patients with COVID-19, the procedure poses the threat of viral transmission to the doctors who perform it. Nevertheless, Dr. Zervos and his team accepted the risks because they believed that the benefits for patients are so vital. To lessen the potential for harm, however, they practiced a rigorous protocol, developed with input from Robert J. Cerfolio, MD, MBA, director of clinical thoracic surgery and chief of hospital operations. “We believe they have a positive impact in outcomes,” says Dr. Zervos, “and we’ve developed a good strategy to mitigate the possibility of viral spread.”

“Dr. Angel and Dr. Zervos had an all-in mentality,” says Mark Nunnally, MD, director of adult critical care services. “That level of dedication and inspiration got us through the darkest days.”

**Robert J. Cerfolio,**  
MD, director of  
clinical thoracic  
surgery and chief of  
hospital operations





April 17

ALBANY, NEW YORK  
THE "RED ROOM,"  
NEW YORK  
STATE CAPITOL  
BUILDING

## Cuomo: Just Wear the Mask



Four weeks after instructing residents to stay home as much as possible, Governor Andrew Cuomo goes one step further, requiring New Yorkers to wear masks in public when social distancing of at least six feet cannot be maintained. The executive order marks a 180° turn from longstanding advice from many public health experts who advised that the general public not wear masks.

"Early on, we were saying, 'No, you don't have to wear masks,' but now we realize what an important public safety measure they have been," says Michael Phillips, MD, NYU Langone's chief hospital epidemiologist. "Covering your mouth and nose in public has made a big difference in containing the virus."

“

**Each of you, no matter what your role in the hospital or the health system, has made an incredible impact on saving lives. Your compassion, empathy, and professionalism are exemplary.”**

**Bret J. Rudy, MD**

CHIEF OF HOSPITAL OPERATIONS,  
NYU LANGONE HOSPITAL-BROOKLYN

April 21

MINEOLA, NEW YORK NEONATAL INTENSIVE CARE UNIT, NYU WINTHROP HOSPITAL

First Person

## I Gave Birth While Sick with COVID

**It is a happy day at the hospital. Less than seven weeks after admitting its first patient with COVID-19, followed by an explosion of cases, NYU Winthrop sends home its 750th recovered patient—Deborah Priester, a 69-year-old grandmother. Hundreds of staff members line the hallways, holding balloons and cheering the milestone. Meanwhile, another celebratory event takes place with a bit less hoopla but no less joy. Adriana Torres, 41, who had an emergency C-section two weeks earlier while in a medically induced coma due to severe respiratory distress, finally gets to hold her baby, Leah. She recounts her story.**

My first visit to the Emergency Department at NYU Winthrop in late March was precautionary. I felt under the weather but had no fever or cough, so I figured it was probably seasonal allergies. The positive COVID-19 test said otherwise. Since my symptoms were mild, the doctor sent me home to recover.

A week later, I was in bad shape, with chills, body aches, and a horrific cough. I started having trouble breathing, and my boyfriend called for an ambulance. I was given oxygen and admitted right away. That was on a Sunday evening. I have no memory of the next five days. Patricia Rekawek, MD, the maternal-fetal doctor who cared for me, says my oxygen level plummeted, and I was transferred to the ICU, sedated, and intubated. The baby wasn't due for 11 weeks, but I was gravely sick, so the doctors decided a C-section was the best option. They delivered Leah at 29 weeks on April 8, weighing about three pounds. Leah went to the neonatal intensive care unit. I returned to the ICU.

Leah progressed remarkably well, coming off the ventilator within two days. I got better, too. Doctors lowered my sedation, and on April 11, the day after my 41st birthday, I pulled the tube out of my throat and woke up, confused and disoriented. A translator explained in Spanish what had happened (I'm from Colombia, though I've lived on Long Island for seven years). Once I calmed down, I felt nothing but deep gratitude to the doctors for saving both our lives.

Dr. Martin Chavez, the director of maternal and fetal medicine, gave me regular updates on Leah. He even shared a video of her. That was powerful medicine, motivating me to get stronger and see her in person. The first time, I could only look through the glass. Finally, on April 21, three days after I was discharged, I got to hold my child. I wept. There's no describing our magical bond.

Leah now weighs five pounds and has taken over our lives. She's a demanding, impatient infant—and I don't mind one bit. To be with her, to watch her growing, means everything to me. God gave us both a second chance.





Adriana Torres cradles her newborn, Leah, for the first time, two weeks after having a C-section while in a coma with COVID-19.



JAN

April 27

NYU LANGONE  
ALL LOCATIONS



## Alert Status Drops

About a month after Governor Andrew Cuomo shuts down all nonessential businesses and orders private-sector employees to work from home, the number of coronavirus patients admitted to NYU Langone finally begins to subside. The downturn comes just in time, as only two weeks earlier the institution's intensive care units were close to capacity. With its case load lightening, NYU Langone reopens some non-COVID-19 ICU and surgical acute units. In an enterprise-wide email, Bret Rudy, MD, chief of hospital operations at NYU Langone Hospital-Brooklyn, welcomes the trend but warns against complacency. "While our numbers have decreased," he writes, "we must not falter in our vigilance to keep both our patients and our staff safe."

FEB

MAR

APR

MAY

April 28

UNITED STATES

This transmission electron microscope image shows novel coronavirus particles emerging from the surface of cells. The crownlike spikes on the outer edge of the virus give coronaviruses their name.





IMAGE POINT FR - LPN/BSIP/UNIVERSAL IMAGES GROUP VIA GETTY IMAGES; RIGHT, © 2020 EPIC SYSTEMS CORPORATION

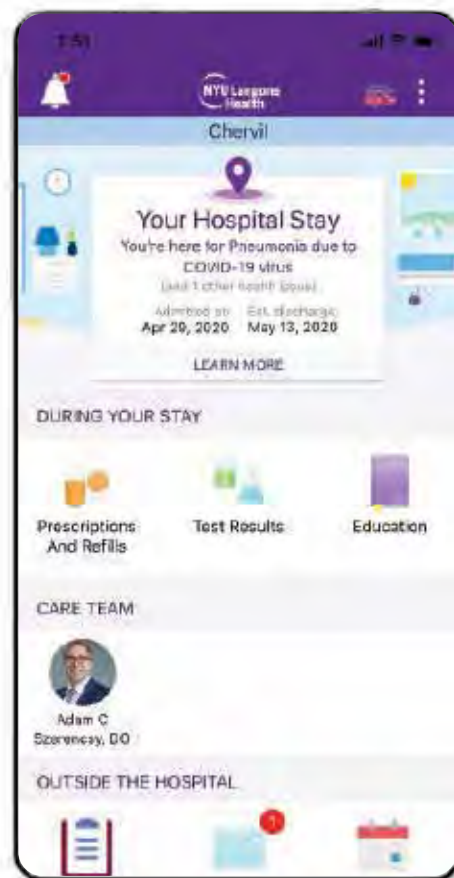
# 1 Million Cases in America

Within three months of the first confirmed case in the US, the number of Americans who test positive for coronavirus tops 1 million. The death toll pushes close to 60,000, surpassing the number of American lives lost during nine years of the Vietnam War. The CDC, meanwhile, expands its list of symptoms associated with COVID-19 from just fever, cough, and shortness of breath to include chills, muscle pain, sore throat, and loss of taste or smell.

April 29

NYU LANGONE HEALTH  
ALL LOCATIONS

## Staying in Touch When Touch Isn't an Option



On April 29, NYU Langone Health introduces MyChart Bedside Mobile, a new feature on the NYU Langone Health app that helps patients and their families stay connected while COVID-19 restricts visitors to the hospital or Emergency Department. Bedside Mobile, which becomes active upon admission, enables patients to designate a family member or loved one to receive real-time information electronically about their clinical status and care plan, including medications, test results, and messaging. The tool was developed prior to the pandemic, but its rollout was expedited to ensure that physical separation wouldn't hinder communication with at-home caregivers. "With the swipe of a finger, the patient can not only view information during the admission phase, but also activate the Share My Records option before arriving at the hospital," notes Paul Testa, MD, assistant professor of emergency medicine and chief medical information officer.



JAN

FEB

MAR

APR

MAY

Terance Moran, 84, a retired NYU professor, leaves NYU Langone Orthopedic Hospital; opposite page, staff at NYU Langone Hospital—Brooklyn watch as patient number 850 is discharged.

April 29

NYU LANGONE HEALTH

# 5,444 Celebrations— and Counting

At NYU Langone, a ritual of cheering recovered patients on their way home boosts spirits.

Hospital discharges are generally happy occasions, but they take on special significance during the pandemic—and not only for patients and their loved ones. For hospital staff, cheering recovered patients as they are wheeled out the door provides a much-needed release from the long hours and the emotional toll of the virus. Beyond this, it is proof positive that our extraordinary efforts have not been in vain: as of today, 85% of all admitted patients have been successfully discharged—a total of 5,444, and counting.

