

ONE TEAM

Yale Department of Internal Medicine's
Response to COVID-19



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Front cover: (L-R) Onyema Ogbuagu, MBBCh;
Lynn Tanoue, MD, MBA; Will Cushing, PA-C.
Back cover: (L-R) Manisha Juthani, MD;
Jonathan Siner, MD; Marcella Nunez-Smith, MD, MHS

Message from the Chair



“Our department’s story is one of teamwork, collegiality, altruism, optimism, courage, and strength.” — GARY V. DESIR, MD

The challenges of the COVID-19 pandemic have tested the resolve of our clinicians, educators, researchers, trainees, and staff.

Along with the many challenges, we shared stories of teamwork, collegiality, altruism, optimism, courage, and strength. We were inspired by the bravery of our clinicians and nursing partners who rushed into patients’ rooms to perform chest compressions without hesitation. We applauded the house staff and the hospitalists who showed tremendous flexibility as we reorganized care pathways. We mourned with family members who had lost loved ones. We rallied to collect personal protective equipment and donations of medications for at-risk patients; to meet new technological challenges; and to do what was best for our patients.

Many of these tasks could not have been completed without the support of our nursing colleagues, housekeeping, environmental health and safety, engineering, information technology services, food services, and other partners across the Yale University, Yale New Haven Health, and the New Haven community.

This report focuses on the Department of Internal Medicine’s response to the first wave of the COVID pandemic. It uses contemporaneous notes to provide a historical record of how the department reorganized its resources to care for its patients and its people; to educate; and to contribute to the understanding and treatment of a new disease. It also seeks to capture our emotions and the emergence of a deeper understanding of teamwork.

In October, the second wave of the COVID-19 pandemic began, and again we are being tested. And we remain committed to our missions and core values.

Sincerely,

A handwritten signature in black ink that reads "Gary Desir".

Gary V. Desir, MD

Paul B. Beeson Professor of Medicine

Vice Provost for Faculty Development and Diversity

Chair, Internal Medicine, Yale School of Medicine

Chief, Internal Medicine, Yale New Haven Hospital

Timeline: A closer look at 2020



COVID-19 by the Numbers



4,106 **Yale New Haven Hospital:**
Cumulative COVID admission
(since 3/14/20-12/31/20)

3,570 **Total Discharges**
439 **Total Deaths**

8,017 **Yale New Haven Health:**
Cumulative COVID admission
(since 3/14/20-12/31/20)

6,939 **Total Discharges**
836 **Total Deaths**

These numbers do not reflect those who remain hospitalized as of 12/31/20.

Department Statistics

Number of volunteers from across
Yale School of Medicine (residents, fellows, faculty)

177+ **Residents + Fellows**



100 **Physicians**



Number of
staff working
from home

300+*

* Does not include Medical Oncology and Hematology

72,154* **Number of phone and video visits**



70+

Number of emergency credentials
issued for Medicine service



Amount of research funding
dedicated to COVID-19

\$10M+

CLINICAL CARE DURING COVID-19

In February 2020, Department Chair Gary V. Desir, MD, and Vice Chair of Clinical Affairs Lynn Tanoue, MD, MBA, began hearing from colleagues at the University of Washington in Seattle and the major medical centers in New York City that the influx of COVID-infected patients was straining the medical services at their institutions. Desir and Tanoue began to plan for the imminent arrival of the pandemic in Connecticut.

They assembled a department leadership team that began discussing how to reorganize in-hospital and outpatient care and education to balance quality, efficiency, sustainability, and risks. They identified key operational issues that required immediate attention and started planning their response.

“People answered the call to mission. This is why we became doctors, nurses, and other health professionals. I think that was incredibly vitalizing. To watch the department function as a whole with everybody contributing from our inpatient to our ambulatory teams was simply amazing.” —LYNN TANOUE, MD, MBA



JONATHAN SINER, MD
CLINICAL CHIEF, PULMONARY,
CRITICAL CARE & SLEEP MEDICINE

Planning for Patients

Concerned about her colleagues' experiences at other institutions, Tanoue drafted a plan for a dramatic reorganization of in-hospital care for the internal medicine service.

Desir called a meeting on Sunday, March 8, with Tanoue and Vice Chairs Aldo Peixoto, MD, and Vincent Quagliarello, MD, to draw up plans for reorganization. They also discussed worst-case scenarios and plans for responses to a variety of potential critical situations among the department clinicians.

And so it began. Department leaders, section chiefs and program directors began daily COVID meetings. One week later, the first patient with confirmed COVID-19 entered Yale New Haven Hospital (YNHH). Many clinicians, educators, researchers, trainees, and staff rose to battle the pandemic.

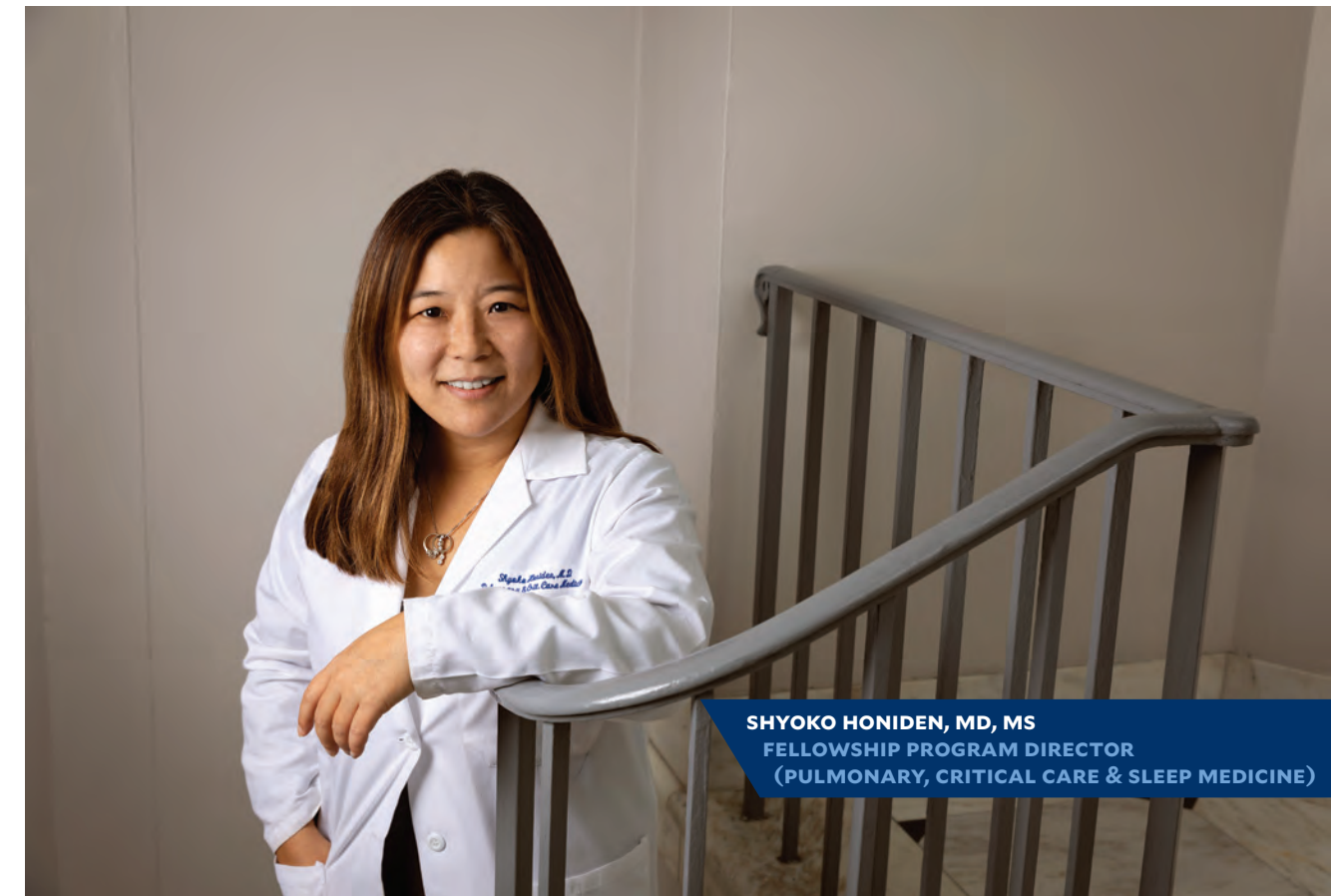
At the VA Connecticut Health care System (VACHS), some actions mirrored what happened at the Yale School of Medicine (YSM) and YNHH, though others were different. One of the first steps taken was the creation of the Incident Command Center (ICC), which included leaders across the facility to prepare for the response to COVID-19. The ICC met on a daily basis to create policies, review issues, and provide resolutions in real time. The work at VACHS was led by Daniel Federman, MD, interim chief of medicine, and Michael

Kozal, MD, chief of staff and a renowned virologist. Secretary of Veterans Affairs Robert Wilkie Jr. came to VA Connecticut in October 2020 to recognize the outstanding efforts of VACHS. Shaili Gupta, MBBS, became the COVID Response Coordinator for the Department of Medicine, VACHS. Additionally, Kathleen Akgün, MD, MS, BS, was named co-chair of the Scarce Resource Allocation Committee, newly formed to respond to COVID-19.

Physical Changes

While the staffing models were evolving, physical changes were also introduced at both YNHH and VACHS. On March 8, VACHS started performing active screening at its main entrance to identify patients who might have been sick or infected by the disease. The number of elective procedures at YNHH was decreased starting the week of March 16, in order to conserve personal protective equipment (PPE) and free up hospital resources. This change reduced the number of elective patients admitted into the facility, and enabled the relocation of services that might not have been possible if the facility had remained at its usual high census.

In ordinary circumstances, the YNHH Medical Intensive Care Unit (MICU) has a capacity up to



SHYOKO HONIDEN, MD, MS
FELLOWSHIP PROGRAM DIRECTOR
(PULMONARY, CRITICAL CARE & SLEEP MEDICINE)

40 beds on the York Street Campus and 16 at the Saint Raphael Campus, with up to 20 negative pressure rooms across both campuses. It became quickly apparent that many more negative pressure rooms and more ICU beds would be needed. The goal was to maximize the available number of these rooms, which are critical to reduce the transmission of such infectious diseases as COVID-19, as well as increase the number of critical care beds to allow safe management of critically ill COVID-19 patients. Jonathan Siner, MD, clinical chief for Pulmonary, Critical Care and Sleep Medicine (PCCSM), and medical director of the MICU, was in charge of the critical care reorganization for the health care system and worked with YNHH leadership to develop a plan to expand the MICU capacity. Because the top three floors of the North Pavilion (NP) of Smilow Cancer Hospital/Yale Cancer Center (YCC) were all built in such a way that the rooms could be converted to negative pressure rooms when needed, the team decided to convert these floors into COVID critical care units.

On March 18, medical and surgical oncology patients were relocated from the top three floors of the NP of SCH/YCC so that the ventilation system on those floors could be changed to some degree of negative pressure to care for COVID-19 patients. The North Pavilion was designed after the SARS epidemic with the foresight that NP-15, NP-14, and NP-12

could be converted as a stack of floors to provide a negative pressure environment.

The transformation of these units into COVID-19 ICU floors led to moving medical and surgical oncology operations to the Saint Raphael Campus (SRC). Moving these lines of service was orchestrated in less than a week by Smilow's operations medical leadership: Kevin Billingsley, MD, MBA; Kerin Adelson, MD; Elizabeth Prsic, MD; Thomas Prebet, MD, PhD; and nursing under the leadership of Kim Slusser, MSN, RN. The conversion of these floors resulted in an additional 84 critical care-capable patient beds, which began to receive patients on March 27.

As inpatient volume grew, additional units were transformed. By April 20, 16 of the 27 units at the York Street Campus (YSC) and 11 of the 18 units at SRC were dedicated COVID-19 positive spaces, in which patients could be safely cared for without endangering others who didn't have the disease.

At the height of the pandemic in the spring of 2020, clinicians, respiratory therapists, and nurses in the MICU cared for 120 patients across both YNHH campuses. Additionally, medical critical care teams collaborated with the leadership of the other YNHH specialty ICUs to provide care for both COVID-19 patients and non-COVID-19 medical critical care patients in the surgical ICUs and operating rooms during this time.



LYNN TANOUE, MD, MBA
VICE CHAIR, CLINICAL AFFAIRS

Prior to COVID-19, VACHS had 34 total negative pressure rooms. To prepare for the influx of patients, personnel converted entire wings and floors to negative pressure rooms, which resulted in an extra 20 beds. In addition, four COVID-19 units were created. The ICU and on-ward policy of care was devised and revised in real time to continue state-of-the-art management of COVID-19 patients with a multidisciplinary team approach involving general medicine, cardiovascular medicine, infectious diseases, infection prevention, pulmonary, critical care medicine, and pharmacy.

Several of the rooms on the inpatient COVID unit did not have windows that enabled staff to easily see the patient when the door was closed. Room cameras were enabled for several rooms that had them preinstalled, and baby monitor cameras were purchased for the other rooms so that all patients could be monitored visually from a central location. The facility also purchased thermometers and pulse oximeters. These were used to monitor all patients who tested positive for COVID-19 but were initially deemed not to require admission. Frequent video or telephone visits were conducted with all outpatients to ensure they did not subsequently require additional care. Several patients were identified

to be deteriorating clinically and were referred for admission prior to severe deterioration. Scrubs were ordered for employees in patient care areas and laundered at the cost of VACT. Surgical masks were also provided to all health care workers. In order to ensure safe discharges for COVID-19 positive inpatients, Benjamin Cherry, MD, led a newly created hospitalist post-discharge video clinic to follow up discharged patients and assess their oxygenation and vital signs.

In recognition of the mental health aspect of receiving a new diagnosis of COVID-19, the Department of Medicine at VACHS worked with other mental health services and developed a process in which every inpatient with a mental health diagnosis would be visited by the psychiatry consult liaison service, and every other inpatient would be offered services by our health psychology team.

The volume of COVID-19 patients at VACHS was lower than that experienced at YNHH, but unfortunately, the hospital did lose nine patients to COVID-19. The oldest patient to pass away was over 100 years of age. He had fought in the Battle of the Bulge during World War II and had been a prisoner of war.



INGINIA GENAO, MD
ASSOCIATE CHAIR, DIVERSITY,
EQUITY & INCLUSION

COVID-19 Planning Challenges

CHALLENGE	SCOPE	STRATEGY	FUTURE EFFORT
Care for Caregivers	Additional support for those providing patient care was needed.	Stress assessments, wellness checks, hotlines, team huddles, peer-to-peer counseling and other services were created. Meals4Healers delivered food to sick, isolated caregivers.	Many of these programs remain in place. Meal delivery restarted in October 2020.
Communication with Families/ Caregivers	Visitor restrictions created challenges for patient care.	Palliative Care created support for clinicians with virtual care conversations; iPads were deployed to MICUs.	These measures are still in place.
Department Health	There was concern about health across the department.	A daily survey was emailed for self-reporting of symptoms. Reports were sent to leadership.	The department survey was rolled into the University's process in October.
Information Distribution	COVID-19 was new and data were changing rapidly.	ID experts led daily virtual didactic rounds to educate other physicians. Daily update calls were also held.	These sessions ran through June.
Comfort Care	Patients who sought hospice care were located throughout the hospital.	A comfort measures unit was created to foster a compassionate atmosphere and focused care for dying patients, and those isolated from loved ones.	The unit was closed after the first wave.
MICU Care across YNHHS	YNHH provides tele-ICU services nightly for YNHHS hospitals. Only 70 beds had been available in March 2020.	Tele-ICU services were expanded through a partnership with ITS and PCCSM. 220 tele-equipped rooms were available and day coverage was added. Physicians considered high-risk covered these services.	Tele-ICU services could be further expanded, and additional ICU evening expansion is possible.