Staff members establish a ritual of cheering for every discharge, while each inpatient facility arranges a larger send-off linked to a milestone number. On April 29, Lois Yang, 72, a grandmother of two, who had respiratory symptoms and a fever for more than three weeks, becomes the 1,000th patient discharged from the main campus, escorted by dozens of clapping caregivers. A week earlier, hundreds of NYU Winthrop Hospital staffers convened for patient number 750, Deborah Priester, 69, a grandmother of eight. “We had no idea how many people would attend,” says Marc Adler, MD, chief medical officer at NYU Winthrop. “After being a hot spot area for COVID-19, it was important to show that we were making headway.”

The sentiment is similar at NYU Langone Hospital–Brooklyn, which hails discharge number 850, Maria Rodriguez, 87, on May 7. Along with hospital leadership and a boisterous crowd, Rodriguez is joined by her grandson Octavio Vargas, Jr., who works in Building Services. “This is a proud moment for all of the heroes who work here,” says Frank Volpicelli, MD, the hospital’s chief of medicine. Three weeks later, employees of NYU Langone Orthopedic Hospital, which has served a vital role in caring for convalescing patients with COVID-19, says a fond farewell to patient number 425, 84-year-old Terence Moran, a professor emeritus of media ecology at NYU. Moran has survived intubation, a percutaneous tracheostomy, and the long road back to reunite with his wife and daughter. “He was a US Marine, and that’s probably the reason he was able to fight the battle and win the war,” says David Dibner, senior vice president of NYU Langone Orthopedic Hospital, Musculoskeletal, and Rusk Rehabilitation. “He is a very endearing guy. The staff liked him a lot, and he worked hard.” Without a doubt, Moran’s discharge, like 5,443 others, is cause for celebration.



RIGHT: IVAN DOMINGUEZ



JAN

FEB

MAR

APR

MAY



CLOCKWISE FROM FAR RIGHT: IVAN DOMINGUEZ (2), ANDREW NEARY, IVAN DOMINGUEZ, ANDREW NEARY





Clockwise from far left: Maria Rodriguez, 87, leaves NYU Langone Hospital–Brooklyn; staff await discharge number 1,000; Deborah Priester, 69, leaves NYU Winthrop Hospital amid celebrating staffers; NYU Winthrop staff hold numbered cards symbolizing other patient discharges; Lois Yang, 72, is the 1,000th main campus discharge.





JAN

FEB

MAR

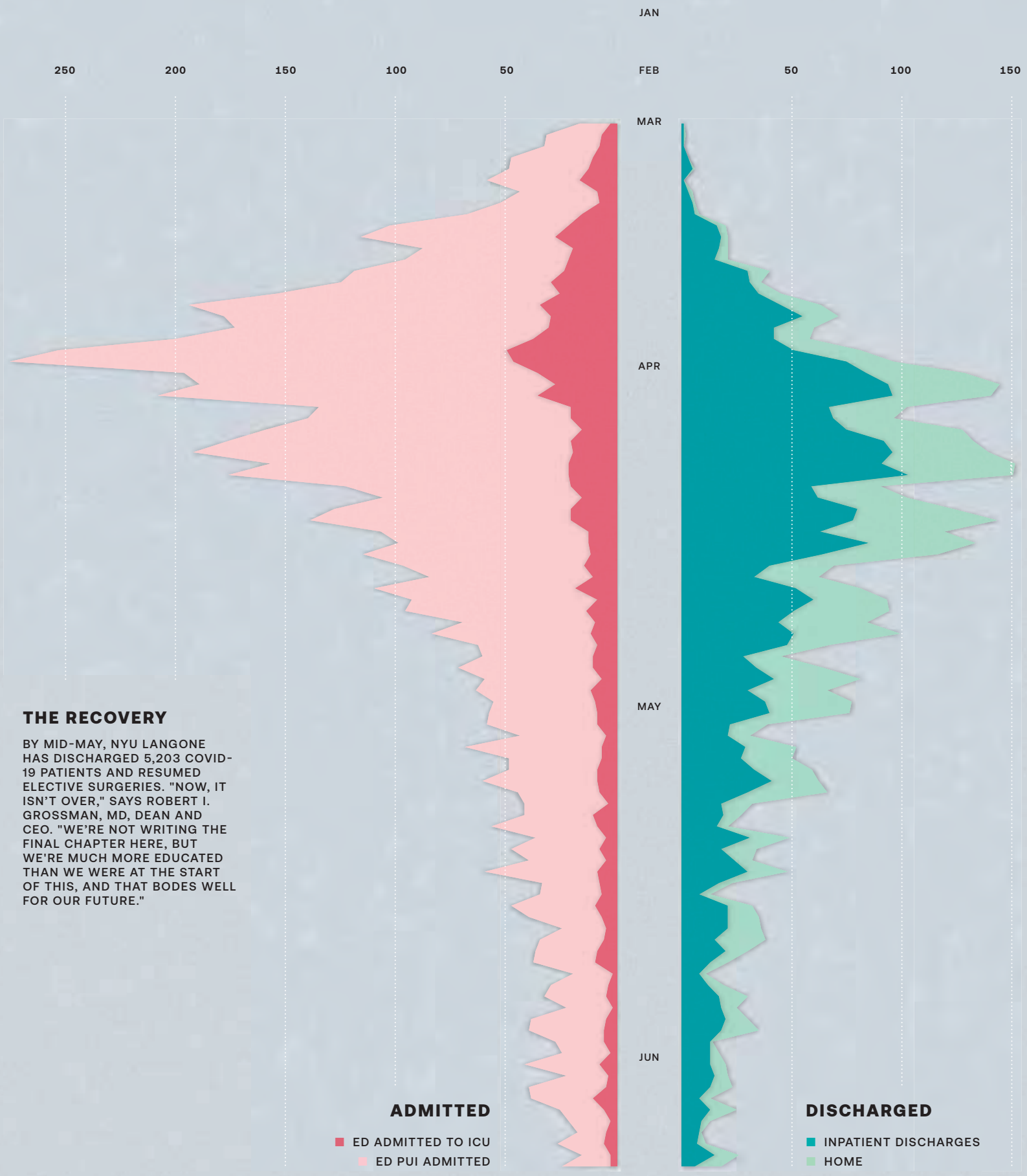
APR

MAY

**“As we deal with the acute uncertainty  
of these times, let’s not forget the critical role that  
incertitude often plays in driving progress.”**

**DAFNA BAR-SAGI, PHD**  
EXECUTIVE VICE PRESIDENT AND VICE DEAN FOR SCIENCE,  
CHIEF SCIENTIFIC OFFICER

# May



**THE RECOVERY**

BY MID-MAY, NYU LANGONE HAS DISCHARGED 5,203 COVID-19 PATIENTS AND RESUMED ELECTIVE SURGERIES. "NOW, IT ISN'T OVER," SAYS ROBERT I. GROSSMAN, MD, DEAN AND CEO. "WE'RE NOT WRITING THE FINAL CHAPTER HERE, BUT WE'RE MUCH MORE EDUCATED THAN WE WERE AT THE START OF THIS, AND THAT BODES WELL FOR OUR FUTURE."



May 4

MANHATTAN  
SCIENCE BUILDING

FEB

MAR

APR

MAY

# The Race for a COVID-19 Vaccine Begins Here

In the nation's early epicenter of the pandemic, NYU Langone Health's Vaccine Center leads an unprecedented global hunt for a vaccine.

When Mark J. Mulligan, MD, was recruited to NYU Langone Health in late 2018, his priority was to establish a formal center for the investigation of new vaccines. Dr. Mulligan had earned a national reputation at Emory University in Atlanta for running clinical trials of new therapies to inoculate against a host of infectious diseases, and at NYU Langone, he had planned to enlist the institution in a national effort to find a universal flu vaccine. The first step was a big one: applying for a grant from the National Institute of Allergy and Infectious Diseases to join its elite network of Vaccine and Treatment Evaluation Units, or VTEUs.

Since 1962, VTEUs have helped the nation roll out new vaccines quickly and safely. "It's the premier network for infectious disease clinical research funded by the government," explains Dr. Mulligan, the Thomas S. Murphy, Sr., Professor of Medicine and director of the Division of Infectious Diseases and Immunology. "It's viewed as a national resource for preparedness and responsiveness to infectious diseases."

But with only 10 sites in the nationwide network, winning a spot on the roster is highly competitive, and NYU Langone's leadership understood that it could take years to strengthen the institution's candidacy. "We recruited Dr. Mulligan with the idea of establishing a vaccine center, but our plans were two to three years out," says Dafna Bar-Sagi, PhD, executive vice president and vice dean for science, and chief scientific officer. "We were confident but ours was a long-term strategy."

Then, the pandemic hit, and ev-

erything changed. In April, with New York City under siege, NYU Langone's application to the VTEU was green-lit, and virtually overnight, it was catapulted to the forefront of a global race for a COVID-19 vaccine. With hospitals in Manhattan, Brooklyn, and Long Island, NYU Langone was well positioned to recruit a steady stream of diverse, healthy people from across the New York metropolitan area to test new vaccine candidates. The center, now the only VTEU in New York City, quickly built out trial facilities in all three locations, hiring a small army of specialized nurses and administrators to help run trials for two high-profile candidates. By early May, the first volunteers were rolling up their sleeves.