A Call for Volunteers

Based on other institutions' experience in the United States and across the globe, leadership quickly recognized that the most severe challenge to patient care in the hospital would occur in the Internal Medicine wards; in particular, in the MICUs. Providing attending house staff and nursing coverage for the latter was anticipated to be the largest potential barrier to maintaining patient care of the highest quality. To meet this challenge, Tanoue collaborated with Yale Medicine (YM) leadership to poll the entire Yale School of Medicine (YSM) faculty electronically in order to identify physician faculty from other departments who would be willing to work on the Internal Medicine service, and who were capable of providing critical care or general medical care independently or with supervision. A remarkable outpouring of volunteers followed, with over 800 faculty members from every department at YSM responding to the survey.

Subsequent surveys identifying their own department responsibilities, restrictions to working with COVID patients, and a critical care skills analysis, resulted in a cohort of nearly 100 faculty who were deployed as needed in the ICUs and on the Medicine wards. Tanoue and Andrew Golus, MBA, associate director of strategic planning and population health for Yale Medicine, collaborated to categorize each volunteer. A separate team led by Shyoko Honiden, MD, MS,

fellowship program director and Margaret Pisani, MD, MPH, vice chief for faculty development and mentoring of the Section of Pulmonary, Critical Care & Sleep Medicine (Yale-PCCSM), did the physician scheduling and deployment with operations managers Helen Siuzdak and Jim Martone.

Every section within the Department of Medicine provided volunteers for the needs of the MICU; no one said no to Tanoue. General internal medicine, digestive diseases, cardiovascular medicine, and nephrology faculty, along with many others across the department, stepped in to work in the MICU for the months of April, May, and June. Fellows from the Sections of Endocrinology and Metabolism, Hematology, Medical Oncology, Nephrology, General Internal Medicine, Cardiovascular Medicine, and Geriatrics stepped back into the resident role to work as house staff. Yale-PCCSM fellows functioned as attendings or fellows on critical care teams, led by Chief Fellow Mark Godfrey, MD.

Another request for volunteers was sent to residents and fellows of other departments to work within General Medicine units at YNHH. The request was coordinated by Inginia Genao, MD, and Stephen Huot, MD, PhD. The response was overwhelming. Over 177 residents and fellows from the Departments of Anesthesiology, Neurology, Dermatology, Pathology, Surgery, Radiology and Biomedical Imaging, Psychiatry, and Pediatrics volunteered to assist the Department of Internal Medicine with its patient load.

In addition, over 70 community physicians were issued emergency credentials to treat patients within the hospital.

At VACHS, health care teams were restructured to provide longer resting periods between shifts so that staff members could de-stress. House staff was included. These changes were made to dispel fears, enhance preparedness, strengthen the workforce, and continue its dedication to education. In addition, protocols were created with a backup workforce and hospital space to be deployed for waves of anticipated COVID-19 surges. Select VACHS employees went on Disaster Emergency Medical Personnel System/FEMA/VISN deployments to Massachusetts, California, New Jersey, New York, Rhode Island, and New Haven, Connecticut.

Testing at VACHS began on March 10, 2020. Led by Brian Linde, MD, employee health testing was robust. Nasopharyngeal testing was performed for symptomatic clinicians, researchers, educators, and staff. Antibody testing was also offered on a regular basis to nurses and clinical staff. As of November 2020, over 7,000 people had been tested at VACHS. Outpatient testing was set up by Primary Care, led by Christopher Ruser, MD, and was a major success.

Evolution of Clinical Care

As the number of patients grew at YNH, the teams adapted to changes in workflow and clinical care. High-risk clinically active faculty and trainees were asked to avoid being physically present on campus. To reduce disease spread, physicians were asked to keep traffic in and out of rooms to a minimum. Video capabilities were made available to communicate with patients with suspected or diagnosed COVID-19.

Infectious disease specialists Lydia Aoun-Barakat, MD; Erol Fikrig, MD; Manisha Juthani, MD; Mercedes Villanueva, MD; and Vincent Quagliarello, MD, led by Infectious Diseases Section Chief Erol Fikrig, MD, began consulting on every COVID-positive or COVID-excluded patient, either in person or through video conference to help preserve the use of additional PPE. They reconfigured numerous teams to meet the rapid increase in consulting requests, and added two additional COVID-specific teams to the York Street Campus (YSC).

Pulmonary, Critical Care and Sleep Medicine (Yale-PCCSM) Section Chief Naftali Kaminski, MD, and Jonathan Siner, MD, clinical chief, Yale-PCCSM, prioritized critical care as they announced to the section that their clinical mission was now of the utmost importance. They established a clinical command center, and reorganized the section to address the escalating

needs of managing critically ill patients. All critical care board-certified physicians were deployed either as attendings; as supervisors to volunteer teams; as administrative leaders for system-wide critical care, physician deployment, respiratory care and supply chains; or with a backup team covering all needs. The outpatient services were converted to telehealth by Jennifer Possick, MD, director of the Yale PCCSM outpatient services; and the tele-ICU services were expanded to address the increased needs of regional hospitals. Physicians considered to be at high risk for care of COVID patients were assigned to cover the outpatient telehealth lines and the tele-ICU.

For patients who were in need of such urgent cardiac procedures, as cardiac catheterization and pacemaker or defibrillator implantation, YNH leadership established protocols to limit the risk of COVID exposure for both patients and health care providers.

The department assembled a group of experts across many specialties to create a treatment guideline for patients diagnosed with the disease. Led by infectious disease physicians, the COVID-19 treatment team created a plan for moderate and severe disease for use across the Yale New Haven Health System (YNHHS). The first iteration was created on March 18. The plan was based on available knowledge, personal observations, and communications from other institutions. In the absence of firm evidence for best treatments, the treatment guidance was intended as a working document subject to revision with additional clinical research data.

The document was updated over time to include recommended medications and provide the rationale for their use; information on adverse reactions; and other considerations that emerged.

The department's communications team started sharing the COVID-19 treatment guideline on Twitter (@YaleIMed) on April 1 with the hope of assisting others with patient care information. The response was tremendous. Requests for the protocols spanned several continents and dozens of countries – from Argentina to Zimbabwe – with a combined reach of nearly 150k with the first tweet of the protocol.

The team consisted of experts from across many disciplines, including infectious diseases, pulmonary, critical care, sleep medicine, allergy and immunology, rheumatology, hematology, hospital pharmacy, and others. The treatment protocol has been incorporated into Epic workflow, adopted across YNHHS, and updated 20 times since its initial release.

In addition to the treatment guideline, a variety of experts across the department created protocols and algorithms within their specialties:

- Due to the thrombotic complications seen in COVID-19 positive patients, hematologists were a critical part of the multi-disciplinary team. Alfred Lee, MD, PhD; Robert Bona, MD; Henry Rinder, MD; George Goshua, MD; and Lydia Tran, PharmD, took the lead. Other faculty stepped up to consult and develop an anticoagulation algorithm.
- Systemic inflammation is an important complication of the virus, which causes respiratory compromise and death in susceptible patients. With the leadership of Section Chief Richard Bucala, MD, PhD, the Section of Rheumatology, Allergy and Immunology worked across interdisciplinary groups to advise on the assessment of inflammatory markers and design protocols for anti-inflammatory therapies.
- Patients with diabetes often presented with extremely high blood sugar levels that were hard to control. For those patients who received insulin infusions, nurses had to go into the room and check their blood sugar every hour, thus risking possible COVID exposure. Silvio Inzucchi, MD, and colleagues in endocrinology revised the insulin infusion guidelines and updated SBARs to maintain excellent patient care and conserve PPE. In addition, the endocrinology team added an automatic Epic alert for COVID-positive patients if their glucose rose to a certain level, and offered to consult on that patient.
- Geriatricians began consulting on the severe delirium seen in older patients caused by a combination of the virus' effect on the brain and the isolation caused by the disease. These frail adults, particularly those from nursing homes, were likely to get very sick and require intensive care and/or a ventilator. The Section of Geriatrics studied the data coming out of Italy and China on this population.
- Medical Oncology and Hematology moved their ambulatory emergency center to the first floor of YCC. There they could do rapid COVID testing to protect their patients with compromised immune systems. Ambulatory care of patients continued with physicians and APPs quickly adjusting to telehealth visits. Such nursing leaders as Lisa Barbarotta, APRN, other practice nurses, and APPs continued to provide direct care to patients in the ambulatory space on a daily basis.
- Nephrology physicians performed a risk assessment based on the data coming out of China and Seattle on the rate of COVID patients developing acute kidney injury (AKI). The nephrologists determined that additional dialysis machines would be needed to care for the possible influx. The team worked with hospital personnel to obtain 15 additional continuous renal replacement therapy (CRRT) machines. Newer functionality of the CRRT machines meant easier monitoring by the nursing staff and less exposure



MARK GODFREY, MD
FELLOW (PULMONARY, CRITICAL CARE & SLEEP MEDICINE)

to a COVID-positive patient. Luckily, many patients were managed using medical therapies and didn't progress to needing dialysis.

- Thomas Prebet, MD, and Christopher Tormey, MD, led a group focused on the development of an algorithm organizing blood transfusion priorities. The status of blood product stocks was evaluated in real time and communicated daily to the Departments of Internal Medicine and Surgery.
- Sumeet Pawar, MD, a 2020 graduate of the cardiovascular medicine training program, developed an eConsult process with Daniel Price, MD, and helped to educate primary care providers about this process.
- Cardiovascular Medicine Fellow Kerrilynn Carney Hennessey, MD, developed a system to triage echocardiography requests during COVID-19 with Echo Lab director Lissa Sugeng, MD; Robert McNamara, MD, MHS; Kamil Faridi, MD, MSc; Vratika Agarwal, MD; and Aaron Soufer, MD.
- An Advanced Therapeutics group was established and led by Richard Bucala, MD, PhD; and Naftali Kaminski, MD. This group was in charge of assessing scientific evidence for promoting novel therapies, diagnostics, and scientific advances into patient care, and for advising the treatment guideline group. See more on this group on page 34.

- The pandemic created a new challenge for David Rosenthal, MD, who cares for homeless veterans. If someone had to be quarantined, how would that be possible if that patient didn't have a home? The potential of infecting others was significantly higher. Rosenthal worked with City of New Haven staff and leaders to care for patients in a 50-bed shelter in the gymnasium of Hill Regional Career High School in New Haven. Rosenthal was assisted by physicians and nurses from Yale's National Clinician Scholars Program and by other colleagues in the community.

In mid-March, when stories began circulating in the mass media about New York City hospitals and their limited resources, concerns about depletion of resources at Yale became an urgent challenge. Department physicians Michael Bennick, MD; Lauren Ferrante, MD, MHS; John Hughes, MD; Sarah Hull, MD, MBE; Jennifer Kapo, MD; Ernest Moritz, MD; and Mark Siegel, MD, teamed with physicians, ethicists, and a lawyer within YSM and YNHHS to form the Ethics Advisory Workgroup and develop protocols to establish a fair and ethical process for the allocation of potentially limited resources. They drafted the Critical Care Triage Policy to save as many lives as possible in a setting of limited resources. The task force also formulated a resuscitation policy.

Concerns for a potential ventilator shortage during the surge required Elaine Fajardo, MD, director of respiratory therapy, to work together with hospital leadership to seek solutions to expand the availability of ventilators and even consider the use of ventilator splitters that allow the treatment of more than one patient. Two such possible solutions allowing the ventilation of two patients on one machine would be developed at Yale: the Vent Multiplexor and PReVentS. Both devices allow the ventilation of two patients using one machine while still individualizing the ventilation. Fortunately, these solutions were never needed.

As visitor restrictions were implemented across Yale New Haven Health and VACHS hospitals, ambulatory/outpatient sites, and clinics in mid-March, other workflow changes were made as department teams implemented creative solutions to assist with patient care.

The Palliative Care service, led by Kapo and Laura Morrison, MD, partnered with Auguste Fortin VI, MD, MPH, and Geriatric-Palliative Care Fellow Rebecca Spear, DO, to create proactive COVID-19 communication support for a variety of scenarios to assist clinicians to have the necessary but challenging conversations with patients' family members that could no longer happen in person. In response to the rapid increase in older adults with severe COVID-19 infections for whose prognosis



ELAINE FAJARDO, MD
DIRECTOR OF RESPIRATORY THERAPY
(PULMONARY, CRITICAL CARE & SLEEP MEDICINE)



Back row L to R: Shana Gleeson, MD; Charles Dela Cruz, MD, PhD; Marwan Azar, MD; Clemente Britto-Leon, MD; Jeffrey Topal, MD; Gary Desir, MD; Tom Balczak, MD; Matthew Davis, PharmD. Front row L to R: Dayna McManus, PharmD; Veronica Meawad, MD; Sonya Abdel-Razeq, MD; Maricar Malinis, MD; Kesey Kaman, MD; Christina Price, MD. Not pictured: Robert Bona, MD; David Gaston, MD, PhD; George Goshua, MD; Insoo Kang, MD; Alan Koff, MBBS; Alfred Lee, MD; Lauren Pischel, MD; Henry Rinder, MD.

was uncertain, geriatrics and palliative care specialists combined efforts to reach out to all patients 65 and older admitted to YNHHS with COVID-19 and their families to have goals of care discussions and address their concerns.

The Grimes Center, YNHHS' 120-bed skilled nursing facility, experienced a COVID outbreak among its residents and staff. Led by James Lai, MD, MHS, and Gerard Kerins, MD, the team of physicians, APRNs, and staff created new protocols to care for this vulnerable group of patients. They distributed these protocols nationwide to assist other skilled living facilities finding themselves in a similar situation.

PCCSM physicians Danielle Antin-Ozerkis, MD; Ashley Losier, MD; and Andrey Zinchuk, MD, were also struck by the communications complications associated with the disease. Updating family members became more difficult, as did decision-making conversations. The trio sought to obtain additional resources, specifically Apple iPads with video messaging capabilities to assist their patients and families. Concurrently, YNHHS IT team members Jennifer Travers, Glynn Stanton, Elliot Jimenez, and Katie Arcangelo; Tina Bennett in Patient Experience; and Leslie Hutchins in Nursing Informatics had been working on a similar project and were happy to partner with the team to speed up distribution of the devices. IT obtained, reimaged, and distributed the Family Zoom iPads across five COVID MICU units at YNHHS's York Street Campus and two COVID-designated areas at SRC.

In early April, collaboration between ITS and Pulmonary/Critical Care Medicine leadership resulted in a dramatic expansion of tele-ICU services across YNHHS, with 220 tele-equipped rooms available – up from 70 monitored beds before the pandemic began. The team also set up a daytime tele-ICU care program to support Westerly and Greenwich Hospitals during the day to assist in staffing shortages. In addition, large-volume infusion pumps were moved outside the ICU rooms to reduce the need to don PPE to make rapid changes to IV infusions.

Adjustments continued, punctuated by gestures of support. Generalist Firm Chief Gretchen Berland, MD, and her colleagues created a “PPE mudroom” where caregivers could put on and remove their PPE. They bought plastic containers to store their N-95 masks. One physician noticed a patient was afraid and isolated, so he started to play the patient's favorite music. Another patient loved baked Cheetos, which a physician supplied. Care Coordination rounds were held over Zoom. Even day-to-day attire was changed to scrubs.

Urgent efforts by SCH/YCC and the Section of Endocrinology launched a Smilow Endocrine Neoplasia weekly clinic to handle urgent outpatient consultations during the time when clinics were mostly shut down. Endocrinology also created a Yale Diabetes Center weekly clinic to handle urgent outpatient consultations.

In mid-April, a Comfort Measures Only (CMO) unit was created on Verdi 5E, which provided for 91



THOMAS DONOHUE, MD
VICE PRESIDENT, MEDICINE SERVICES
YALE NEW HAVEN HOSPITAL

patients who sought hospice care. Another supportive care unit was created in the outpatient clinic on NP-4, which fostered an atmosphere of compassion and focused care for patients who were not only dying, but isolated and distanced from their loved ones due to the pandemic. The CMO unit was led by Elizabeth Prsic, MD.

As knowledge about the disease continued to accumulate, it became apparent that COVID-19 symptoms can linger for months after diagnosis. PCCSM physicians Denyse Lutchmansingh, MD, and Jennifer Possick, MD, established the Winchester Chest Clinic's Post-COVID-19 Recovery Program. They continue to partner across YNHHS to care for patients with post-COVID complications.

Moreover, cardiologists Nihar Desai, MD, MPH, and Tariq Ahmad, MD, MPH, added COVID-19 information to their Heart Failure Registry because these patients are at heightened risk of heart failure. The surge of inflammatory cytokines, which the disease can cause, may lead to myocardial damage and eventual heart failure. Under the leadership of Parul Gandhi, MD, the Congestive Heart Failure Transitional Care Clinic at VACHS adapted to the COVID-19 era by combining on-site clinical care with cardiology providers along with telehealth care for nutrition, health psychology, nursing, and pharmacy using both phone and video capabilities.

Rethinking Traditional Firm Structure

The internal medicine service at YNHHS is organized into 12 firms by specialty. On a typical day, teams of one or two residents and one or two interns rotate with attending physicians caring for patients and performing bedside rounds. Each firm is headed by one or more firm chiefs.

Department leadership understood that physicians on the medicine firms would be in high demand and constrained. New rounding practices drawn up by Vincent Quagliarello, MD, Mark Siegel, MD, and Primary Care Residency Director John Moriarty, MD, were announced on March 23 in the teaching firms in order to minimize risk of exposure to patients and providers.

Moreover, on March 26, the department announced the restructuring of its firm system and the manner in which residents, faculty, and hospitalists are deployed. Led by Thomas Donohue, MD, and William Cushing, PA-C, the hospitalists (physicians who care for patients exclusively in the hospital) were spread across new units throughout the hospital.

Responsibilities of the pulmonary, critical care, and general internal medicine specialists were expanded to care for the influx of those needing care. Significant

changes were also made to the units that treated nephrology, medical oncology, and digestive diseases patients.

On March 27, the Donaldson Firm and the Goodyear teaching services were moved to the hospitalist service. On the same day, pulmonary and critical care experts Astha Chichra, MBBS; Geoffrey Chupp, MD; Elaine Fajardo, MD; Shyoko Honiden, MD, MS; Melissa Knauert, MD, PhD; Margaret Pisani, MD, MPH; Mark Siegel, MD; Jonathan Siner, MD; Lynn Tanoue, MD, MBA; and Mayanka Tickoo, MD, became shift commanders for pulmonary and critical care in this new setting. Lydia Aoun-Barakat, MD; Marjorie Golden, MD; Manisha Juthani, MD; and Merceditas Villanueva, MD, led the teams for infectious diseases. In late March and early April, the Cooney, Fitkin, Medical Oncology, Hematology, Generalist, Peters and Klatskin Firms were moved. House staff were moved to other hospital locations. The Klatskin service continued to care for liver patients but at a lower capacity. The Verdi General Medicine service remained unchanged.

To assist clinicians new to providing care without residents or advanced practice providers, Resident Marla Jalbut, MD, MBA, and Departmental Electronic Health Records (EHR) Utilization Specialist Sinead McKernan created three instructional videos with practical directions for placing orders to admit a patient; to provide care during an admission; and to discharge a patient.

Transition to Virtual Visits

In mid-March, Yale Medicine clinic schedules were actively reduced across department practices in an effort to lessen traffic and potential disease spread. Patients were asked to be seen via remote visits by phone or video. All nonessential procedures were postponed.

Ilana Richman, MD; Joyce Oen-Hsiao, MD; and Sarah Mougalian, MD partnered with representatives from each section to rapidly implement the use of video telehealth. The trio partnered with McKernan to prepare support documents for video or telephone visits. By March 16, a majority of patient appointments were performed remotely either through phone calls or video visits. Routine visits were rescheduled for later dates.

For patients of Yale's Dorothy Adler Geriatric Assessment Center, the conversion to virtual visits came with its own set of challenges. Caring for a patient population that might not be tech-savvy proved difficult. Richard Marottoli, MD, MPH; James Lai, MD, MHS; and Assistant Director of Geriatric Services, Kathleen Maturo, walked patients through the process using MyChart and other video tools. Leo Cooney Jr., MD; Mary Tinetti, MD; and Marottoli devised a way to perform cognitive testing by phone.

PCCSM transitioned all of the ambulatory services of the Winchester Chest Clinic (WCC) to telehealth. Because nearly all the physicians in the practice in WCC



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A Moment Worth Sharing

The health concerns for COVID-19 are magnified by the disease's psychological toll. Patients in medical isolation often experience anxiety and loneliness away from their loved ones. Over several weeks, stories have emerged of physicians demonstrating the singular importance of human connection. Samit Shah, MD, PhD, from the Section of Cardiovascular Medicine shared how an act of kindness enabled a terminally ill patient to connect with his wife remotely.

"I have had several patients with COVID under my care. Last week our team admitted an elderly Korean War veteran with COVID viral pneumonia and mild respiratory failure. The patient was a retired costume jewelry designer. He had remarried and had been with his current spouse for 20 years. As he grew older, his mental faculties had diminished, and his wife became his steadfast caretaker. In her own words, she 'could not imagine life without him.'

Despite our best efforts, his condition worsened, and my sense was that he had only hours to days to live. His wife desperately wanted to see him but was limited by hospital visitor restrictions as well as her own condition, as she was suffering from a presumed COVID infection as well. I offered a video conference as an option, but she did not know if she had any devices that were video-capable.

Last Saturday after I had informed the patient's wife that he was gravely ill, I offered to visit her at her home so that she could see him via video. I prepared a full complement of PPE with some guidance from hospital infection control and drove to her home. We called one of our very diligent nurses who was on standby in the patient's room and we were able to allow them to see each other.

He had been almost unresponsive throughout the day, but when he heard her voice and saw her face, he sat up and told her that he was feeling better. She told him that their dog missed him and was looking for him, and he told her not to worry. She pleaded with him that she needed him to come home, and he assured her that he would be home soon.

The patient's wife did have a smartphone, and I was able to teach her to use its videoconferencing feature. We were able to arrange a few more video calls between the

two of them until he peacefully passed away two days after my visit to her home.

This was such a heartbreaking situation. One of the cruelest aspects of COVID is the crushing hopelessness that comes with patients being separated from their families. We were able to utilize technology to bring this husband and wife together for a final few moments, and I think being witness to these terminal video conversations is going to be a common experience for frontline providers during the pandemic."

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ASSOCIATE PROFESSOR
(INFECTIOUS DISEASES)

are critical care board-certified, they were needed in the expanded medical intensive care units. Jennifer Possick, MD, and Denyse Lutchmansingh, MD, redesigned their operations using mainly fellows and faculty considered too high-risk for face-to-face patient management. A team of medical student volunteers helped to arrange the patients in their virtual rooms. 3,359 telehealth/telephone visits occurred from March to June.

The Section of General Internal Medicine's two primary care centers (PCCs) quickly shifted from primarily resident-based care as house staff were pulled from the clinics to care for COVID patients in the hospital. Under the leadership of medical directors Laura Whitman, MD, and Daniel Tobin, MD, MS, these practices, which care for over 10,000 patients, quickly moved to faculty-based care and telehealth with great success. Similarly, Yale Internal Medicine Associates (YIMA) redesigned its practice under the direction of Matthew Ellman, MD, who also developed a program to provide care for residents who contracted COVID-19 infection themselves. General internal medicine faculty included those from the PCC and Yale's Physician Associate Program to create a new program to provide virtual care for patients infected with COVID-19 after they left the hospital to return home.

With a majority of its care given in the outpatient setting, patients of the Section of Rheumatology, Allergy and Immunology began to experience a shortage of hydroxychloroquine (HCQ), a critical medication used

to treat lupus. Hydroxychloroquine helps lupus patients remain in remission. Richard Bucala, MD, PhD, made a direct and successful appeal to Teva Pharmaceuticals to obtain 10,000 tablets of the medication to provide to patients free of charge who couldn't obtain the drug.

Luckily, long before COVID-19 appeared, the VACHS already had systems in place to provide virtual visits by phone or videoconferencing. In fact, virtual care had been used for nearly a decade before COVID-19. Once the pandemic struck, the official switch to telemedicine was led by Christopher Ruser, MD. A website gave veterans access to pharmacy services, appointment scheduling, their personal medical records, and secure email messaging to their VA health care team. In addition to the website, VA Video Connect, a mobile application that gives patients the ability to schedule an at-home video health care visit with a primary care physician, was in use before the pandemic. Most telephone care before the pandemic was done using existing VA phone lines because no clinical providers were working from home at that time.

VACHS clinical staff began online training with telemedicine about two years ago. By fiscal year 2019, all clinicians had been trained to use telephone, video, and secure email messaging, and had carried out at least one video visit with a patient.

In early March, all veterans were contacted about the use of mitigation strategies and COVID-19 precautions at the facility. When the federal government

announced the national stay-at-home mandate, VACHS was already providing full virtual care to patients.

Nonessential visits and elective or non-emergent procedures were converted or cancelled altogether. More than 58,000 veterans utilized telemedicine during the pandemic.

The VA had a call center to triage calls about COVID-19 symptoms, medication refills, or other patient concerns. In mid-March, VACHS started a COVID-19 virtual triage clinic along with drive-up testing.

Communications

Gary V. Desir, MD; Lynn Tanoue, MD, MBA; and Aldo Peixoto, MD, drafted and distributed the first of daily updates on March 11, which kept clinicians, researchers, educators, trainees, staff, and community physicians

informed about critical changes to protocols and policies. This email would be the first of 43 messages sent by Desir to departments and leaders across YSM, YM, and YNHHS during the first wave of the pandemic. These 2,200 recipient email updates continued until June 26, 2020. These updates proved to be a valuable resource, highlighting key information about wellness, clinical care, research, education, and administration.

The department communications team, led by Julie Parry, with the assistance of staff from the Section of Endocrinology and colleagues in the department's business office, created a daily survey to monitor the health of its most valuable resources: its people. The survey consistently drew over 1,100 responses, with its peak of 1,391 on March 19. Reported illness also peaked on March 17, with 2.0% of those surveyed reporting symptoms. The wellness data compiled by Sean Stacy were shared in Desir's daily messages.

Other Challenges Throughout Wave 1

CHALLENGE	SCOPE	STRATEGY	FUTURE EFFORT
Communication	How to communicate rapidly changing information.	Summaries of daily operation meetings emailed to wide audience. Website housed important documents. Town halls also held.	Frequency of meetings and email messages adjusted from daily to weekly as necessary.
Clinical Treatment	Limited experience with new disease.	A team of experts tasked with developing and updating a COVID-19 management plan for use across the health system. Plan incorporated in the EHR and shared on social media.	Continue to release treatment updates. Create and implement protocols for other conditions.
Equipment / Resource Shortages	Possible shortages of ventilators, dialysis machines, and other resources were a grave concern.	A workgroup established a fair and ethical process for the allocation of potentially limited resources. Two solutions that allow the ventilation of two patients on one unit were devised. Extra dialysis machines were obtained.	These policies can be reactivated. New dialysis machines provide extra capability for monitoring patients.
Exposure Risk	Create COVID-positive units within the hospital.	As inpatient volume grew, units were converted into COVID-positive spaces.	Patient census will determine bed stack decisions.
MICU Bed Shortage	More negative pressure rooms and MICU beds were needed.	84 additional MICU beds created by converting 3 negative-pressure floors (NP-15, -14, and -12) previously occupied by Oncology.	Stepwise conversion back to Oncology as situation dictates.
Virtual Care	Care needed to transition from in-person to virtual to reduce virus spread.	Ambulatory Clinic schedules were lessened sessions and non essential procedures postponed. Telehealth platform launched in record time.	Telehealth platform will be expanded and incorporated into overall clinical strategy.
Workforce Planning	Scale up number of teams available for deployment to meet demand.	Recruited faculty, trainees and staff from other clinical services to work on the Internal Medicine service, thus creating One Team.	The One Team concept is now part of our culture.



JENNIFER POSSICK, MD
DIRECTOR, YALE PULMONARY, CRITICAL CARE & SLEEP MEDICINE OUTPATIENT SERVICES

This survey design was replicated by other departments and continued until mid-November, when it was rolled into Yale University's process. Additionally, the communications team built a website to host updates and documentation, and partnered with the Clinical Affairs team led by Jennifer Lacerda to have the most current information available on the page.

Support for Caregivers

As the pandemic continued, additional support for those providing patient care was introduced in conjunction with other YSM departments and YNHHS. On the individual level, stress assessments, wellness checks, hotlines, counseling, quiet reset rooms, mindfulness-based stress reduction, and other programs were created. On a team level, the buddy system, peer support, and coaching were instituted along with team huddles. Town halls and mindfulness sessions were started on the community level. The department also started a peer-to-peer counseling program led by Jennifer Kapo, MD, and Robert Soufer, MD.

In addition, to assist those health care providers who were most affected by COVID-19 on the frontline, a food delivery initiative was started for house staff who stayed home in isolation as well as those who were displaced due to COVID-19. The effort was led by Claudia-Santi Fernandes, EdD, LPC, from General

Internal Medicine. Over 1,050 meals were given to health care workers sick with the disease. \$35,000 was raised in support of this initiative.

Housing in local New Haven hotels was also provided for those physicians and residents who were in need of temporary accommodations due to high demand in high-risk areas, or were ordered to self-isolate but were unable to do so safely at home. Stephen Huot, MD, PhD, and Helen Siuzdak led this effort.

Health Disparities & Diversity, Equity, and Inclusion

Creative solutions were implemented to keep many existing diversity, equity, and inclusion initiatives moving ahead. Since travel was restricted, diversity committee members were unable to visit Historically Black Colleges and Universities for recruiting as in year's past. Other opportunities to recruit at national conferences were also curtailed. To overcome these obstacles, Associate Chair Inginia Genao, MD, in collaboration with Minority House staff Organization, Diversity Council and others, organized a virtual information session for future URiM resident applicants, which had over 100 students in attendance across all graduate medical education programs. Program directors, faculty, and current residents joined the Zoom call to share their experiences and answer questions.

In addition, the team partnered with Quinnipiac University to recruit their undergraduate students to visit and learn more about Yale School of Medicine.

The launch of the New Haven pipeline project, to introduce medicine to younger audiences, has been delayed until March 2021.

Along with existing projects, Genao and her team sought to support the greater New Haven community and limit the spread of the virus. They organized a mask distribution to the community with the assistance of the Yale Center for Clinical Investigation (YCCI) Cultural Ambassadors, made possible by a donation from Masks for CT Organization; Mask Transit; and Richard Bucala, MD, PhD, John Wysolmerski, MD, and Naftali Kaminski, MD. To assist with further outreach in underserved communities, Genao; Charles Dela Cruz, MD, PhD; Marcella Nunez-Smith, MD, MHS; and others participated in a virtual Yale Cultural Ambassadors Town Hall on COVID-19, in conjunction with YCCI. These town halls were held weekly. In addition, a list of resources in numerous languages was created and distributed by Genao to department faculty to share with patients.

Genao also coordinated other mask distributions to underserved New Haven communities.