One leading trial is a partnership with the pharmaceutical company AstraZeneca and Oxford University in the United Kingdom. Their candidate, AZD1222, is based on a component of the coronavirus, known as the spike protein, that gives the virus its crown-like outer covering. Researchers believe the spike protein binds to susceptible human cells during the initial phase of infection. Based on a phase I clinical trial suggesting that AZD1222 is safe and can spur a protective immune response against the virus, the Vaccine Center began enrolling the first volunteers in September as part of a massive phase 3 trial aimed at answering the ultimate question: Does the vaccine protect against COVID-19. "It's a huge effort," Dr. Mulligan says.

A separate collaboration with pharmaceutical company Pfizer and German biotech firm BioNTech has helped advance another promising candidate,

called BNT162b2. The experimental vaccine includes an RNA-based genetic template that also encodes the coronavirus spike protein. Based on the success of the phase I trial, partly conducted at the center, NYU Langone is now vaccinating healthy New Yorkers as part of a final phase III trial that aims to enroll 30,000 healthy volunteers.

The clinical trials, Dr. Mulligan emphasizes, demonstrate NYU Langone's commitment to reducing the health-care disparities that have contributed to a disproportionately heavy toll on some underserved communities. "We're making strong efforts to enroll people with higher than average risk for COVID-19 infection, which means racial and ethnic minorities, frontline workers, first responders, and essential workers who couldn't stay home when many people did," he says. "We're also enrolling those who are at risk for the highest levels of complications, such as older adults and those with chronic conditions."

The trials have demonstrated uncommon agility, as well. "We went from zero to 60 in seconds," says Dr. Bar-Sagi, the Saul J. Farber Professor of Biochemistry and Molecular Pharmacology. "Research, IT, Human Resources, Real Estate Development and Facilities, Communications, and Marketing—everyone came together to get these trials up and running. The collaboration has been simply amazing."



READY TO ROLL UP YOUR SLEEVE AND JOIN A COVID-19 VACCINE TRIAL? LEARN MORE: [IS.GD/NYUCOVIDVACCINETRIAL](https://is.gd/NYUCOVIDVACCINETRIAL)



“

Our infrastructure has been absolutely essential in allowing us to be on the cutting edge, and be a part of important national research in response to this pandemic.”

**Mark Mulligan, MD**

DIRECTOR, NYU LANGONE HEALTH'S  
VACCINE CENTER



May 4

NEW YORK  
NYU LANGONE HEALTH

The COVID-19 testing team at the main campus.

May 7

TRISTATE AREA  
NYU LANGONE HEALTH

## What Goes Up Must Come Down

Despite a slight increase in overall patient volume at the main campus in Manhattan, fewer than 100 patients with COVID-19 occupy the ICUs—less than half the number at the peak of the outbreak. Considering that 20% of the patients who visit the Emergency Department are admitted to an ICU, it's welcome news. Every day, fewer patients require ventilators. "We saw many patients spend weeks on a ventilator," says Mark Nunnally, MD, director of adult critical care services. "Remarkably, some recovered enough to come off and begin the process of healing."

## Back in Business

NYU Langone resumes medically urgent and necessary surgical procedures, with preoperative COVID-19 testing to be performed on all surgical patients. It also notifies its 1.4 million patients that in-person physician visits are now available at consolidated Faculty Group Practice locations, or "hubs." By June 8, when New York City green-lights all elective and ambulatory surgeries, NYU Langone's caseload has rebounded to 75–80% for surgery and 90% for ambulatory surgery.

With up to 80% of NYU Langone's surgeries performed on an ambulatory basis, NYU Langone considers a different strategy in the event of a second wave. "We learned that elective cases don't require hospital beds," says Andrew Brotman, MD, executive vice president, vice dean for clinical affairs and strategy, chief clinical officer. "My hope is that if there's another surge, we won't need to shut down our surgical program again."

“

By June 8, when New York City green-lights all elective and ambulatory surgeries, NYU Langone's caseload has rebounded to 75–80% for surgery and 90% for ambulatory surgery.”

May 9

MANHATTAN  
HASSENFELD CHILDREN'S  
HOSPITAL

## The Kids Are (Mostly) Alright: A New Pediatric Syndrome Deepens the COVID-19 Mystery

If there has been one bit of good news about the pandemic, it's this: the novel coronavirus has largely spared children. Of the roughly 6,500 patients admitted to NYU Langone Health with COVID-19, less than 1% have been pediatric patients, says Jennifer Lighter, MD, a pediatric infectious disease expert and hospital epidemiologist at NYU Langone Health.

However, the virus's impact on children is called into question in early May, when doctors identify an odd and concerning syndrome: healthy kids suddenly develop a fever, a rash, swollen hands and feet, and abdominal pain. Blood tests reveal that the children have acute inflammation, in some cases affecting the heart muscle, a condition known as myocarditis. The illness bears similarities to Kawasaki disease, the leading cause of acquired heart disease in infants and young children in the US. Yet with 232 reported cases and two deaths in New York State, it turns out to be a unique condition and is closely connected to SARS-CoV-2, the virus that causes COVID-19.

"There are definitely Kawasaki-like aspects," says Adam Ratner, MD, the director of pediatric infectious diseases and a pediatrician at Hassenfeld Children's Hospital at NYU Langone. But while Kawasaki almost always affects children under age five, the new illness, now known as Multisystem Inflammatory Syndrome in Children, or MIS-C, skews older. Some 34 patients are diagnosed at NYU Langone between mid-April and mid-June—a time span during which the institution would typically see only two to four Kawasaki patients—and one-third are teenagers. "Adolescents and young adults with the syndrome tend to have a more severe course," says Dr. Lighter.



A paramedic carries a 10-month-old with a fever after arriving by ambulance to a Stamford, Connecticut, hospital.

More than half of the patients at NYU Langone with MIS-C test positive for COVID-19 antibodies, indicating that they've previously been infected. A majority, though, had such mild cases that their families didn't realize they had it. Doctors aren't sure why these children become so sick weeks after recovering from the virus, but there is a theory. Some patients who contract COVID-19 are prone to an extreme overreaction of the immune system, known as a cytokine storm, that causes the illness to become infinitely worse. A related response may be causing children's immune systems to go haywire. "As with COVID-19, there's still a lot we don't know about this rare syndrome or the cause," cautions Dr. Ratner.

Fortunately, NYU Langone has notable success treating patients with a regimen borrowed from the standard care for Kawasaki disease and designed

to tamp down the immune system. A mix of antibodies, known as immunoglobulin, delivered intravenously, in combination with steroids and aspirin, enables most affected children to convalesce within a week. Hassenfeld Children's Hospital supports their care by establishing a multidisciplinary clinic that combines pediatric experts in infectious disease, rheumatology, cardiology, dermatology, and hematology.

Cases of MIS-C in New York decline by June, but the syndrome soon pops up in other US COVID-19 hotspots, sparking concern that the inflammatory condition might resurface in concert with a second wave. While the pediatric team at Hassenfeld remains on guard, Dr. Ratner cautions parents not to panic. "The syndrome requires immediate medical evaluation and treatment," he says, "but with the right care, the children end up doing quite well."



JAN

May 11

BROOKLYN  
NYU LANGONE  
HOSPITAL—  
BROOKLYN

FEB

MAR

APR

MAY

First Person

# I Clean Hospital Rooms—and I Was on the Front Line, Too

**As a child growing up in Jamaica, Carol Flemming had one dream—to feel the satisfaction of taking care of people. Now a housekeeper at NYU Langone Hospital—Brooklyn, Flemming, 49, says she never imagined her dream would collide with a pandemic, but she’s grateful for the opportunity to help so many during a crisis. This is Carol’s story.**

I have never experienced anything like it. Ever. It was a different world. Everyone wrapped up in their masks, goggles, and gowns, so you couldn’t recognize anyone. It was so busy. Everything happened in seconds. One after the next. It was so powerful. You know, some of my coworkers couldn’t take it. But I stayed until the end.

I don’t know why, but I was never scared. That’s why they put me in the belly of it—I was in the Emergency Department. Thankfully I never got sick.

When you go into the room to clean, you say, “Good morning. How are you doing?” You remove the garbage, wipe everything, mop the floor. What touched me the most was seeing patients all alone, no family, nobody to hold their hand. You see them struggling to breathe. You tell them, “Please feel better.” Sometimes, you go for lunch, and you come back, and they are no longer there. That hurts. We lost so many people. It makes you appreciate life so much more.

Everyone says, “We want to thank the first responders and the nurses and the doctors.” Why did they never say, “We want to thank the building services, the housekeepers, the phlebotomists, the X-ray techs”? We were in the fight, too.

—AS TOLD TO AMY ENGELER



Carol Flemming using an atomized sprayer that charges particles in liquid disinfectants so that the droplets cling to surfaces and envelop an entire object.