The COVID-19 pandemic brought health disparities back to the forefront. Black and brown communities have endured a disproportionately high mortality rate

because of this virus, and at the end of May, when George Floyd was killed, we were reminded of the deep-rooted racism in our country. Genao, along with her colleagues across the Section of General Internal Medicine, began hosting town halls to support the URiM faculty, residents, fellows, and trainees within the department. These open forums were a time to meet virtually and connect with others to share frustration and sadness. Genao and Gary V. Desir, MD, sent a message to the department to address these two epidemics. Department residents Sumit Kumar, MD, MPA; Nazeela Awan, MD; Asadullah Awan, MD; Jake Quinton, MD; Janani Raveendran, MD, MEd; Julia Rosenberg, MD; Hannah Rosenblum, MD; Rahul Shah, MD; along with Psychiatry's Kiki Kennedy, MD, and Dentistry's Lydia Hunt, DDS, MPH, arranged YSM participation in the New Haven Green march on Friday, June 5. The Department of Internal Medicine partnered with Yale New Haven Hospital to donate over 3,000 masks for the protestors.

Nunez-Smith and others within the department highlighted health inequities in their in their research. See page 39 to learn more.

Genao partnered with Icahn School of Medicine student Aishwarya Raja to write about the challenges in underserved communities and lessons that can be learned from the pandemic in "Unmasking inequality: the power of community organization during COVID-19" on KevinMD.com.

Advocacy, Community Support and Outreach

In addition to efforts across YNHHS and VACHS facilities, clinicians, educators, researchers, and staff assembled in the community to slow the spread of the virus:

- In mid-March, due to the amount of misinformation regarding COVID-19 and inspired by a fellow section chief, Mary Tinetti, MD, partnered with Richard Marottoli, MD, MPH, to write, "Advice About COVID-19 For People Over 60 With Chronic Conditions," which was published widely and provided to local governments, including the New Haven Mayor's Office. The article discusses the outbreak; the steps that older adults and caregivers can take to stay healthy; and actions that local governments can take.
- A shortage of blood products occurred in early March 2020 that could have affected patient care. The Section of Hematology partnered with Lab Medicine and the Blood Bank to organize blood drives throughout March and April.



ALDO PEIXOTO, MD
VICE CHAIR, QUALITY & SAFETY



MARCELLA NUNEZ-SMITH, MD, MHS
ASSOCIATE DEAN FOR HEALTH
EQUITY RESEARCH

- Naftali Kaminski, MD, the immediate past president of the Association of Pulmonary, Critical Care and Sleep Medicine Division Chiefs, organized weekly meetings of all pulmonary and critical care division chiefs across the United States. In these Sunday night meetings, held before real evidence was available, they compared experiences, shared information and advice, and tried to establish best practices. These meetings were widely attended and reduced the burden of decision making during the early days of the pandemic's spring surge.
- Recognizing that the lack of face coverings could contribute to the spread of the virus, the Community Health Care Van, a 40-foot mobile medical clinic created by Frederick Altice, MD, repurposed its activities starting on April 27. The van assists with combating the COVID-19 epidemic in vulnerable neighborhoods in the New Haven community. It is equipped with examination and counseling rooms and can communicate with Epic, YNHHS's medical record system. The van's mission is to support these neighborhoods by helping reduce community transmission through distribution of PPE and educational materials. In addition, the van provided postpartum visits for mothers and their infants, coordinated with telehealth visits with their doctor. Rather than using public transportation to travel to hospital clinics, mothers and infants could obtain care near their homes and reduce the risks to themselves and the rest of the community.

The van relies completely on outside support. Funding from YNHHS's Medical Staff Fund to provide community outreach jump-started the initiative with some assistance from the March of Dimes to supplement mother/newborn care. The YNHHS Medical Staff Finance Committee, chaired by Lynn Tanoue, MD, MBA, was instrumental in obtaining funding to get the van back into the community, with a stipend that was matched by YNHHS. A number of organizations, including the Yale School of Drama and The Shade Store®, donated face coverings to support the project.

The program is directed by Sharon Joslin, APRN, FNP. Pediatrician Leslie Sude, MD, partnered with the department to offer newborn care. Outreach workers educated and provided PPE to the community, and mothers and newborn infants were scheduled for direct clinical care.

- With the guidance and support of COACH 4M and a faculty mentorship team that bridged Geriatrics and Geriatric Psychiatry, Yale medical students coordinated several volunteer activities to address challenges faced by older adults during the COVID-19 pandemic. These activities included virtual visitation with socially isolated older adults in local assisted living and skilled nursing facilities; partnership with a statewide volunteer network focused on grocery delivery for high-risk older adults; and helping patients and family members of our Northeast Medical Group geriatric home care program to sign up for and use MyChart.



MANISHA JUTHANI, MD
ASSOCIATE PROGRAM DIRECTOR
(INFECTIOUS DISEASES)

- Second-year MD student Annika Belzer was on her clinical rotation when she learned all student rotations had to be put on hold for the next eight weeks because of the pandemic. She spoke with her preceptor, Peter Kahn, MD, MPH, about how students might offer indirect help with the COVID-19 situation. Those discussions quickly turned into the Yale Medical Student Task Force (MSTF). About 100 MD and MD/PhD students called patients who had their outpatient appointments cancelled or rescheduled as virtual visits due to COVID-19, to check on them and make sure they did not have any urgent medical or prescription needs. The students relayed the information to the patients' providers, while on-call faculty members addressed any urgent needs. The first week involved a pilot project with endocrinology led by Silvio Inzucchi, MD. The students contacted about 600 patients over three days. The week of March 30 focused on cardiovascular medicine. The group rapidly created a structure that allowed many students to see results, with the help of Kahn, Inzucchi, Frank Bia, MD, and Peggy Bia, MD. The students received positive feedback from patients who, for example, were "really glad to know they have not been forgotten," and from providers, for whom this extra support reduced their non-COVID workload.
- In early April, the New Haven County Medical Association leadership, current President Deborah Desir, MD, and Managing Director Jillian Wood, teamed up with students from the Frank H. Netter MD School of Medicine at Quinnipiac University to distribute N95 masks to all who requested them.
- In late April, the Yale Cancer Disparities Firewall (CDF) rallied to deliver face masks to local organizations to distribute to city residents. Medical Oncology Section Chief, Roy S. Herbst, MD, PhD, Ensign Professor of Medicine (Medical Oncology) collaborated with Kaminski, who donated the masks to the CDF for distribution. Included with the masks were fact sheets on the proper use and cleaning of cloth masks in both English and Spanish.
- Masks were also provided to support the march on the New Haven Green in June.
- Tapped to advise Connecticut Governor Ned Lamont on when and how to reopen the state were faculty from within the department, including Albert Ko, MD: Harlan Krumholz, MD, SM: Marcella Nunez-Smith, MD, MHS: and Carrie Redlich, MD, MPH. In May, the task force advised the governor on public health and economic recovery.

- Faculty across the department took to the airwaves, print, and web media to inform the public about the virus, instruct on ways to reduce spread; and discuss possible treatments, patient care, and other topics related to the pandemic. Department members were quoted in publications that included *The New York Times*, *Good Morning America*, *CNN*, *Vanity Fair*, *Cosmopolitan*, and *20/20*. From January 1 to December 31, 2020, the department had 11,619* media mentions, with an ad equivalency of nearly \$72.5M*

*These figures do not include media mentions of Yale New Haven Hospital, Yale New Haven Health, or Smilow Cancer Hospital.

- On November 9, Marcella Nunez-Smith, MD, MHS, was named as co-chair of President-elect Joe Biden's COVID-19 Transition Advisory Board. The full board, which includes 10 other physicians, scientists, and public health experts, will guide the incoming administration's response to the COVID-19 crisis, including efforts to manage the surge of infections, ensure the approval of safe vaccines, and protect at-risk populations.
- Led by Luke Davis, MD, a group of 42 YSM clinicians, researchers, and educators sent an open letter to Connecticut Governor Ned Lamont on November 24, detailing the impact of the second COVID surge has had on frontline workers, and urging the governor to enact more restrictive measures to reduce the number of infections. In addition, an online petition garnered over 1,100 signatures. On December 1, Governor Lamont invited Luke Davis, MD; Gary V. Desir, MD; Manisha Juthani, MD; Naftali Kaminski, MD; Albert Ko, MD; Mark Siegel, MD; Jonathan Siner, MD; and Lynn Tanoue, MD, MBA, to meet to discuss workforce issues, surge capacity and potential actions that would decrease the spread of the virus. Also in attendance were Deidre Gifford, MD, MPH, Department of Public Health commissioner; Josh Geballe, chief operating officer; and Paul Mounds, chief of staff.
- In addition, Davis, Juthani, Kaminski, Ko, and others have expressed concerns and action steps to reduce viral spread via local, regional, and national media, including on such social media platforms as Twitter.

There were many more steps taken by clinicians, educators, researchers, and staff during the first wave of COVID-19. For more information, visit: medicine.yale.edu/intmed/.



The Gift of Saying Goodbye

One of the most heartbreaking aspects of the COVID-19 pandemic is that it has prevented hospitalized patients from having visitors, leaving patients to die alone, and depriving families of a chance to say goodbye to their loved ones. But the nurses and clinical staff on EP 9-5, the infectious disease unit at Yale New Haven Hospital (YNHH), have made it possible for many patients and families to actually have that final goodbye—even when the family is half a world away.

During the first weeks of the pandemic, Erin Wilson, RN, MSN, patient service manager for EP 9-5, asked her online neighborhood group in Milford whether any of them had electronic tablets that they could donate. One neighbor bought four small tablets on Amazon and donated them to Wilson's unit at the hospital. Other neighbors donated old iPads and laptops that they were no longer using, for a total of about eight donated devices.

With those devices in hand, the nurses on EP 9-5 began working with families to set up face-to-face calls with patients who were classified as "comfort measures only" (CMO)—patients who were very sick and did not want extraordinary measures to keep them alive. The families of those patients had resigned themselves to never seeing their loved ones again and were thrilled when nurses offered to connect them.

"They said 'Oh my gosh, you mean I can see Mom? I can see Grandma?' That's what really pulled on my heartstrings," Wilson said. "The fact that we were able to do this was just magical."

Reuniting Families around the World and Next Door

One of the most poignant moments came when the hospital staff was able to use Zoom to connect a patient in his 90s who was classified as comfort measures only, with 15 to 20 family members living in different parts of South Korea. Marietta Khalil, RN, the charge nurse on EP 9-5, said staff members worked with the patient's son, who lives locally, and with the hospital's Information Technology Services team to set up the complex Zoom call and make sure everything was HIPAA-compliant, all under very time-sensitive circumstances.

"It was really emotional for everybody there. The one thing that stuck with me is that they (the family members in South Korea) said 'This is priceless,'" Khalil said. The patient was not able to speak, "but he knew his family was there. He cried a little when he saw them."

Khalil helped arrange another emotional reunion that didn't involve any technology at all. When a COVID-positive woman in her 70s was admitted to EP 9-5, Khalil

recognized her last name and realized that the woman was the wife of a patient who had been admitted to the ICU several days earlier. When the man was transferred from the ICU, hospital staff arranged for him to be in a room on EP 9-5 next to his wife's room.

Hospital clinicians, together with the couple's son on the phone, had to break the news to the wife that her husband of about 50 years had very little time left. They wheeled her next door to his bedside, and the couple was able to spend several hours saying good-bye to each other—a rarity during the pandemic.

"She was extremely grateful—it really meant the world to her," Khalil said. Hospital staff became very close to the woman during her stay at YNHH, and checked in on her frequently after her husband died. "We all comforted her when her family couldn't," Khalil said.

No Longer Feeling Useless

In the early days of the pandemic, before receiving the donated electronic devices, the nurses and clinical staff on EP 9-5 had to watch patients

die alone without having any contact with family members—an experience Khalil described as "horrible."

"They never imagined dying alone in a hospital. Having a nurse by their side to comfort them is good, but it doesn't at all compare to seeing and hearing your family."

During those times, Khalil said she was feeling "pretty useless. I felt like there was nothing we could do for these patients." But once she and her colleagues started setting up Zoom meetings with their loved ones, Khalil felt that "finally I can do something that

means something to them and that can really help them."

The staff on EP 9-5 has always been incredibly strong and compassionate, says Sheela Sheno, MD, MPH, a physician specializing in infectious diseases. The unit has historically treated patients with HIV/AIDS, many of whom have complex social, psychological, and medical needs.

"Staff on this unit are accustomed to managing a lot of nonmedical issues and serving patient needs that go beyond tests and medicines and more traditional medical interventions," Sheno says.

Once the pandemic began, EP 9-5 was the first unit at YNHH to care for COVID-19 patients.

As a truly historic medical event, the COVID pandemic has naturally inspired a huge amount of research. "There are a million minds working on the science," Sheno says. "But sometimes we get lost in the science. That human element is so important. There are incredible human stories that we don't spend enough time thinking about."

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RESEARCH

As the frequency and geographic distribution of COVID-19 progressed, so did the concern for the safety of all persons engaged in research activities and in turn the impact of the virus on public health. A comprehensive review of research in the department resulted in cessation of all nonessential research in wet/dry laboratories across campus. Research was shut down in mid-March 2020. These efforts were organized by the Vice Chair of Basic Research, Lloyd Cantley, MD, and the Vice Chair of Clinical Research, Robert Soufer, MD.

“There was a tremendous effort that everyone in the department put in to both shut down their research without losing everything, and then reactivate it without inducing a new outbreak.” —LLOYD CANTLEY, MD



ONYEMA OGBUAGU, MBBCH
ASSOCIATE PROFESSOR OF MEDICINE
(INFECTIOUS DISEASES)

Labs Shuttered Across the School of Medicine

The process of shutting down the laboratories required tremendous collaboration by all laboratory personnel. With limited notice, laboratories were able to suspend nearly all in-person experiments while following environmental and safety standards.

Personnel prepared their work spaces for shutdown by ramping down all operations. Laboratories ceased all functions without knowing when experiments would resume. From inspecting equipment to halting shipping, receiving, and management of materials, to more complicated issues like waste management and decontamination, procedures were followed to minimize safety issues. For research involving animals, veterinary care and husbandry was provided primarily through the Yale Animal Resource Center (YARC).

Since most on-campus research efforts were paused, laboratory personnel were encouraged to be productive and challenge themselves intellectually by working from home, including analyzing data, writing grants, and planning experiments. Many found themselves holding virtual meetings with colleagues and becoming creative with remote work.

The restrictions put in place had a significant effect on the department's traditional research projects. While some research was disrupted entirely, other projects were repurposed to confront the current health crisis: research on SARS-CoV-2. In late March, the Yale Center for Clinical Investigation (YCCI) implemented resources to assist researchers who wanted to pursue this work. Yale's Research, Clinical and Data Driven Responses to COVID-19 website began tracking data repositories, biorepositories, and other resources to assist in research efforts.

For many junior investigators, the pandemic had the potential to derail their career progression. In academia, milestones are set for faculty members depending on their rank and chosen track. Faculty also have a specified amount of time to fulfill research requirements. For example, an assistant professor in the Traditional, Investigator, and Clinician-Scientist tracks may devote between 50-80% of their time to research. But as the clinical demands of the pandemic required more of their time and research was halted across Yale, these faculty members were at risk of failing to meet these requirements in the allotted amount of time.

Yale University and Yale School of Medicine (YSM) made some programmatic changes to support the faculty during the pandemic. In March 2020, Provost Scott Strobel announced that Yale would grant tenure-track faculty a one-year extension to

their current appointment. YSM partnered with departments across the school to offer gap funding to support junior investigators who needed additional financial support. The program was announced in August 2020. A new section on the CV supplement was also added to note COVID-19 clinical work.

Eligible faculty for the gap funding were assistant professors on the Traditional, Investigator, and Clinician-Scientist tracks with 50% or more effort dedicated to research. Of the 33 members of the department who applied for the funding, 100% received it.

Advanced Therapeutics Group

The department formed the Advanced Therapeutics Group, an interdisciplinary group of departmental and basic science faculty that met weekly through July 2020 to discuss features of the disease; review the scientific basis of such candidate therapies as convalescent plasma; and make connections for members to obtain more information. Fifty-one members from the department participated in the group, which led to numerous clinical trials and key observations of the disease. The team was led by Rick Bucala, MD, PhD, the Waldemar Von Zedtwitz Professor of Medicine (Rheumatology) and professor of pathology and of epidemiology (microbial diseases); and chief of rheumatology, allergy and immunology; and Naftali Kaminski, MD, the Boehringer-Ingelheim Endowed Professor of Internal Medicine and chief of pulmonary, critical care, and sleep medicine.

Reactivation of Research

A three-phase reactivation of in-person research began in early June 2020. The purpose of the phased approach was to allow for the gradual reopening of research activity, while maintaining the health and safety of all staff members. The reactivation phases followed strict procedures and guidelines from both the State of Connecticut and Yale University to decrease the spread of COVID-19.

In order to mitigate the possibility of an outbreak, specific procedures were set down for those whose research qualified them to return to campus. The procedures included training on safety, daily health checks and symptom monitoring, and the required use of PPE; and physical and temporal distancing as well as rigorous cleaning standards.

Each phase granted more access to on-campus research with the flexibility of shifting between phases based on federal, state, and local public health guidance in a rapidly evolving and changing situation.

As was the case at YSM, research was shut down at VACHS. For research to start again, each area had to submit a plan to the local research office that had to be cleared by both Hospital Epidemiology and the research group leadership.

Equitable Access to COVID Data for Research: Yale DOM COVID Explorer

In mid-July, in order to provide equitable access to COVID-related hospital data for research purposes, the Department of Internal Medicine launched the Yale DOM COVID Explorer (DOM-COVX).

Created by F. Perry Wilson, MD, MSCE, and his team at the Clinical and Translational Research Accelerator, the DOM-COVX tool is an open-access dataset with clinical data from more than 3,000 COVID-19 positive patients across Yale New Haven Health. This resource is available to the Department of Internal Medicine and can be used to generate hypotheses; to support research projects; to provide preliminary data for grant applications; and to foster inquisitiveness among department faculty. This project highlights the faculty's commitment to an expansion of the department's intellectual culture and the vision of continued research development within the department. To date, 20 data engagement groups are working with this information, and several papers and grant submissions have been published or submitted as a result.

Phase 3 Vaccine Trials

In August 2020, Yale School of Medicine and Yale New Haven Hospital announced the start of Phase 3 of the Pfizer vaccine trial at the hospital. This groundbreaking study was one of several vaccine trials to be undertaken in hope of finding a scientifically validated vaccine in the shortest amount of time. The study is a collaboration between BioNTech SE and Pfizer using modified RNA and is a novel way to create a vaccine for use in humans. Rather than using the part or whole of the actual virus in an inactive form to create immunity, this vaccine candidate uses a genetic code (modified RNA) to make the body generate proteins that resemble the SARS CoV-2 virus spike protein, thereby stimulating development of antibodies against it. Antibodies against the

spike protein, a projection from the COVID virus that allows it to attack cells and infect a person, may block the infection from taking hold if the body comes in contact with the virus. In Phases 1 and 2 of the trial, this novel vaccine has proven safe and effective in generating an appropriate immune response. This third phase hopes to show that it can prevent infection. Onyema Ogbuagu, MBBCh, is the principal investigator on the study.



COVID-Related Research

Many COVID-related research projects emerged as a result of the department's commitment to innovation, creativity, and scientific rigor.

Internal Medicine has many active research projects investigating complications of the disease on various organ systems; overall health disparities across different populations; and operational and logistical challenges posed by the pandemic.

Current projects include:*

- Abnormal blood clotting and platelet dysfunction in patients with COVID-19
- Anti-rheumatic disease therapies for the treatment of COVID-19
- Decreased plasma renalase associated with worse outcomes in COVID-19
- Mechanism of acute kidney injury in SARS-CoV-2 and therapeutic utility of renalase agonists
- Cardiovascular complications stratified by age and outcomes for patients with cardiac conditions
- COVID-19's effects on vulnerable populations and health disparities across different populations
- COVID-19's effects on patients with cancer and hematologic malignancies
- COVID-19's effects on children
- COVID-19-induced collateral damage in limited resource settings
- COVID-19's interaction with insulin signaling and obesity-associated insulin resistance in a genetically modified mouse model
- Evaluation of volatile organic compounds as diagnostic markers of COVID-19
- Fatty acid metabolism and its impact on T-cell immune response
- Functional assays involving humoral response
- Genetic predisposition to severe COVID-19 disease
- Identification of cytokine profiles associated with BMI in patients with COVID-19
- Immunologic responses
- Impact of COVID-19 on the liver
- Interactions among diabetes, obesity, and hyperglycemia in older patients with COVID-19
- Mask adherence among health care workers
- Mouse modeling of COVID-19 disease
- New-onset diabetes as a result of COVID-19
- Neurological complications and neuroinvasive potential of the disease
- NLRP3 activation

- Outcomes of COVID-19 infection in patients with HIV and opioid use disorder
- Provider satisfaction with e-consults during the pandemic
- Rates of new-onset type 1 diabetes and diabetic ketoacidosis in COVID-19 versus influenza infections
- Restructuring residencies for a possible second wave
- SARS-CoV-2 interaction with host cells
- SARS-CoV-2 viral load correlation with clinical severity in immunocompromised patients
- Self-replicating RNA vaccine against SARS-CoV-2 and novel pandemic viruses
- Targeted goals of care for older patients with COVID-19
- Transition of in-person clinics to telehealth
- Use of tocilizumab for COVID-19 patients
- VALIANT project to track the outcome of older adults admitted with COVID-19
- Viral proteins in urine and other biospecimens for use as biomarkers of kidney injury and the virus' impact on kidney transplant recipients

Department researchers are also working on the following clinical trials:*

- Camostat mesylate in COVID-19 outpatients
- Convalescent plasma
- MIF antagonism
- Immunophenotyping assessment in a COVID-19 cohort (IMPACC)
- Pfizer vaccine trial
- Remdesivir
- SARS-CoV-2 recombinant spike protein nanoparticle vaccine (SARS-CoV-2 rS) with Matrix-M1 adjuvant
- Targeting TMPRSS2 in early COVID-19

Other clinical research projects quickly developed with the support of YCCI and the Smilow Clinical Trials office teams led by Roy Decker, MD/PhD; Joyce Tull, MSN, RN, CCRP; and Patricia LoRusso, DO. The clinical trial enrollments were quickly resumed after the teams developed new workflows for remote operations.

One unsolved mystery for doctors and patients is the long-term effects of COVID-19. Alfred Lee, MD, PhD, partnered with Hyung Chun, MD, to examine blood samples of 68 patients with COVID-19. They found that injury to endothelial cells may be a key indicator of COVID-19 severity.

Samit Shah, MD, PhD, and Alan Enriquez, MD, contacted national training program leaders of their respective subspecialties to assess the impact of COVID-19 on their training programs. They each published their findings:

- Shah S, Castro-Dominguez Y, et al. "Impact of the COVID-19 pandemic on interventional cardiology training in the United States." *Catheterization and Cardiovascular Interventions*, August 2020: doi:10.1002/ccd.29198.

This paper concluded that the COVID-19 pandemic has substantially affected interventional CV training in the United States, with many fellows at risk of failing to satisfy current program procedural requirements:

- Singla VK, Jain S, Ganeshan R, Rosenfeld LE, Enriquez AD. "The Impact of the COVID-19 Pandemic on Cardiac Electrophysiology Training: A Survey Study." *Journal of Cardiovascular Electrophysiology*, November 4, 2020. doi: 10.1111/jce.14805.

This study found that while nearly all fellows and programs experienced an interruption in procedural volume, only a minority felt unprepared for independent practice.

In July, Amy Justice, MD, PhD, was chosen to participate in the COVID-19 Insights Partnership, a joint initiative between the U.S. Department of Veterans Affairs (VA) and the Departments of Energy (DOE) and Health and Human Services (HHS). As VA-DOE Scientific Liaison and Head of the Data/Analytics Group, Justice will work closely with VA and DOE scientists to maximize the clinical effectiveness of their joint research. She has served in a similar role for another research initiative between VA and DOE for the past two years. The COVID-19 Insights Partnership will focus on increasing knowledge of COVID-19, including vaccines, treatments, virology, and other critical topics.

*At the time of publication, the projects and clinical trials were underway.

Department members of the Advanced Therapeutics Group included:

Choukri Ben Mamoun, PhD
 Jeffrey Bender, MD
 Robert Bona, MD
 Richard Bucala, MD, PhD
 Vaidehi Chowdhary, MBBS, MD
 Hyung Chun, MD
 Geoffrey Chupp, MD
 Joseph Craft, MD
 Charles Dela Cruz, MD, PhD
 Nihar Desai, MD, MPH
 Evelyn Hsieh Donroe, MD, PhD
 E. Jennifer Edelman, MD, MHS
 Lauren Ferrante, MD, MHS
 Liana Fraenkel, MD, MPH
 Rajagopalan Govindarajan, MD
 Erica Herzog, MD, PhD
 Monique Hinchcliff, MD, MS
 Raymond Johnson, MD, PhD
 Naftali Kaminski, MD
 Insoo Kang, MD
 Jonathan Koff, MD
 Lisa Korn, MD, PhD

Michael Kozal, MD
 Priti Kumar, PhD
 Alfred Lee, MD, PhD
 Lin Leng, PhD
 Maricar Malinis, MD
 Mark Mamula, PhD
 Richard Martinello, MD
 Ruth Montgomery, PhD
 Sukanya Narasimhan, PhD
 Lauren Pischel, MD
 Christina Price, MD
 Carrie Redlich, MD, MPH
 Changwan Ryu, MD
 Maor Sauler, MD
 Albert Shaw, MD, PhD
 Abbas Shojaee, MD
 Jonathan Siner, MD
 Joseph Vinetz, MD, BS
 Andrew Wang, MD/PhD, AB
 Adam Wisnewski, PhD, BS
 Lawrence Young, MD



Schwartz Finds “Heart of Gold”

At Yale New Haven Hospital (YNHH), visitor restrictions were put in place in mid-March 2020 to protect patients, families, employees, and the community during the COVID-19 pandemic. While these restrictions were in the best interest of the patients, some patients felt lonely without having their loved ones near them while they battled their illness. The challenges posed by COVID-19 led to some creative thinking among the medical and nursing staffs in caring for the whole patient.

Jeremy I. Schwartz, MD, assistant professor of medicine (general medicine) and epidemiology (chronic diseases) took over the care for a patient in his 70s who was COVID-positive and who “posed some challenges to the staff in caring for him.”

“In addition to chronic lung disease and other conditions that had made him particularly susceptible to COVID, his prolonged illness and isolation in the hospital were causing him to act out,” explained Schwartz. “He was abrasive to the staff. I had to talk to him a few times and let him know that he couldn’t act like that to the people who were trying to care for him.”

The next morning, the patient was still ornery, so Schwartz asked him what would make him happiest right now.

“My guitar,” said the patient. He launched into a story about his six-string and 12-string guitars, and how he used to perform.

“His face lit up,” said Schwartz. “I told him to give me a while and see what I could figure out.” Schwartz and his resident, Jihoon Kim, MD, MSc, finished their round on the other patients, and when he could, he contacted the patient’s long-term care facility in Hamden. Kim, a psychiatry resident, volunteered to serve in Medicine while on his vacation. Schwartz explained



the situation and was pleasantly surprised when the facility staff said he could pick up the guitar. Schwartz drove to nearby Hamden where he obtained the six-string guitar.

Schwartz returned to the YNHH’s Saint Raphael Campus, put his personal protective equipment back on, and delivered the guitar. The patient was thankful and started tuning and playing it right away.

“The rest of the day, you could hear him playing in his room,” recalled Schwartz. “His entire persona changed instantly and dramatically. In addition to the patient, the staff were also very appreciative. The next morning, I asked him if he would give us a little concert, and he played Neil Young’s ‘Heart of Gold.’ He had a great voice.”

The next morning, Schwartz asked him if he would like to perform for a larger group of doctors. He was really excited and proud to have the opportunity. “I sent a message to the residents and faculty of the Yale Primary Care program, and he

performed live via Zoom—sort of a pop-up concert right from his hospital room. That was my final day caring for him.” He was discharged the following week, one of over 3000 patients discharged with COVID-19 throughout the Yale New Haven Health System since the start of the pandemic.

“This story encapsulates what we believe here at Yale,” said Patrick G. O’Connor, MD, MPH, the Dan Adams and Amanda Adams Professor of General Medicine and chief of General Internal Medicine. “Jeremy recognized that this patient needed more than his medical expertise. He treated the whole patient, not just his disease, which made a huge difference for the patient and the other health care professionals involved in his care. Jeremy is a truly remarkable role model for a patient-centered physician who goes ‘above and beyond,’ and whom we should all emulate!”

Originally published June 8, 2020

Research on COVID-19 and Health Disparities

Under the leadership of Marcella Nunez-Smith, MD, MHS, from the Section of General Internal Medicine, the Yale Equity Research and Innovation Center (ERIC) has partnered with collaborators across Yale, the City of New Haven, the region, and nationally to respond to the COVID-19 crisis. A team of over 50 YSM researchers has met regularly since April to investigate disparities in access to testing, outcomes, and effects of the pandemic on non-COVID ambulatory service delivery across Yale New Haven Health. ERIC partnered with the African American Research Council and the NAACP to conduct a first-of-its-kind national survey assessing African Americans’ COVID knowledge, attitudes, and behaviors. They are working with colleagues at the Yale School of Public Health to evaluate the State of Connecticut Department of Public Health Contact Tracing Program. Thanks to a generous donor gift, ERIC launched a project to examine supportive services for self-quarantine or isolation at the local, regional, and national levels. Finally, with an NIMHD-funded RADx-UP award, ERIC researchers will enhance and amplify the COVID-19 diagnostic testing cascade in the U.S. Virgin Islands and Puerto Rico by using community-based assets – Federally Qualified Health Centers (FQHCs) and their community-based organization (CBO) partners – to address barriers to full participation in the testing continuum from diagnosis through to self-isolation and quarantine.

Yale-Led medRxiv Leading Source of COVID-19 Discoveries

A site co-founded by Harlan Krumholz, MD, SM, and Joseph Ross, MD, MHS, for sharing preliminary medical research called medRxiv (pronounced “med archive”) has become a leading source of scientific discovery related to the COVID-19 pandemic.

Known as a preprint server – an online archive of scholarly papers that have not yet been peer-reviewed – medRxiv allows scientists to share new discoveries and research findings in the clinical and health sciences as rapidly as possible in order to accelerate possible treatments.



MARICAR MALINIS, MD
ASSOCIATE PROFESSOR OF MEDICINE
(INFECTIOUS DISEASES)

The researchers launched medRxiv in June 2019 in a partnership with the Long Island-based Cold Spring Harbor Laboratory and with *The BMJ*, a global medical journal. The site received a \$2 million award from the Chan Zuckerberg Initiative in May 2020 to support its operations. Krumholz and Ross recently reported on the submissions, downloads, and experience over the first year of medRxiv in the November 10, 2020 issue of *JAMA*.

Sharing scientific data is especially critical during a pandemic. As of November 18, 2020, there were over 13,400 articles posted on medRxiv for the scientific community to view, including over 8,300 reports of COVID-19 research from around the globe. These included studies of the impact of so-called super spreaders on disseminating COVID-19; the estimation of the true infection rate of COVID-19 in each country; and a novel antimicrobial coating that has been found to be effective against the virus for hours after application.