JAN

May 13

MANHATTAN NYU LANGONE HEALTH  
DEPARTMENT OF RADIOLOGY

# The Truth about COVID Lung

FEB

MAR

APR

MAY

Confronted with an unfamiliar respiratory disease with unknown hallmarks, physicians have turned to their colleagues in radiology for clinical clues to help them diagnose and treat COVID-19. Early on, hazy areas of increased density, or ground-glass opacity, discernible on the X-rays or CT scans of some patients' lungs, caught the media's attention as being sufficient for diagnosing COVID-19. "But there are dozens of things that could cause such areas of inflammation, so it's not the basis for a diagnosis," notes William Moore, MD, chief of thoracic imaging in NYU Langone Health's Department of Radiology. Dr. Moore and his colleagues have found that patients with a ground-glass configuration may actually do better than those whose lungs have denser air spaces. "The central portion of the lungs shown in this 3-D rendering of a CT scan is densely consolidated," he notes, "suggesting a poor prognosis." More peripherally, Dr. Moore adds, there are rounded areas of ground-glass opacities. The more disease in the lower lobe, he explains, the worse the outcome may be because that's where most oxygenation occurs. "This kind of condition is something a radiologist might see once or twice in their career," says Dr. Moore. "Hopefully, we'll never see anything like it again."

PHOTO CREDIT

“

This kind of condition is something a radiologist might see once or twice in their career. Hopefully, we'll never see anything like it again.”

**William Moore, MD**

CHIEF OF THORACIC IMAGING

CINEMATIC RENDERING IMAGE COURTESY OF MATTHEW YOUNG, DO, CLINICAL ASSISTANT PROFESSOR OF RADIOLOGY; AP/KATHY WILLENS

May 17

NEW YORK STATE



A state-managed drive-thru testing site.

## A Test Worth Leaving Home For

Nearly three weeks after NYU Langone Health sets a record for the number of COVID-19 diagnostic tests it has performed in a single day—1,400—New York Governor Andrew Cuomo reports that by partnering with the federal government, the state is doubling its daily testing capacity to 40,000, with a total of more than 80,000 tests available when private labs are included. Though health officials have previously advised New Yorkers with mild or no symptoms to stay home rather than put themselves and others at risk, they are now encouraging people to get tested to help trace the virus and contain its spread. The governor explains that nasal swab, or PCR, tests are available at 700 drive-in and walk-in sites statewide to anyone with COVID-19 symptoms or who plans to return to their workplace in phase one of the state's reopening plan. In the weeks that follow, NYU Langone ramps up its own testing capacity, providing the service at its hospitals and some of its ambulatory sites.



**#NYU Langone started clinical trials for a COVID-19 vaccine. Learn more about developments in healthcare here:**  
<https://bit.ly/2WjmhgL>

**NYU Alumni@NYUAlumni**

MAY 10



May 18

MANHATTAN  
NYU LANGONE  
HEALTH

# The Safest Place to Be

By the time the surge of infections abates in New York City, COVID-19 has sparked so much terror that people stay home even when they shouldn't—in the midst of medical emergencies that threaten their lives. The CDC reports that in the 10 weeks after COVID-19 was declared a national emergency, visits to emergency departments nationwide declined by 20% for heart attack and stroke care and 10% for diabetic care. Between March 11 and May 2, New York City reported about 24,000 more deaths than usual during that period, and an estimated 20% of those mortalities were attributed to health issues unrelated to COVID-19.

The perception that visiting a hospital or doctor's office poses a greater hazard than a supermarket or pharmacy gives rise to a secondary crisis: people neglecting their medical care or ignoring urgent warning signs. Mental health professionals say that's just how the brain is wired. When we lack enough information to make plans or predictions confidently, anxiety can easily turn to dread. During the outbreak, emergency medicine physicians expected to see more heart attacks than usual, rather than fewer, due to intensified stress and the cardiac strain caused by COVID-19's pulmonary damage. Other kinds of medical emergencies were also dangerously downplayed by patients. "When somebody has lower abdominal pain, which is associated with appendicitis, they usually come in to be seen," says Andrew Brotman, MD, executive vice president, vice dean for clinical affairs and strategy, chief clinical officer. "But during this crisis, we saw a 700% increase in the number of appendices that ruptured."

Video visits and Virtual Urgent Care visits remain options when an in-person visit isn't necessary or convenient. But by mid-July, the number of patient visits at NYU Langone Health's faculty group practices was more than 100% higher than the pre-COVID-19 volume, and most patients had resumed routine screenings, such as colonoscopies, mammograms, and gynecologic exams, as well as annual physicals. At NYU Langone's hospitals, Emergency Departments, and outpatient sites, rigorous measures have been implemented to ensure patient safety. "We're taking extraordinary precautions to make sure our locations are as low risk as they can possibly be," explains Andrew Rubin, senior vice president of clinical affairs and ambulatory care. "If you have to leave your house to go somewhere, this is the safest place to be."

“

We're taking extraordinary precautions to make sure our locations are as low risk as they possibly can be.”

**Andrew Rubin**

SENIOR VICE PRESIDENT OF CLINICAL  
AFFAIRS AND AMBULATORY CARE



STR/AFP VIA GETTY IMAGES

May 21

SHULAN,  
JILIN PROVINCE,  
CHINA



Social distancing  
during a lunch break  
at a Chinese auto  
factory.

## Done with COVID? Not So Fast.

While public health measures have helped contain the novel coronavirus in some regions, preventing new outbreaks is proving far more problematic. The latest evidence: China appeared to have COVID-19 under control following extreme restrictions on citizens and an aggressive approach to testing. Yet on the very same day Beijing officials announce that no new cases have been reported for 30 days and that masks no longer need to be worn outdoors, the residents of Shulan, a city of 700,000 about 600 miles away, are locked down following the infection of at least 34 people. About 8,000 more are placed in quarantine, and travel into and out of the city is suspended. China's new hotspot is a stark reminder that hard-won gains against COVID-19 can be easily lost. "We have made it to the other side of the pandemic's peak, but we will not become complacent against COVID-19," says Fritz François, MD, NYU Langone Health's chief medical officer and patient safety officer. "We are better equipped now, with tools, people, and processes ready if and when the second wave comes to New York City."



# Mining Patient Records to Help Crack the Code of COVID-19

A landmark study of more than 5,000 NYU Langone patients with COVID-19 yields the most complete picture of risk factors and outcomes to date.

In mid-March, about a week after the COVID-19 pandemic hit New York City, Christopher Petrilli, MD, received an ambitious assignment: Dan Widawsky, NYU Langone's chief financial officer, and Fritz François, MD, chief medical officer and patient safety officer, asked Dr. Petrilli to develop a deeper understanding about the patients being treated for the virus. The research that had come out of China and Italy, early novel coronavirus hotspots, had been largely descriptive. "We suspected that older patients were more likely to have negative outcomes, but given the urgency of the crisis, we needed to understand what factors put patients at higher risk," says Dr. Petrilli.

So Dr. Petrilli, clinical lead for value-based medicine and medical director of clinical documentation improvement, began assembling a team to mine Epic, NYU Langone's electronic health record (EHR) system. Nader Mherabi, executive vice president and vice dean, chief digital and information officer, suggested that he reach out to Yelena Chernyak, lead developer for medical center information technology, to pull and organize patient data. Next, he turned to Steven Chatfield, assistant vice president of decision support and value improvement, whose team provided data and analytic support throughout the project. Finally, at a preliminary presentation of the research results, he was fortunate to find a partner in Leora Horwitz, MD, director of the Center for Healthcare Innovation and Delivery Science, who has built a career leveraging big data to improve

the quality and safety of healthcare. "She quickly figured out how to take our work to the next level by creating a more rigorous analytic process using advanced modeling techniques," says Dr. Petrilli.

The team compiled detailed demographics for nearly 5,300 COVID-19-positive patients treated across the institution. Their landmark study, published in *The BMJ* on May 22, remains the most comprehensive report of outcomes among patients hospitalized with COVID-19 in the United States, a game changer that has boosted clinical knowledge about who is affected most acutely by the virus and how to spot them earlier. Among the key findings: patients with oxygen saturation levels below 88%, the benchmark for hypoxia, and those with elevated blood markers for inflammation and the presence of blood clots tend to have the worst outcomes. "Labs explain a lot about this disease," says Dr. Horwitz. "We have incorporated these blood tests and oxygen readings into our COVID-19 protocols at NYU Langone to make sure these higher-risk patients are monitored closely."

The study further revealed that obesity, independent of comorbidities like high blood pressure and diabetes, is a notable risk factor for both hospitalization and severe illness due to COVID-19. The finding is significant given that more than 40% of US adults are obese, defined as having a body mass index of 30 or above. "There are not many obese people in China, so it wasn't initially on anybody's radar," says Dr. Horwitz,



Taylor Thornton, RN, a nurse at NYU Langone Orthopedic Hospital, examines Cory Margolis, one of nearly 5,300 patients whose demographics were used to compile the landmark COVID-19 outcomes study.



who notes that it is not clear whether obesity's link to inflammation or the impact of the condition on lung capacity accounts for the heightened risk.

Like obesity, heart failure and kidney disease are associated with inflammation, and both were shown to raise the risk for critical illness. By contrast, asthma and COPD, two chronic inflammatory airway diseases, were not. That surprised the researchers and has enhanced the broader understanding of the novel coronavirus. "This is not a pure lung disease," says Dr. Horwitz. "This is a respiratory disease that causes blood clots and inflammation, that causes kidney failure, that causes strokes."

Perhaps the most encouraging finding of the study, which has been cited in more than 100 scientific publications and attracted inquiries from medical institutions in the US and Europe, is that the rate of critical illness and death among hospitalized patients dropped significantly between March and May. This suggests that NYU Langone's care improved over time as clinicians incorporated therapeutic techniques like proning (placing patients on their stomach to improve breathing) and the early use of anticoagulants for those at heightened risk for blood clots. As well, Dr. Horwitz believes that people—particularly those in high-risk categories—became more compliant in adhering to community safety measures, such as wearing a mask and social distancing, resulting in lower viral load exposure.

Although a single-institution study poses limits in its demographic makeup, Dr. Petrilli points out two factors that helped broaden this one. First, Epic is deployed in all four NYU Langone hospitals, comprising a diverse mix of urban, suburban, and high- and low-income patients that made it generalizable. Second, unlike some health systems, NYU Langone's EHR combines data from inpatients and outpatients at its 260 ambulatory practices, enabling a complete snapshot of its COVID-19 care. Says Dr. Horwitz, "We were the only institution in New York City to be able to do this kind of modeling of our data."

## Anatomy of a COVID-19 Patient: Who's Most at Risk?

NYU Langone's landmark study of nearly 5,300 patients revealed three major risk factors for COVID-19—and challenged a few assumptions.

**Obesity.** More than one out of three hospitalized patients had a body mass index (BMI) above 30, and this group was more likely to become critically ill from the virus. "It's more difficult to take a deep breath when you have extra soft tissue pushing against the lungs," says Leora Horwitz, MD, director of the Center for Healthcare Innovation and Delivery Science. "But obesity is also linked to inflammation, which we know is central to this disease." Even younger patients with an elevated BMI are at increased risk of having complications from COVID-19.

**Sex.** Men have a higher risk for hospital admission and critical illness due to COVID-19 than women. Subsequent research has shown this may be because women have a stronger immune response to the virus. Dr. Horwitz notes that men may also wait longer before seeking care, a factor that may affect both the admission rate and outcomes.

**Preexisting conditions.** Having diabetes, heart failure, or kidney disease all elevate the risk that an infected patient will be hospitalized or become critically ill. Some 80% of admitted patients in the NYU Langone study had at least one chronic disease.

**But not so much respiratory ones.** Surprisingly, patients with asthma and chronic obstructive pulmonary disease who are infected with the novel coronavirus do not have a higher risk for severe illness than the general population. "This suggests that COVID-19 is as much an inflammatory disease as it is a respiratory one," says Christopher Petrilli, MD, NYU Langone's clinical lead for value-based medicine.



# It's OK Not to Feel OK During This Crisis

COVID-19 has overtaxed not only the US healthcare system, but also the frontline workers who show up every day to manage the crisis. They see colleagues fall ill with the virus and worry about their own well-being, along with the agonizing possibility of infecting loved ones. They watch patients die, without family present, and feel powerless against a disease with no proven treatments. Staff who are parents must resolve child-care issues, serve as de facto teachers, and soothe their little ones' fears. Given these challenges, the pandemic inevitably takes a mental toll, leading to symptoms of depression and anxiety among many frontline staff.

"It's overwhelming what they've gone through," says Charles Marmar, MD, the Lucius N. Littauer Professor of Psychiatry and chair of the Department of Psychiatry at NYU Langone Health. "Seeking help when facing these conditions is understandable and not a sign of weakness."

To meet the emotional needs of workers, NYU Langone, now ranked number 11 nationally by *US News* for Psychiatry, launches a variety of mental health resources by the height of the crisis. "The goal is to make sure people don't feel alone—that there are easily accessible ways to get support," says Helen Egger, MD, the Arnold Simon Professor of Child and Adolescent Psychiatry and chair of the Department of Child and Adolescent Psychiatry.

Those seeking self-help solutions can turn to the frontline healthcare worker Mental Health Resources website, built with the guidance of the Department of Child and Adolescent Psychiatry's in-house digital innovation laboratory, called the WonderLab, and the Medical Center Information Technology team. The site provides stress management tips, meditation exercises, and a "coping card" that recommends calming breaks staff members can perform within a minute or less. Nearly 1,300 people visit on the first day.

Additionally, the site guides users on the path to join in-person and virtual support groups. These offer a safe space for faculty, nurses, residents, and staff to share thoughts and experiences in virtual meetings, with a mental health professional serving as a facilitator. "Many of our groups were created for existing teams that already knew each other and were going through the crisis together, and that made the forum a more powerful tool," says K. Ron-Li Liaw, MD, chief of service for the Department of Child and Adolescent Psychiatry at Hassenfeld





Children's Hospital. "We had 500 staff members join, many of whom had never sought help before."

Another initiative involves more direct intervention: behavioral health nurses conduct rounds to check in on staff members stationed in COVID-19 ICU and acute-care units. "Frontline nurses really liked these sessions because they were talking to a peer," says Dr. Marmar.

Frontline workers who require ongoing care turn to the House Staff Mental Health Program, which provides no-cost video visits for residents, as well as 24/7 counseling through the NYU Langone Employee Assistance Program. As well, NYU Langone Psychiatry Associates and the NYU Child Study Center see a 20% increase in visits once the pandemic hits. Much of the jump occurs in May, as the volume of COVID-19 patients at the institution declines. "People hold it together during a crisis," says Dr. Egger. "When things calm down is often when you see symptoms rising."

Dr. Liaw, seeing a potential silver lining, hopes the increased recognition of the importance of mental health services decreases the stigma of pursuing them. As she observes, for some workers, the painful experiences, memories, and grief will far outlast the pandemic. "NYU Langone did an amazing job treating patients with COVID-19," says Dr. Liaw, "and we need to do the same for the healthcare team that served them."

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## Wellness Resources

NYU Langone Health offers a number of programs to support the mental health of its employees. Staff and faculty can visit the employee portal *Inside Health* for additional information.

► **Mental Health Resources for Frontline Healthcare Workers**

The site has self-care activities, advice for managing anxiety, and information on pursuing additional services.

► **Healthcare Worker Support Groups**

These virtual sessions are organized by team—staff, faculty, nurses, etc.—and are guided by a mental health professional.

► **House Staff Mental Health Program**

NYU Langone residents can receive free confidential treatment, with evening hours prioritized to meet their schedule demands.

► **NYU Langone Employee Assistance Program**

Staff and their family members can receive emotional support 24/7 through Corporate Counseling Associates (CCA) by calling 1-800-833-8707. CCA also provides referrals for mental health professionals covered by employee insurance plans.

► **COVID-19 Mental Health Resources for Families**

A series of pandemic-themed articles supports parents, from coordinating distance learning to helping children process grief and loss. ([nyulangone.org/covidfamilyresources](https://nyulangone.org/covidfamilyresources))

► **NYU Langone Psychiatry Associates**

Licensed psychiatrists and psychologists treat mental health and emotional challenges via video visits. For more information or a referral, call 212-263-7419.



# IT'S BEEN WORSE. IT WILL GET BETTER.

Smallpox. Polio. Yellow Fever. HIV. NYU Langone's courageous frontline builds on a long and vibrant legacy of helping New Yorkers shoulder deadly epidemics. Historian **David Oshinsky** looks back to look forward.

Families huddled around radios as if listening to the World Series or a championship fight. Crowds stood four deep on city sidewalks watching the TV sets placed in department store windows. Loudspeakers blared out the news in offices and on factory floors: "The vaccine works. It's safe, potent, and effective." To many, April 12, 1955, resembled V-J Day—the end of a war. "Outside, we could hear horns honking and church bells chiming in celebration," a fourth-grader from Baltimore recalled. "We had conquered polio."

It hadn't been easy. The struggle took more than two decades, culminating in the largest public health experiment in American history. More than a million schoolchildren participated, some getting the real polio vaccine, others a look-alike placebo. Today, the scourge of polio is a distant memory in most parts of the world, thanks to the killed-virus vaccine developed by Jonas Salk, MD, and the live-virus version championed several years later by Salk's competitor, Albert Sabin, MD. As so often happens in bitter rivalries, the two men held many things in common—none more precious than the diplomas they earned from NYU School of Medicine.

The story of the polio vaccine—like so much else in the conquest of epidemic →



“

The man or woman or child who will not wear a mask now is a dangerous slacker.”

RED CROSS PUBLIC SERVICE ANNOUNCEMENT, 1918

During the 1918 influenza pandemic, face masks—shown being made by American Red Cross workers—were a critical containment tool.





disease—has deep roots at NYU. Had our medical school not existed, Salk and Sabin would likely have chosen different careers. As the children of Jewish immigrants, they gravitated to one of the few places that didn't have a "Jewish quota." ("Never admit more than five Jews, take only two Italian Catholics, and take no blacks at all" was the mantra of at least one Ivy League school.) A few years later, when applying for a fellowship that would start him on the road to the polio vaccine, Salk needed the blessing of his NYU mentor, Thomas Francis, MD, a giant in the field of infectious disease. Realizing that the process had as much to do with religion as with talent, Francis ended his recommendation with these carefully chosen words: "Dr. Salk is a member of the Jewish race but has, I believe, a very great capacity to get on with people."