EDUCATION

As the department leadership team planned for the outbreak of COVID-19 in Connecticut, they decided that action was needed to preserve the department's most valuable resource: its people.

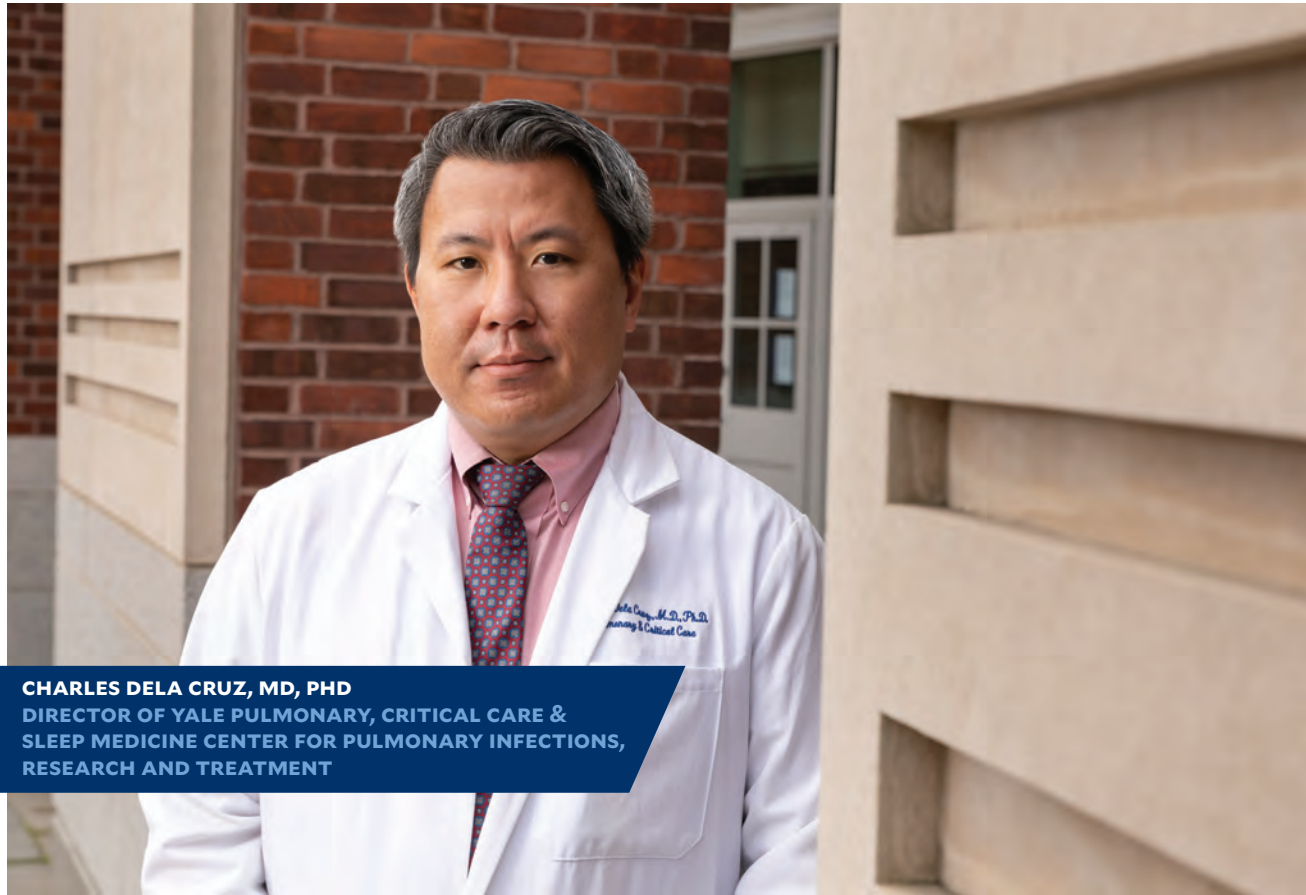
Department Chair Gary V. Desir, MD, Paul Beeson Professor of Medicine, announced on March 11 that all department in-person meetings would be cancelled through the end of March, including Medical Grand Rounds, the department's weekly training forum.

“We had a major impact on both patient care and education. I view them both as equally important. During the first phase of the pandemic, we focused on educating other physicians and staff on how to care for patients as best they could.”

—EROL FIKRIG, MD



MERCEDITAS VILLANUEVA, MD
ASSOCIATE PROFESSOR OF MEDICINE
(INFECTIOUS DISEASES)



CHARLES DELA CRUZ, MD, PHD
 DIRECTOR OF YALE PULMONARY, CRITICAL CARE &
 SLEEP MEDICINE CENTER FOR PULMONARY INFECTIONS,
 RESEARCH AND TREATMENT

Balancing the department’s educational initiatives with the overwhelming demands of clinical care proved to be difficult. Due to heavy clinical duties, the Section of Pulmonary, Critical Care and Sleep Medicine made use of opportunistic educational opportunities rather than formal events, but focused on ways for their younger physicians to excel. Because information was changing so rapidly, the Section of Infectious Diseases started daily virtual COVID didactic rounds to discuss treatment plans and educate other physicians involved with direct patient care. Along with delivering important information, the infectious disease specialists answered questions from across the hospital. Their expertise enabled them to relieve some anxiety expressed by clinicians. The section also held daily update calls because information was changing so quickly. Hundreds of people from across the university attended these educational calls. There were also concerns across VACHS about exposure, so Shaili Gupta, MBBS; Richard Sutton, MD/PhD; Brian Linde, MD, MPH; and Dan Federman, MD, set up information sessions for all facility staff to ask questions and voice concerns. Epidemiologist Louise-Marie Dembry, MD, MS, MBS, also provided guidance on the calls.

At both YNHHS and VACHS, teaching conferences, morning reports, and firm conferences all converted

to virtual meetings. Many other sections without such a heavy clinical load began virtual didactics, journal clubs, and grand rounds, which were more widely used than previously and run by many of the physicians who were considered high risk.

The teaching firms at YNHHS were restructured as a result of the influx of COVID-19 positive patients. As a result of the changes, the education of trainees was focused on caring for patients with the disease. Department fellows were also affected. Infectious diseases fellows worked in the YNHHS COVID-19 Call Center answering questions from the community. They also still served as fellows, providing back-up on all ID services. Fellows from Geriatrics and Medical Oncology/Hematology served as residents on the firms. Endocrinology fellows filled in as extra house staff within General Medicine. Hematology/oncology fellows covered patients at both YNHHS campuses, essentially performing residents’ duties. Advanced practice providers in Hematology/Oncology stepped up to cover services across both York Street and Saint Raphael campuses. General Internal Medicine, cardiology and nephrology fellows cared for COVID-19 patients. See page 20 for more information on the firm transformation.

Medical Grand Rounds

Medical Grand Rounds returned after a short hiatus to focus on the COVID-19 pandemic with virtual presentations. The presentations hit record numbers for attendance due to the desire for up-to-date information along with a sense of community.

The scientists and clinicians at YSM and YNHHS performed heroically, facing daunting obstacles as they worked to tame the COVID-19 pandemic in Connecticut. That was the message from a panel of Yale experts who gathered on March 26 for “COVID-19 Update: Caring While Keeping Safe,” a virtual discussion sponsored by the Department of Internal Medicine’s Office of Global Health (OGH). Asghar Rastegar, MD, was the moderator.

Yale’s work has included that of Marie-Louise Landry, MD. When tests for COVID-19 were lacking early in the pandemic, Landry and her lab developed one that met the exacting specifications set forth by the Food and Drug Administration (FDA), which were modified along the way as the pandemic grew and the need for testing became ever more urgent. In order to develop a test quickly, Landry and the laboratory staff adapted the Centers for Disease Control and Prevention test to the instruments available on site, established its accuracy, submitted their data to the FDA, and were able to fill an important need at YNHHS. Landry noted

that a significant obstacle to attaining the desired testing levels at Yale as elsewhere is the sporadic supply of reagents – the substances that laboratory tests use to identify the contents of patient samples.

Richard A. Martinello, MD, described engineering controls designed to limit the spread of the virus. Many rooms were converted to negative pressure by YNHHS facility engineers in direct response to the COVID-19 pandemic. Martinello also described a constant need for more PPE for health providers, a problem plaguing medical facilities across the country.

Other aspects of protecting frontline health care workers included their monitoring their own health, according to Mark Russi, MD, MPH.

Intensive care units are another point of great concern nationwide, including Connecticut. Charles Dela Cruz, MD, PhD, said the Yale system has developed procedures for determining who needs intensive treatment. There also is the need to treat patients with other conditions that are more typically seen in the ICU.

Yale worked diligently on tracking the transmission of COVID-19. Saad B. Omer, MBBS, MPH, PhD, said most current transmissions in Connecticut come from domestic sources, as they do in New York City and Boston. Omer said the ultimate goal is a safe and effective vaccine for the novel coronavirus.



MARGARET PISANI, MD, MPH
 VICE CHIEF FOR FACULTY DEVELOPMENT AND MENTORING
 (PULMONARY, CRITICAL CARE & SLEEP MEDICINE)

The April 23, 2020 Medical Grand Rounds was titled “COVID-19 Clinical Management at Yale: What We’ve Learned So Far.” It was presented by Mercedes Villanueva, MD; Maricar Malinis, MD; and Mayanka Tickoo, MD. This event had a record-breaking 1,375 people on the virtual seminar.

Villanueva started with the natural history of the disease, its epidemiology, clinical presentation, and testing. She was involved in the first diagnostic case at YNH and couldn’t believe how much the world had changed in six short weeks. Malinis highlighted treatment options and the treatment guideline, which is frequently revised on the basis of the most up-to-date clinical data, local clinical experience, and expert opinion. Tickoo presented management of critically ill COVID-19 patients in the intensive care unit (ICU). She discussed respiratory support modalities, mechanical ventilation, the use of extracorporeal membrane oxygenation (ECMO), and such surge strategies as ventilator splitting.

Hannah Oakland, MD; Jonathan M. Siner, MD; Alfred Lee, MD, PhD; Charles Dela Cruz, MD, PhD; Elaine C. Fajardo, MD; and Margaret Pisani, MD, MPH presented at the April 30, 2020 event on “Critical Care in COVID-19 Patients.” This virtual seminar was attended by 784 people.

Oakland presented the case of a 33-year old man that was extraordinary but had become commonplace in the MICU. Dela Cruz discussed critical illness from the coronavirus pneumonia standpoint as compared to SARS in 2003 and MERS in 2012, and reviewed data from Wuhan, China; Lombardy, Italy; and Seattle, Washington. He highlighted the potential long-term health care complications in individuals recovering from COVID-19 and discussed ongoing research findings. Siner’s talk covered acute respiratory distress syndrome (ARDS) outside of and during a pandemic like COVID-19. He reviewed the treatment for ARDS and noted that the focus should be on low tidal ventilation, prone positioning, and sensible use of positive end-expiratory pressure (PEEP). Lee reviewed COVID-associated coagulopathy (CAS), which is characterized by such unique features as high D-dimer and fibrinogen levels. Fajardo explained the concern regarding a potential ventilator shortage during the surge in critically ill COVID-19 patients in Connecticut. She explained the principle behind expanding ventilator capacity as well as the limitations of using ventilators that were not designed for critical care in patients with ARDS. She also described two Yale solutions: the Vent Multiplexor and PreVents devices. Pisani described the impact of the disease on the management of critically ill patients. She explained why COVID-19 has altered patient care,



SAAD B. OMER, MBBS, MPH, PHD
DIRECTOR, YALE INSTITUTE OF GLOBAL HEALTH



RICHARD MARTINELLO, MD
MEDICAL DIRECTOR, INFECTION PREVENTION

and finished by emphasizing the important issue of the long-term effects of critical illness on health.

As the last Medical Grand Rounds of the academic year, the department held its special event focused on sharing stories on June 1, 2020. The fourth annual “Stories of Yale Internal Medicine” focused on seven clinicians sharing COVID-19 stories. Participants included Bethany Canver, MD; Manisha Juthani, MD; Elizabeth Y. Li, MD; Christina Demopoulos, MD; Cynthia Frary McNamara, MD; Hafsa Nawaz, MD; and Sharon Ostfeld-Johns, MD. Juthani’s piece, titled “Nanima,” is about her relationship with her resilient grandmother whom she called Nanima; her health challenges; and her passing during the COVID-19 pandemic. “Nanima” was published in *The New England Journal of Medicine* in October 2020.

IM Inpatient Telehealth Elective

YSM suspended medical and physician associate student clerkships and electives in mid-March 2020. These students received a concentrated eight-day didactic course in June called the IM Inpatient Telehealth Elective to prepare them to go back to the wards in July.

When the COVID-19 crisis hit, Mark Siegel, MD, and Ethan Bernstein, MD, were eager to engage students in supporting their team. They asked for student volunteers to help design a pilot project for a possible elective involving remote support. Rising fourth-year MD student Fouad Chouairi, and rising fifth-year MD students Lina Vadlamani, Amanda Zhou, and Isaac Freedman, all of whom were one week into their IM sub-internship when COVID-19 interrupted their work, raised their hands. They hoped to continue as much of their sub-intern role as they could remotely and were eager to help with patient care related to COVID-19.

When it was clear after four days that the students’ involvement was beneficial to the IM team and to student learning, the pilot was converted to a two-week elective. Students were paired with the same resident and intern on COVID-19 teams for the two weeks. Their roles included writing progress notes; participating in rounds remotely; engaging with patients and their families remotely; and conducting literature reviews based on clinical questions that arose during rounds. The aim was to enable students to learn about the COVID-19 pandemic and gain experience with ICU rounding and documentation while also reducing the residents’ workload.

Educational Challenges

Cardiovascular Medicine Fellow Jennifer M. Kwan, MD, PhD, led efforts to understand how the pandemic affects physician-scientists. With the support of the American Physician Scientists Association (APSA), Kwan conducted a national survey this spring of more than 2,000 members in the field, ranging from current MD-PhD students to mid- and late-career researchers. Her preliminary analysis indicates that the research of women physician-scientists is the most threatened. Young physician-scientists are also bracing for the impact of COVID-19 on their mental health, with post-traumatic stress disorder a potential concern.

Fotios Koumpouras, MD, co-authored, “Stand Together and Deliver: Challenges and Opportunities for Rheumatology Education during the COVID-19 Pandemic,” an article published in *Arthritis & Rheumatology* on how rheumatology education can and should continue during the pandemic. He emphasized the need for flexibility, innovation, and safety as the fellows continue their training.

Other Educational Events

The eighteenth year of Research in Residency Day was altered in April due to the pandemic. With the assistance of the department’s communications team, the poster presentation was held online on a special website so that presenters could interact with virtual attendees.

The Office of the Dean began Dean’s Workshops in late March that focused on the pandemic and featured many department clinicians and scientists.

The department’s Advanced Therapies Group hosted virtual seminars that focused on COVID-19. These included the institutional clinical care experiences from such overseas centers as those in Beijing, China; and a Grand Rounds by Stanley Perlman, MD, PhD, from the University of Iowa, a leading authority on coronaviruses.

The department’s chief residents created a House Staff Educational Series on COVID management. They held six seminars, ranging from palliative care and various therapeutic trials to a webinar with Tehran University of Medical Sciences, in which residents in Iran shared their experiences and insights.