The medical education of Salk and Sabin speaks volumes about NYU's early leadership in virology, bacteriology, and infectious disease. While elite institutions like Harvard and Johns Hopkins received the lion's share of attention, NYU had compiled a record to match—more quietly, perhaps, but no less impressive.

Salk readily admitted his debt to R. Keith Canaan, PhD, a brilliant biochemist who recruited the young medical student to work in his laboratory, and to Francis, whose pursuit of a killed-virus flu vaccine would deeply influence Salk's research agenda. Indeed, the caption under Salk's 1939 NYU graduation photo read: "Seems to have researched in every laboratory on First Avenue ... Can probably call more faculty members by their first name than anyone in school."

Sabin's NYU experience proved equally rewarding. As a first-year medical student in 1926, he caught the eye of the influential William Hallock Park, MD, who had introduced the lifesaving diphtheria antitoxin to America's medical community. Park had been at NYU since 1900, serving as a department chair and then dean of the medical school.

Working in Park's laboratory, Sabin developed a method for the rapid typing of pneumococci. Park proudly called it "the Sabin method" and claimed that it saved lives. As with Francis and Salk, the relationship between Park and Sabin exemplified the generational partnerships that fueled the extraordinary research occurring at NYU. "He was my champion," Sabin recalled, "the illustrious, gentle, and warm-hearted Dr. Park."

**IT TAKES THE FEAR** of a pandemic, as we are experiencing today with COVID-19, to remind us that epidemics have long marked our history. No American city suffered more than New York, whose bustling harbor became a magnet for the world's microbes and maladies. Periodic eruptions of measles, influenza, cholera, and scarlet fever killed untold numbers in the colonial era, especially children. Barely a decade went by without a serious outbreak of smallpox—the epidemic of 1731 causing 500 deaths in a city of barely 10,000 people. Then, in the 1790s, came the scourge of yellow fever, causing the city fathers to buy a decaying mansion overlooking the East River to house the sick and dying—the "Bel-View Estate."

Nobody at this time knew what caused yellow fever or how to treat it. Physicians blamed the disease—indeed, virtually *all* diseases before the acceptance of germ theory—on dangerous airborne clouds known as miasmas. The favored treatments for yellow fever were purging and bleeding, which did nothing but add to the pain. The only good news was that those who survived were immune for life.

A young doctor named Alexander Anderson, MD, faced the epidemic virtually alone. Barely into his 20s, he had left his family to treat the sick who arrived at Bellevue by horse cart and river barge. "We lost three patients today," reads an entry in the remarkable diary he kept. "I am sometimes tempted to resign my station, but, really, I am afraid that like Jonah, I shall meet a worse fate." In the summer of 1798, Anderson's infant son died of yellow fever. In September, the disease took his brother, then his father. In October, it claimed his wife and his mother. "A tremendous scene have I witnessed," reads Anderson's final diary entry, written on New Year's Eve. "Yet I have reason to thank the Author of my existence and am still convinced that

'whatever is right, is right.' " For Anderson, being right meant taking responsibility for society's most fragile members. Forgotten today, he stands as Bellevue's first true physician, serving a riverfront pesthouse in a murderous time.

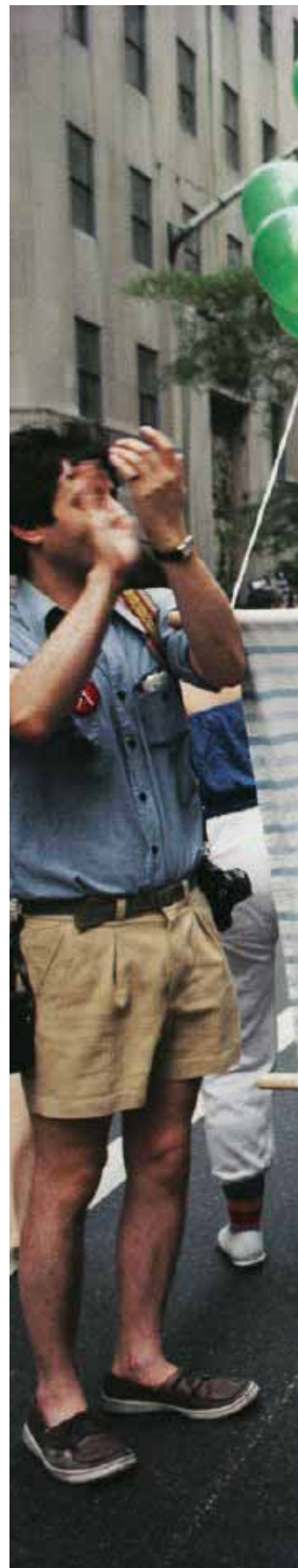
Fast-forward a full century to the work of Walter Reed, MD, and William Gorgas, MD, the clinician/researchers who unlocked the mysteries of yellow fever—the former demonstrating its transmission (the vector being the *Aedes aegypti*) and the latter providing the first blueprint for its eradication (draining swamps, screening windows, fumigating with wood alcohol). Their work not only lowered the casualty rates in the Spanish-American War, it also aided construction of



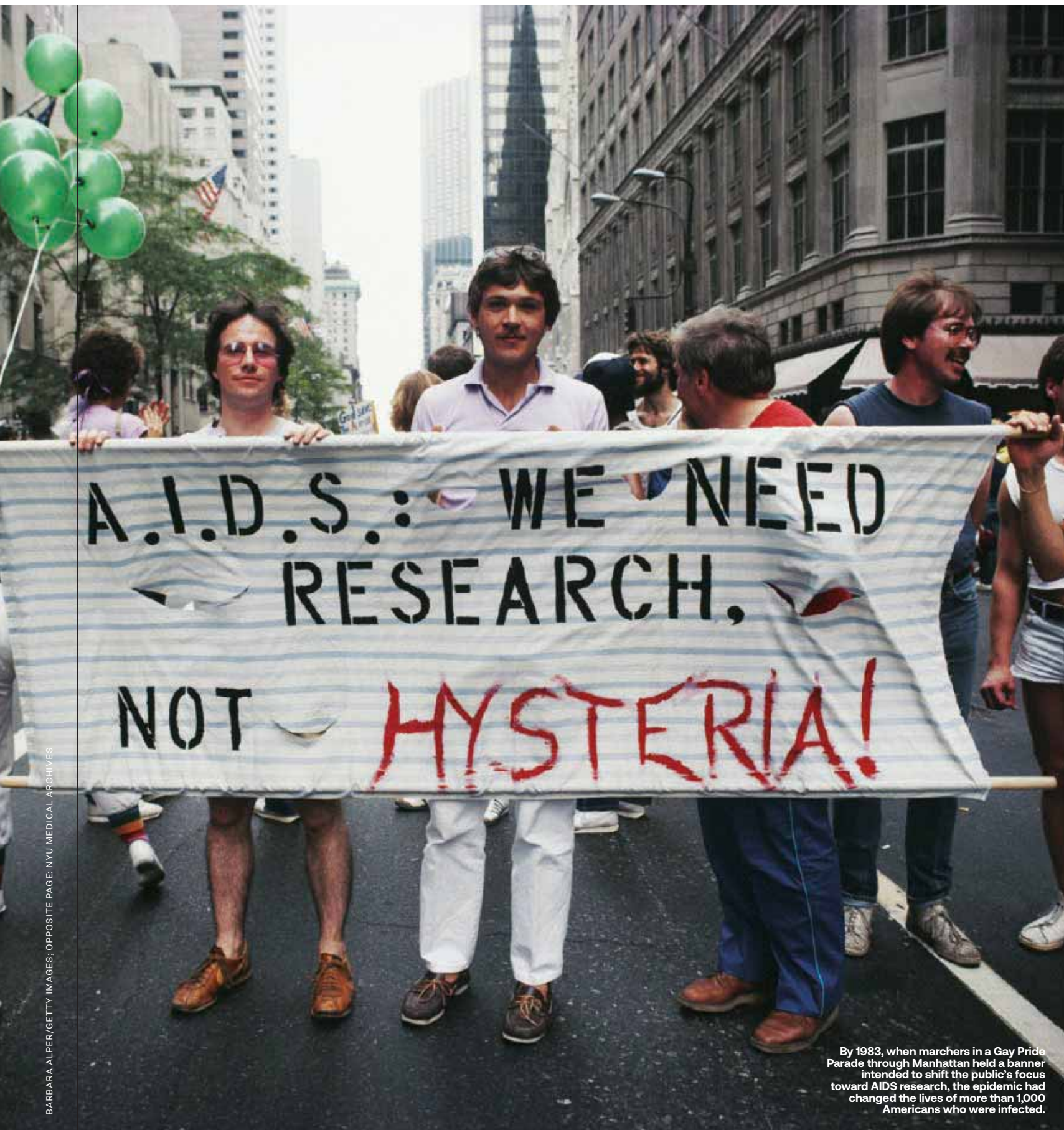
Jonas Salk



Albert Sabin







BARBARA ALPER/GETTY IMAGES; OPPOSITE PAGE: NYU MEDICAL ARCHIVES

By 1983, when marchers in a Gay Pride Parade through Manhattan held a banner intended to shift the public's focus toward AIDS research, the epidemic had changed the lives of more than 1,000 Americans who were infected.



the Panama Canal. Many consider their contributions to be among the most significant in the history of medicine. Fittingly, both men had been trained and educated at Bellevue and NYU.

The link between these two institutions goes back to 1841, when the NYU College of Medicine first opened its doors, and Bellevue quickly became its training ground. The partnership would survive some intense crises—none more severe than the epidemic of 1848, when typhus struck New York City. A bacterial disease spread by a body louse, it likely came from Europe on the so-called “famine ships” carrying Irish immigrants to the East Coast port cities of the United States. As the sickness spread, Bellevue erected “pest tents” to handle the overflow. The patient death rate soon exceeded 40%, and for the staff, it was even higher. So many resident physicians fell to the disease that medical students were used to fill the void. There is no record of anyone fleeing. To scroll through the fatalities of this epidemic is akin to reading the names on a war memorial:

► Elihu Hedges, student of medicine, died in NYC, 1848. Cause: typhus fever, contracted while on duty in the hospital.

► Gorham Beals, MD, died in NYC, 1848. Cause: typhus fever, contracted while on duty in the hospital.

► David Seligman, student of medicine, died in NYC, 1848. Cause: typhus fever, contracted while on duty in the hospital.

► William Cahoon, MD, died in NYC, 1848. Cause: typhus fever, contracted while on duty in the hospital.

The list, comprising dozens of names, is a reminder of those who selflessly walked our halls long ago.

**IN 1870, 20% OF THE** children born in New York City would not live to see their first birthday, and 25% of those who did reach adulthood would die before the age of 30. Many perished in the terrifying epidemics that periodically swept the region, but many more fell to endemic diseases related to filth and overcrowding—in short, the plagues of modern city life. Among the deadliest offenders was tuberculosis.

The battle to contain TB in the late 19th and early 20th centuries owed its success to a cadre of NYU physicians, most notably Hermann Biggs, MD, and Edith Lincoln, MD. Guided by the microscopic isolation of the tubercle bacillus in 1884, Biggs used his funding as the head of New York

City’s Medical Research Laboratory to lobby for quarantine, facial masks, and the mandatory reporting of all suspected TB cases, followed by a sputum culture—a process opposed by most doctors at the time as a threat to their livelihood. Biggs prevailed. “Public health is purchasable,” he famously declared.

Though close to half the patients in Bellevue’s sprawling chest unit were children, it didn’t create a special ward for them until the 1920s, when Lincoln, an assistant professor of pediatrics at NYU, took the job. (Earlier, as one of the first female interns at Bellevue, she had refused to eat with

the nursing staff, demanding, and winning, a seat in the doctors’ dining room. As payback, she was warned for wearing her skirts too high.) A disciple of Biggs and his preventive methods, Lincoln compiled data for one of the largest medical studies of that era, tracking close to 3,000 TB survivors from the time they entered her ward until their 25th birthday. Her conclusions reinforced the work of most social reformers: the patients, almost without exception, “came from low socioeconomic backgrounds.” Nearly half of them were black and Puerto Rican at a time when their combined percentage in Manhattan was below 20%.

In the mid-1940s, Selman Waksman, PhD, a microbiologist at Rutgers, revealed that a soil-based derivative he called streptomycin had shown great potential in killing the tubercle bacillus. While testing it at Bellevue, Lincoln achieved even better results by using streptomycin in combination with a second antibiotic, isoniazid, which lowered TB mortality in the children’s ward to 1.5%—a success rate confirmed in later trials by the US Public Health Service.

Today, Biggs is considered by many to be “the father of public health in the United States.” Waksman went on to win the 1952 Nobel Prize in Medicine. Lincoln never received the acclaim she deserved, though her studies of multidrug therapies would reorient the treatment for tuberculosis—and later, some believed, for HIV/AIDS. Her true reward, she said, lay in watching her once-jammed TB ward empty out and eventually close. For NYU’s Lincoln, that legacy seemed more than enough.

**IF HISTORICAL COMPARISONS** are to be made regarding the impact of COVID-19, two examples stand apart. Nothing in modern times comes close to matching the fury and dev-

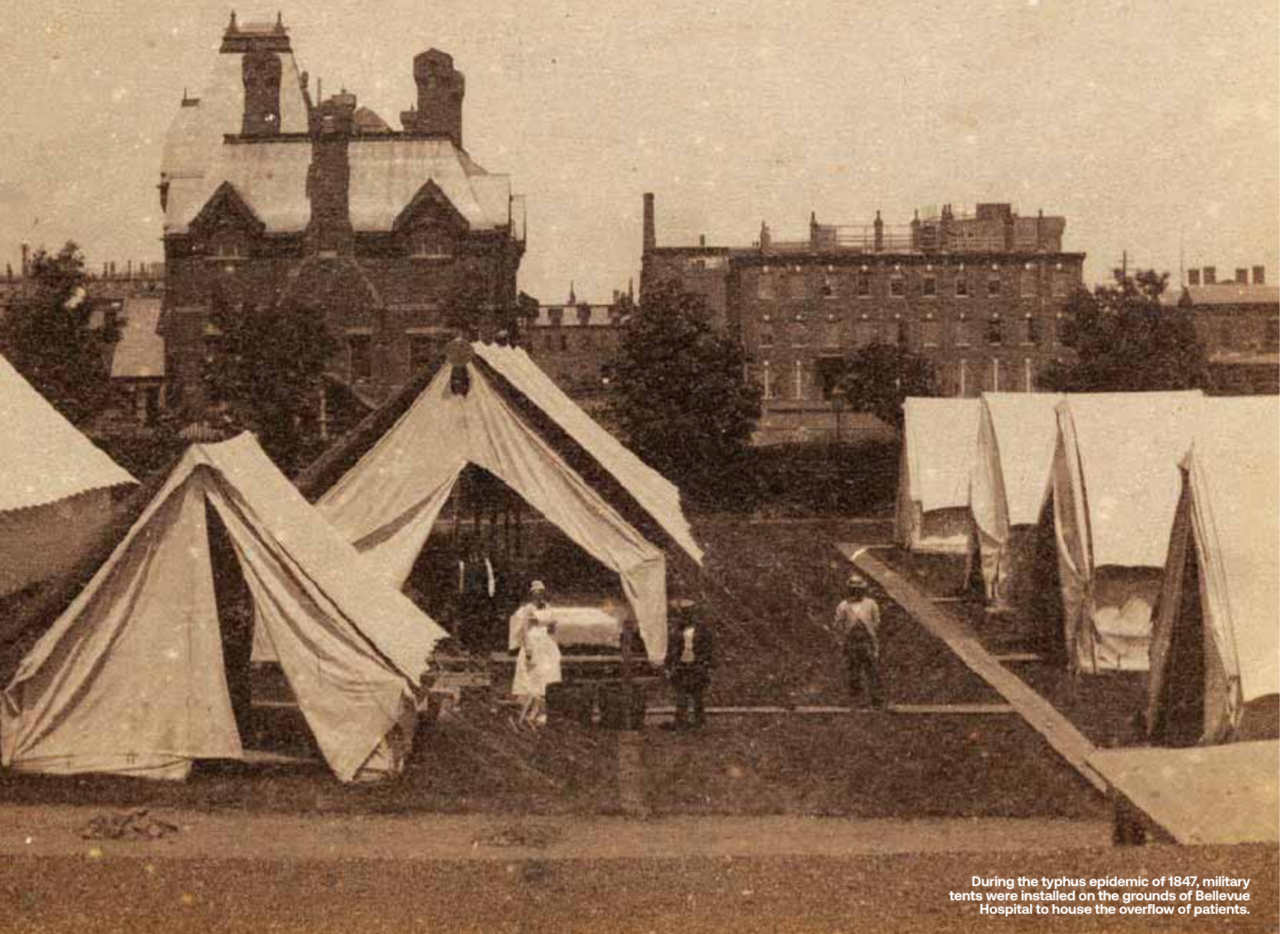


PHOTOS COURTESY OF NYU MEDICAL ARCHIVES



“

The COVID army called to duty over the past few months is part of a tradition spanning two centuries. Crises erupt, and professionals rise to the challenge.”



During the typhus epidemic of 1847, military tents were installed on the grounds of Bellevue Hospital to house the overflow of patients.



astation of the “Great Influenza” of 1918 or the decades-long struggle against HIV/AIDS. The influenza pandemic of 1918 killed more people in a shorter period than any event in world history. At least 50 million perished, including 700,000 in the United States—a number so staggering that the life expectancy of the average American dropped by 12 full years.

As the virus spread, the New York City Health Department banned spitting as well as “promiscuous coughing and sneezing.” To prevent crowding, work hours were staggered, and theaters were forced to cut their ticket sales in half. Public libraries stopped lending books, gauze face masks became regular attire, and people stopped shaking hands.

Bellevue saw more admissions in the fall of 1918 than at any time in its history. There was little to be done beyond providing aspirin, whiskey, and words of comfort. So many nurses and doctors took sick that city officials thought seriously about refusing new patients; they decided against it, though many wound up sleeping on the floor. “It got to the point where I would see them only twice,” a medical resident recalled. “Once when they came in and again when I signed their death certificate.”