VACHS researchers and clinicians shared their findings in numerous publications during and after the first wave of the pandemic. Four major publications are listed:

- Gupta, Shaili, Federman, Daniel G. “Hospital preparedness for COVID-19 pandemic: experience from department of medicine at Veterans Affairs Connecticut Health care System.” *Postgraduate Medicine*. 10.1080/00325481.2020.1761668
- Spelman, Juliette F.; Brienza, Rebecca; Walsh, Robert; Drost, Paul; Schwartz, Amy; Kravetz, Jeffrey; Pitkin, Patricia; Ruser, Christopher. “A Model for Rapid Transition to Virtual Care, VA Connecticut Primary Care Response to COVID-19.” *Journal of General Internal Medicine*, July 2020. <https://doi.org/10.1007/s11606-020-06041-4>
- Rentsch CT, Kidwai-Khan F, Tate JP, Park LS, King JT, Skanderson M, Hauser RG, Schultze A, Jarvis CI, Holodniy M, Lo Re V, Akgun KM, Crothers K, Taddei TH, Freiberg MS, Justice AC. “Covid-19 Testing, Hospital Admission, and Intensive Care Among 2,026,227 United States Veterans Aged 54–75 Years.” *medRxiv* [Preprint]. 2020 Apr 14:2020.04.09.20059964. doi: 10.1101/2020.04.09.20059964. PMID: 32511595; PMCID: PMC7276022.
- Federman DG, Gupta S, Stack G, Campbell SM, Peaper DR, Dembry LM, Fisher A, Tarabar AF, Kozal M, Ruser CB. “SARS-CoV-2 detection in setting of viral swabs scarcity: Are MRSA swabs and viral swabs equivalent?” *PLoS One*, 2020 Aug 5;15(8):e0237127. doi: 10.1371/journal.pone.0237127. PMID: 32756602; PMCID: PMC7406068.

Good Times Never Seemed So Good

Jorge Moreno, MD, noticed that his patients being treated for COVID-19 felt down and isolated. “The patients were elderly or lived in long-term facilities and they were super isolated,” explained Moreno. “They can’t get visitors. They see us with these big suits without a face coming in to talk to them.”

Moreno and resident Catherine Mezzacappa, MD, MPH, started visiting patient rooms. One older woman had gastrointestinal symptoms and her nausea made eating impossible. She was very depressed. The physicians began to interact with her. Her room lights were turned off, as was the television. She didn’t want to video-chat with her loved ones. She proclaimed that during her 89 years of life, this was the toughest thing she had gone through.

Then Moreno asked the magic question: “Do you like music?” to which she proclaimed, “I really like Dean Martin.”

Moreno and Mezzacappa had a thought—what if they figured out how to play some of Dean Martin’s hits for her and return that afternoon with the surprise? Later that day, the duo grabbed an iPad, brought it into the patient’s room, and played her favorite Dean Martin songs, “Everybody Loves Somebody” and “Volare.”

“Music filled the room for a couple of minutes, and she sat up, which she had not done for us by that point, and she was smiling,” said Moreno.

They wondered which other patients could benefit from the newly christened “Music Rounds.” One patient

loved the Beatles, so they played a few songs for her on the day of her hospital discharge. She laughed aloud and was transformed to another time and place. She even started sharing some antics from her younger years and how each Beatles song reminded her of a different suitor.

They returned to the 89-year-old woman’s room who, with her spirits raised, requested Neil Diamond. Even though not everyone in the room was a Boston Red Sox fan,

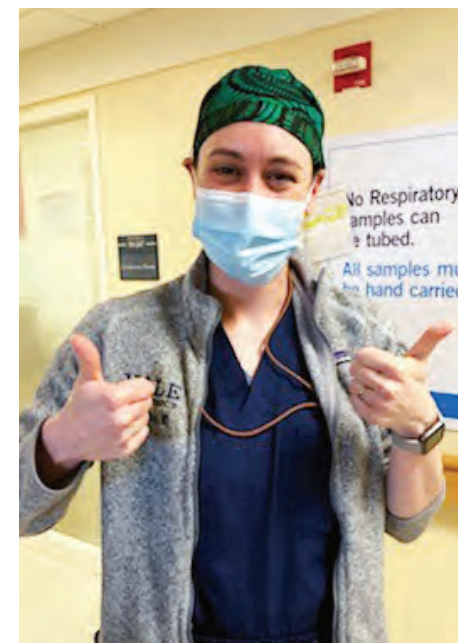
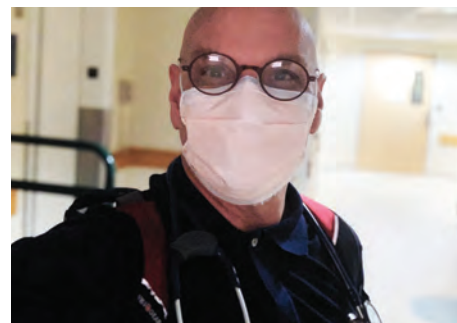
they started off with a “Sweet Caroline” sing-a-long.

“I think in this crazy world, we have to find ways of interacting, and little things like music have been helpful,” Moreno said. “At the moment, we were just trying to bring some joy into a patient’s life, but obviously music is healing. We were doing something for the whole person, not just focusing on their disease. It was very rewarding for us to see her smile.”

Originally published May 12, 2020



Our Frontline Heroes: Views From One Team



Yale's Veteran Virologist Leads a Team to Close the Coronavirus Testing Gap

As cases of the novel coronavirus began appearing in the United States this year, a veteran Yale virologist was keenly aware of the severe shortage of virus testing kits, both nationwide and in Connecticut. That shortage has become a hallmark of the COVID-19 pandemic.

Marie-Louise Landry, MD, professor of laboratory medicine and of medicine (infectious diseases) and director of Yale's Clinical Virology Lab, knew that with a concerted effort, such independent hospital labs as hers could replicate the COVID-19 test used by the Centers for Disease Control and Prevention (CDC) and quickly help expand the country's testing capabilities. But the Food and Drug Administration (FDA), which oversees all diagnostic testing in the United States, still had a massive number of red-tape regulations in place that would initially bar using her test for people who might be infected.

"Even for academic centers, it would have been very hard to set up testing," says Landry, who has studied viruses for four decades. "And there were no patient samples of the virus to work with [in early February], so it was a non-starter."

On February 29, the FDA finally relaxed its rules, allowing labs to develop their own tests and submit their data for approval.

Building a molecular test meant "cooking from scratch."

Landry and her team began working immediately to set up Yale's COVID-19 assay. First, Landry ordered the reagents that are needed to extract the virus' genetic material from patient samples. Reagents are the components that cause a chemical reaction which reveals a sample's properties. Next, she worked to calibrate her lab's polymerase chain reaction (PCR) thermal cycling machines to match the timing and temperature of the CDC's.

"If you didn't have the exact same equipment that public health laboratories use, then you had to prove yours worked precisely the same," she says.

By then it was early March, but Landry still needed a full-length copy of the RNA genetic virus to test the accuracy of her lab's assay. She requested reagents and a copy of the virus from the International Reagent Resource (IRR) and from BEI Resources, both online supply



catalogs maintained by the CDC that provide pathogens and other resources for researchers and public health laboratories. In the meantime, she also tried to order reagents from a commercial supplier, only to find that they were on backorder. Only a small portion of the order could be filled.

Landry also learned that in order to receive a copy of the virus, she would need to complete a 14-page application that required extensive documentation, including proof of past publications. "I called them and said, 'Is this for real?'" Landry says. The entire process would have taken at least a month. Instead, she found a Yale colleague who had already applied for the virus; he quickly added what she needed to his order. While Landry waited 10 days for that viral RNA to arrive, she called New York State's public health laboratory and asked if it would share the genetic sequence and source of the virus that it was using. She received it within a week—albeit just a section of the virus' RNA, not the whole length—and immediately got to work using the limited reagents she could secure.

Putting the new test to work

In order to perform a test, Landry and lab members needed to inject the copy of the virus into biological samples. So they swabbed their own noses and throats, and added the piece of SARS-CoV-2 virus to the samples. Then they ran the samples through a complex process: isolating the virus with a combination of reagents and further purifying the RNA that was separated from the sample. Using PCR, they amplified the amount of RNA and compared the sensitivity of results using different instruments available on site. After running many tests, Landry and her team noticed that the piece of RNA they were working with was too

fragile: it was degrading before it reached the final step of testing.

By this time, Connecticut's state public health lab had patient samples of the virus. It sent a series of 18 blinded samples to Landry's lab. The results matched perfectly; the test was ready.

"I sent the FDA an email saying that we're going live with the test, and I listed the instruments we used and reagents," Landry says. "Then I had a 15-day grace period before submitting our extensive validation studies for review." Her message was sent on March 24; approval was granted on April 1.

Beginning on March 13, she and her team began testing samples from patients already hospitalized at Yale New Haven Hospital (YNHH), followed by other hospitals in the network, including those in Greenwich, Bridgeport, and New London. The team turned results around in 6 hours. Five days later, after additional virology staff were trained, her lab was set up to handle health care worker testing. A third shift to the lab was added and testing ramped up quickly.

The State of Connecticut then approved testing by Yale's pathology lab, further increasing Yale's on-site testing capability, which when combined is capable of providing up to 800 tests per day, depending on the available but sporadic supply of reagents.

At a virtual town hall meeting on March 26 for YNHH health care workers, Yale School of Public Health, Yale School of Nursing, and the medical school community at large, Landry confirmed a situation she had already anticipated: the latest shipment of reagents had been delayed.

"Supply chain is a big issue," she explained. Landry also shared news of PCR manufacturer Cepheid's plans to ship 1,500 two-hour turnaround

tests per week for use throughout the YNHH system. "That obviously will not meet our needs," she said. In addition, after contracting at the outset to supply a high-throughput commercial testing platform, the manufacturer subsequently revealed that no SARS CoV-2 test kits would be available until mid-May due to production issues. Still, testing for health care workers and hospital inpatients continues, thanks largely to the efforts of Landry and her team.

A continuing conundrum and one bit of comfort

During a separate interview, the veteran virologist expressed her overriding concerns about SARS-CoV-2: no one has immunity to the brand-new virus and it transmits very efficiently from person to person. The world had not bargained for a viral outbreak of this type. "While we were waiting for the next pandemic, we thought it would be an influenza strain," Landry says.

She recalls her experience with other coronaviruses, including the severe acute respiratory syndrome coronavirus (SARS) in 2003 and the Middle East respiratory syndrome (MERS) in 2012. The CDC estimates the overall SARS fatality rate as 10%, and for MERS, about 35%. Luckily, neither of those viruses spread easily person-to-person, Landry says.

"I'm comforted at least by the fact that so far, our children seem fine," Landry says, referring to the low hospitalization rates of children with SARS-CoV-2. "That's the bright spot." *Originally published April 6, 2020*

Finance and Administration

The department consists of approximately 1,200 faculty, 350 residents and fellows, and a staff of 400. Over the past decade, the department has experienced significant growth in both its clinical and research mission with a total operating budget exceeding \$300 million. The clinical practice represents more than 50% of the department's operating revenue.

In line with Yale Medicine, the Department of Internal Medicine is furthering the ambulatory COVID-19 recovery planning tailored to the specific needs of our diverse clinical practice. Each section has developed plans as outlined within Yale New Haven Health guidance for provider-based sites and within Yale Medicine guidance for our office-based locations. Important areas to be addressed include: social distancing within practice sites; PPE needs; availability

of clinic staff; availability of provider staff (faculty, APPs, trainees); impact of telehealth on patient engagement; potential financial impact of telehealth/payer mix; and future telemonitoring needs. These plans are to ensure that the department's extensive clinical practice continues to meet the needs of both our external and internal stakeholders while also continuing to monitor the financial consequences of this paradigm shift in delivery of care.

The research efforts of the Department of Internal Medicine have grown significantly during the 2019-2020 academic year. More than two-thirds of the department's faculty are actively involved in research, spanning the spectrum from clinical outcomes and epidemiologic studies to translational and basic science investigations. The department is the single largest research unit at Yale University, with a total of \$124 million in sponsored funding.

Under the leadership of Vice Chair Mark A. Holter, CMPE, CPA, the department is restructuring the business office through centralizing operations to alleviate the operation manager's burden and create an infrastructure solely dedicated to financial management and reporting. The creation of a centralized business unit falls in line with School of Medicine initiatives to develop model business office recommendations.

PANDEMIC RESPONSE

Due to the pandemic, many of the department and section staff were dismissed from campus on Friday, March 13, 2020. They were instructed to vacate their offices and work from home until further notice.

Holter, along with section-dedicated operations managers and human resources personnel, developed a work-from-home plan for staff. Challenges included the need to supply and distribute laptops and other equipment to employees as quickly as possible. Many staff took on additional responsibilities to assist with tasks that arose during the pandemic, such as the department health survey. Excellent service continuity was maintained while operations moved to remote locations.

The finance team was asked to update budget projections at the start of the pandemic, with the possibility of budget cuts and a hiring freeze looming. Department finances were affected due to revenue losses because of the shift in patient volumes, as well as budget cuts. Recruiting for open positions was put on hold and a hiring freeze was instituted.



Faculty Affairs

The COVID pandemic affected academic career development by requiring additional clinical care effort by clinical faculty; severely restricting research laboratory and clinical investigation; and posing considerable challenges for faculty with dependent or sick children or relatives at home.

Led by Lawrence Young, MD, vice chair for Faculty Affairs, the department streamlined appointments, reappointments and promotions processes for July 2020. On March 21, Yale University Provost Scott A. Strobel announced a one-year extension of term for all assistant professors in the traditional, CS, CE, and investigator tracks, as well as for associate professors in the traditional and investigator tracks. Laura Whitley and her assistant Catherine Severino were instrumental

in implementing the term extensions and leaves of absence. Young advised faculty members about their options and worked closely with section chiefs to formulate plans regarding individual faculty. Most eligible faculty members were approved for the term extensions, but others who prepared to proceed with an application for promotion in July 2021 were encouraged to do so.

Faculty triennial and sabbatical leaves during the spring of 2020 were adversely affected by the pandemic. The increased direct patient care demands as well as the need for clinical program leadership and restructuring precluded many faculty members from taking their academic leaves. In other cases, restrictions on travel interfered with triennial and sabbatical plans.

Snacks of Kindness Delivers Goodies to YNHH

In April 2020, a group of staff within the Department of Internal Medicine decided they needed to do something to bring some joy to the frontline caregivers at Yale New Haven Hospital (YNHH). Mastermind Jessica Santore invited Jennifer Caprio, Roberta Biceglia, Nancy Kravitz, Amy Anderson, Julie Parry, and Julise Penn to brainstorm about what the staff could do to relieve some of the stress felt by the physicians working around the clock to treat COVID-positive patients.

"We knew that there was a lot of food being delivered to the hospital," explained Biceglia. "But we felt that if there were quick, convenient snacks that physicians could grab and go and eat as needed, that would be different and enjoyed by all any time of the day."

In this way Snacks of Kindness, its name coined by Caprio, was born. In two weeks, the department staff (and some faculty) raised over \$1,000 from 40 people. Santore, Caprio, and Biceglia assembled the bags of granola bars, chips, gum, trail mix, nuts, and chocolates, and completed the first round of deliveries on

May 7 to the COVID floors at both the York Street and Saint Raphael campuses of YNHH. On May 27, the group made a second round of deliveries of 500 snack bags to the COVID floors and emergency departments on both campuses. *Originally published May 12, 2020*



Other Programs

The effects of the pandemic rippled across the department. Below are two programs highlighted as illustrative examples.

Occupational Health

The COVID-19 pandemic created the unprecedented risk of SARS-CoV-2 infection among health care workers (HCWs) and other essential workers. Concerns about COVID-19 were compounded by shortages of personal protective equipment (PPE), initial limited COVID-19 testing, and confusion regarding the routes of SARS-CoV-2 transmission. Yale Occupational and Environmental Medicine Program (YOEMP) faculty and trainees began to address these challenges early on in the pandemic. In April 2020, Carrie A. Redlich, MD, MPH, director of YOEMP and Adam Wisnewski, PhD, senior research scientist, began a longitudinal study to assess the seroprevalence of SARS-CoV-2 among our HCWs and risk factors. By late December, just prior to COVID-19 vaccination, 14% of the 1,000 HCWs enrolled had evidence of prior COVID-19 infection. Redlich and Wisnewski are continuing to assess the immune response to COVID-19 and now the response to vaccination.