Meanwhile, work proceeded on a flu vaccine, led by Biggs and Park. The results proved discouraging. Their laboratory couldn’t isolate the responsible pathogen, an impossible task given the mysteries of the endlessly mutating virus. In the end, an estimated 30,000 New Yorkers perished in the pandemic. Still, the city could boast a significantly lower death rate than Boston or Philadelphia due to the active involvement of its public health officials, led by the ubiquitous Biggs. Early intervention worked; so, too, did social distancing, the banning of large public events, and a layered approach to reopening the city—painful lessons that resonate to this day.

Unlike previous epidemics that ravaged New York City, AIDS had no history, not even a name, when it first appeared in the fall of 1980. NYU’s Fred Valentine, MD, saw his first case at Bellevue in the form of pneumocystis pneumonia, a rare opportunistic infection, while Alvin Friedman-Kien, MD, saw his first case at NYU Dermatology Clinic in the form of Kaposi’s sarcoma, an equally rare skin cancer. The only visible link was that both patients were gay men in their 20s with severely compromised immune systems. Before long, the net had widened to include drug addicts sharing needles and hemophiliacs receiving blood transfusions. Were they all

suffering from the same disease? If so, how was it transmitted? With death being the one certainty, panic was palpable.

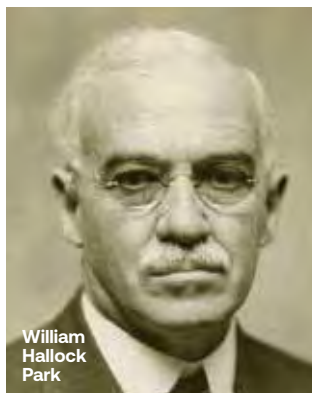
A decade earlier, the medical schools at Cornell and Columbia had departed Bellevue, leaving the hospital’s entire medical needs in the hands of NYU. Then came the pandemic. More patients would be treated for AIDS at Bellevue, and more would die, than at any other hospital in the United States. Gowns, face masks, double gloves, and goggles became standard equipment for doctors and nurses on the AIDS floors, though many abandoned the attire once the mode of transmission became known. Those who worked

and trained at Bellevue in those years recall a sense of bonding and accomplishment that framed their later professional lives. They also remember the feelings of futility that often overwhelmed them in early years of the epidemic. “Every third admission seemed to be a patient in his mid-20s who looked as if he arrived from Dachau or Biafra,” a resident confessed. “Witnessing your own generation dying off is not for the faint of heart.”

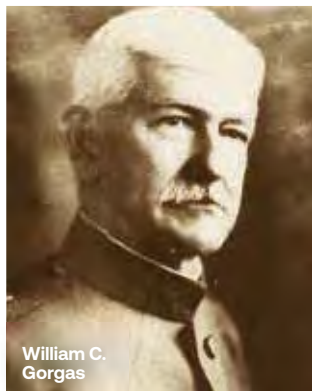
By the 1990s, two groups affiliated with NYU had begun testing a multidrug therapy designed to suppress HIV in already infected patients—one group led by David Ho, MD, the other by Valentine. Both showed promising results. The viral loads of the subjects dropped to almost undetectable levels and stayed there as long as the routine was faithfully followed. By the year 2000, Bellevue was seeing more AIDS patients in its outpatient clinics than on its wards, and in 2012, the hospital shuttered its AIDS unit, a once unthinkable move. A momentous chapter in the history of NYU and Bellevue had closed—perhaps for good.

**THE COVID ARMY CALLED** to duty over the past few months is part of a tradition spanning two centuries. Crises erupt, and professionals rise to the challenge. From the indomitable Alexander Anderson to the young physicians who sacrificed their lives in the typhus epidemic of 1848, from the brilliance of Salk and Sabin to the selflessness of the frontline AIDS fighters—that is our history, refreshed by each succeeding generation.

Historian David Oshinsky, PhD, is the director of the Division of Medical Humanities and professor in the Department of Medicine at NYU Grossman School of Medicine. His books include *Polio: An American Story*, which won the Pulitzer Prize for History in 2006. His essays and reviews appear regularly in *The New York Times* and other publications.



William Hallock Park



William C. Gorgas

February, 1954: Jonas Salk, MD, administers a trial polio vaccine to an 8-year-old boy at the Frick Elementary School in Pittsburgh, Pennsylvania.

PHOTOS AT LEFT COURTESY OF NYU MEDICAL ARCHIVES; RIGHT, UNDERWOOD ARCHIVES/GETTY IMAGES





# WHAT WE'VE LEARNED. WHERE WE'RE HEADED.

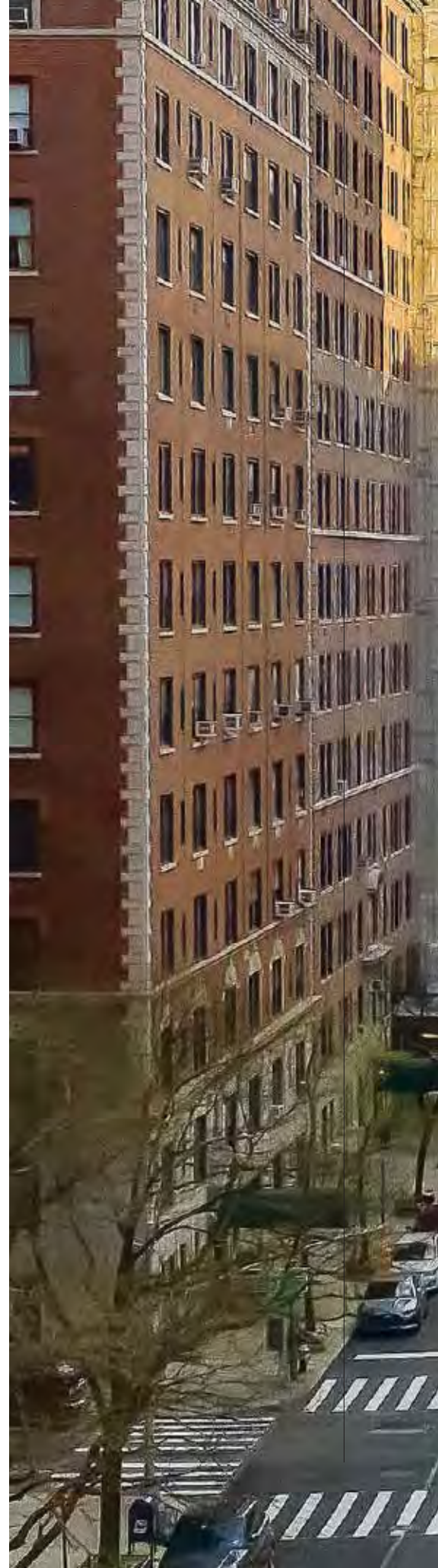
BY **ROBERT I. GROSSMAN, MD**, DEAN AND CEO



A crisis brings out the best in us. The bigger the crisis, the deeper we dig to find out what we're made of. COVID-19 has tested us, for sure, but it has also brought our mission to another level. We've served patients with the utmost care and compassion. We've taught each other what's possible when so many lives depend on us, and when we depend on each other. We've discovered new ways to improve outcomes.

Many of these achievements are vividly chronicled in this timeline of NYU Langone Health's efforts during the Spring surge that claimed the lives of nearly 20,000 New Yorkers. Since the outset of the pandemic, we have:

- ▶ Saved the lives of thousands of patients
- ▶ Enrolled volunteers in landmark clinical trials of two leading vaccines
- ▶ Developed treatment protocols that have led to some of the best outcomes for COVID-19 in New York City
- ▶ Established one of the nation's most reliable and efficient COVID-19 testing centers →









- ▶ Transformed our telemedicine services
- ▶ Published dozens of high-impact research publications that have transformed our understanding of COVID-19
- ▶ Conducted over 20 studies probing some of COVID-19's toughest questions
- ▶ Offered early graduation to heroic medical students who chose to serve on the front lines

Retrospectives, by definition, allow us to look back. But this one actually helps us look ahead. Being reminded of our triumphs amid so much tragedy—and seeing this chapter of our history as the heroic, sweeping tale it is—give us much cause for optimism.

In many ways, what we have done since the surge is every bit as important as what we did during it. As this publication goes to press, we are treating nearly as many patients in person as we did before the pandemic, thanks to our stringent safety protocols and dedicated staff. We are in the final phases of testing two critical vaccines, as well as a highly promising monoclonal antibody treatment. We have wholly reimagined our approach to acquiring personal protective equipment. And we are exploring a combination test for flu and COVID-19.

I've said from the start that this would be a marathon, and we're certainly not near the finish line. But we should take comfort in knowing that our institution has emerged from this ordeal even stronger and savvier. Whatever challenges lie ahead, we are far better equipped to contend with them.

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## Dedication





“

**This kind of condition is something a radiologist might see once or twice in their career. Hopefully, we'll never see anything like it again.”**

**William Moore, MD**

CHIEF OF THORACIC IMAGING

(SEE PAGE 100)