In VA Connecticut Health care System (VACHS)-focused efforts, Brian Linde, MD, MPH, chief of Occupational Health Services, and Efa James, MD, MPH, chief of Occupational Health, VISN1, have been providing and regularly updating occupational health guidance on COVID-19 for VACT and the New England Region, while Louis Fazen, MD, PhD, designed a new clinical informatics system to facilitate VACT employee COVID-19 vaccination efforts; and Jacqueline Cook, MD, MPH, medical advisor, Occupational Safety and Health, VA Central Office, has been working on COVID-19 polices to protect the Veterans Affairs' workforce nationwide.

In efforts to protect HCWs across the Yale New Haven Health System (YNHHS), Mark Russi, MD, MPH, director of Occupational Health Services, YNHHS, worked with multiple partners to minimize HCW risks and optimize PPE despite severe shortages. Russi also collaborated with the Centers for Disease Control and Prevention on guidance documents related to HCWs COVID-19 exposure.

As the COVID-19 pandemic quickly started to affect employees across Connecticut, Redlich and YOEMP fellows, including Queenie Ann Abad, MD, and Joseph Zell, MD, MBA, provided educational sessions and guidance on COVID-19 workplace health and safety to different at-risk employee groups in the state, including K-12 school cafeteria workers, hairdressers, and hotel workers, as well as physicians in training. Zell worked closely with the Connecticut Army and Air National Guard on their COVID-19 pandemic response, policies, and protocols. He also enrolled over 2,000 Connecticut National Guard troops in a longitudinal seroprevalence study to better understand COVID-19 transmission and the duration of the immune response in this critical workforce. Redlich and her team also partnered with the Mohegan Tribe to better understand SARS-CoV-2 transmission and immunity among more than 1,200 Mohegan tribal employees and tribal members in eastern Connecticut as they worked to safely reopen.

Yale Program in Addiction Medicine

The COVID-19 pandemic hit individuals who use substances and those with addiction with particular severity. Such substances as tobacco and alcohol can increase the risk of and severity of COVID-19 infection. Physical and social distancing, as well as social and economic stressors introduced by the pandemic, can lead to increased substance use or return to use among those in remission. Changes in the drug supply, including the surging presence of fentanyl, has created a more toxic and lethal environment for the millions of individuals with opioid use disorder in the United States. Evidence indicates that the COVID-19 pandemic has resulted in increased opioid overdose deaths in many parts of the country. Finally, fewer patients are beginning addiction treatment due to limited access as a result of COVID-19 restrictions placed on outpatient and inpatient practices.

The Yale Program in Addiction Medicine addressed these challenges in several ways. Program faculty and trainees worked closely with New Haven community-based organizations and stakeholders to address community treatment and social needs. Faculty also converted all but essential outpatient visits to telehealth; decreased the frequency of monitoring visits when appropriate; and made certain that outpatient program services at eight outpatient sites, including the Emergency Department and Primary Care, remained available for new patients. The inpatient Yale Addiction Medicine Consult Service moved to remote and electronic consultations when appropriate, and broadened coverage to both YNHHS campuses to ensure high-quality addiction treatment was provided and to address barriers to discharge, including necessary outpatient follow-up. Addiction Medicine Program faculty and Addiction Medicine fellows continued educational programs and provided general medicine attending coverage. The program created

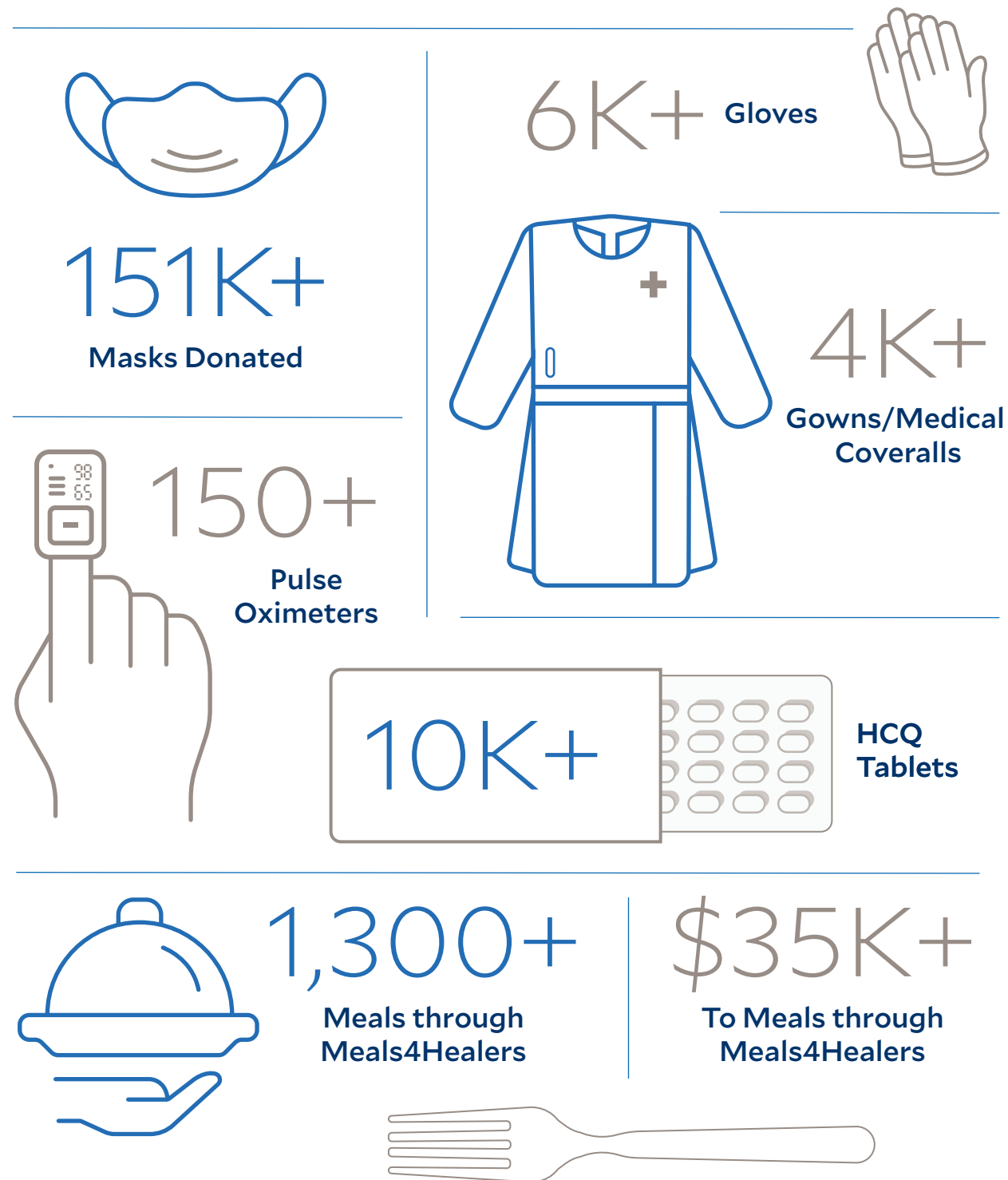
five COVID-19 Addiction Medicine guidance documents for clinicians (adult, pediatric, and hospitalist) and patients that have served as templates for other academic medical centers nationwide. Program faculty published in the *Annals of Internal Medicine* on the impact of COVID-19 on the opioid crisis. Program research was halted or converted to remote assessments where possible, and program faculty conducted and published studies on safe drug supply and the impact of COVID-19 on naloxone use and outpatient buprenorphine and methadone treatment.



Department of Internal Medicine faculty members participate in a variety of programs, clinics, and centers throughout the Yale School of Medicine, Yale University, Yale New Haven Health System, and Yale Medicine. For more information, visit: medicine.yale.edu/intmed/.

Philanthropy

\$5.25M COVID philanthropy dollars
from hundreds of donors including individuals, corporations and foundations



Throughout the COVID-19 pandemic, many stepped up to assist the Department of Internal Medicine, Yale School of Medicine, Yale Medicine, and Yale New Haven Health with monetary donations, as well as donations of personal protective equipment (PPE) and other necessities. Our department was shown tremendous generosity from hundreds of donors, including individuals, corporations, and foundations during these challenging times.

Disclaimer: These are direct donations to the Department of Internal Medicine only, and do not account for those made to Yale Medicine or Yale New Haven Hospital/Health.



Department Chair Gary V. Desir, MD, receives large donation of PPE from AMT Consulting and Yale Chinese Parent Club.

\$100,000 Gift Speeds Exploration of Sobetirome as COVID-19 Treatment

The Department of Internal Medicine is grateful for a generous gift of \$100,000 to speed initiation of Phase II clinical trials of sobetirome, a well-characterized thymomimetic drug, as an early treatment for COVID-19. Naftali Kaminski, MD, chief of Pulmonary, Critical Care and Sleep Medicine and professor of medicine, and his team are pursuing this treatment approach – one that aims to address the lung injury component of COVID-19-induced acute respiratory distress syndrome (ARDS) to halt disease progression. Kaminski’s team believes that sobetirome will enhance lung resilience to injury in COVID-19-induced ARDS and accelerate recovery from the virus. The team obtained an IND from the FDA and is now pursuing additional funding to run the trial.

Originally published April 16, 2020

Yale Medicine Receives Large Donation of PPE

On April 2, Yale Medicine received a large donation of personal protective equipment (PPE) from a Chinese company and a group of Yale parents. The equipment is critical to the fight against the COVID-19 pandemic and came at a time when these supplies were in highest demand.

More than 7,750 KN95 face masks were donated by AMT Consulting in Shanghai, China, with 14,000 additional masks arriving over the next several weeks. Sixteen boxes of hazmat suits (108 sets)

were donated by the Yale Chinese Parent Club.

In addition, 2,000 surgical masks are being donated by Chinese employees and families at Boehringer Ingelheim, Danbury Chinese Alliance Church, and the West Connecticut Chinese Community.

After learning about Yale’s PPE shortage, Jiankan Guo, PhD, a research scientist within the Section of Nephrology, contacted Gary V. Desir, MD, the Paul B. Beeson Professor of Medicine and chair of the Department of Internal Medicine, to see how he could help. Guo partnered with Zhenzhen Wu, Steve Xu, Shanshan Zeng, and Jason Zhao to lead a KN95/N95 drive with more than 170 local Chinese volunteers to solicit PPE donations in both Connecticut and China. They collected over 22,000 masks from inside and outside Connecticut.

Originally published April 3, 2020

Meals4Healers Feeds Health care Providers

Many people asked how they could support the frontline health care providers (HCPs) during the pandemic. Some HCPs were in isolation due to a possible COVID-19 exposure, illness related to COVID-19, or were displaced due to the pandemic. To show gratitude to HCPs and support local restaurants, an innovative food delivery and wellness support initiative was started in March 2020, has provided 1300 meals, and is ongoing.

Claudia-Santi F. Fernandes, EdD, associate research scientist (general internal medicine) spearheaded the initiative and has been working closely with the local restaurants and the Graduate Medical Education (GME) office at Yale, and has raised \$35,000 in donations thus far. Two New Haven restaurants, Tavern on State and ROIA Restaurant and Café, were partners in this initiative.

Former Chief Resident Donates PPE

As the COVID-19 cases picked up across Connecticut, Nicole (Rabidou) Bundy, MD, a rheumatologist in Ohio, contacted a friend, Ursula Brewster, MD, associate professor of medicine (nephrology) to see how she could help. Bundy, a former Yale School of Medicine (YSM) chief resident from 2002–2003, wanted to support her former community.

“Nicole called me and let me know that she had 1000 KN95 masks to donate to Yale,” explained Brewster. “She asked that they be distributed wherever they would do the most good: the city of New Haven or at the hospital.” As the COVID-19 pandemic spread, personal protective equipment (PPE) was in short supply. The kindness of Bundy’s donation was not lost on Brewster.

“We talk about the Yale family, and we very much are that: a family,” said Brewster. “Nicole trained with many of us here. It means a lot to us that she cared so much about her former community to make this generous donation of protective gear.”

Originally published June 8, 2020

Donation of Masks to Help New Haven’s Vulnerable Populations

Many programs at Yale Cancer Center and Smilow Cancer Hospital have evolved to support the community during the COVID-19 pandemic, and the Yale Cancer Disparities Firewall (CDF) project is no exception. Originally designed to address cancer disparities among minorities and people of low socioeconomic status living in New Haven, the team recently rallied to deliver face masks to local organizations to distribute to city residents.

Roy S. Herbst, MD, PhD, Ensign Professor of Medicine (Medical Oncology) and chief of Medical Oncology at Yale Cancer Center and Smilow Cancer Hospital, and one of the leaders of the CDF project, collaborated with Naftali Kaminski, MD, chief of Yale-PCCSM and the Boehringer Ingelheim Pharmaceuticals, Inc. Professor of Medicine (Pulmonary). Kaminski organized the donation of the masks from PCCSM. The masks will offer much-needed protection, as COVID-19 infection rates are still rising in underserved populations. Included with each mask is a fact sheet on the proper use and cleaning of cloth masks in both English and Spanish.

Beth Jones, PhD, MPH, and Sakinah Carter Suttiratana, PhD, MPH, MBA, members of the Yale School of Public Health faculty, are also co-leaders of the project, which is funded by the Bristol Myers Squibb Foundation.

The masks were distributed to Christian Community Action, Inc. Food Pantry Program; Meals on Wheels; Coordinated Food Assistance Network (CFAN) Loaves

& Fishes; Downtown Pantry; and six soup kitchens to be used by frontline staff serving food to the community and to be distributed to city residents. Jose DeJesus, Community Health Educator for Yale Cancer Center and Smilow Cancer Hospital, coordinated the pickup and distribution of the masks. The hope is that these masks will offer a layer of protection that may not have otherwise been available to underserved residents.

Originally published April 30, 2020

Donated Oximeters Help with COVID-19 Recovery at Home

The Department of Internal Medicine is grateful to have received a generous philanthropic gift of 100 wearable pulse oximeters from Norwalk resident and investment banker Anne Yang. These health monitoring devices are being distributed to selected Yale clinicians and patients who have been infected with COVID-19 and sent home or discharged to recover. Worn comfortably on one’s finger, the oximeter ring monitors the wearer’s blood oxygen level and heart rate 24 hours a day.

Yang, a Hopkins School parent, reached out to friend and fellow Hopkins parent, Naftali Kaminski, MD, to ask how she could help. Kaminski, chief of Yale-PCCSM, was at the time very concerned about the dangerous shifts in blood oxygen levels and heart rates that can develop undetected in people with COVID-19 and signal a downturn in health. He suggested that a gift of oximeter rings for infected health care workers who were staying at home to recover from the disease would be a useful, valuable tool to see whether their disease state is improving or worsening.

Yang agreed, purchased the oximeter rings, and gifted them to Yale. “I was delighted to help by donating a monitoring solution,” said Yang. “Testing is a first line of defense against COVID-19. Monitoring solutions are an important next step . . . until we have a vaccine.”

As of May 8, 20 oximeter rings had been distributed to Yale residents and nurses who had treated COVID-19 patients and were themselves recovering from the virus at home. The devices not only enable self-monitoring but are also equipped with alarms that sound automatically if measurements jump to dangerous levels. “It’s incredibly reassuring to have these monitoring devices on hand; they’re giving infected clinicians peace of mind as they recover,” Kaminski said.

Decisions about who receives the oximeters are made by a small committee that Kaminski formed. The committee will also be exploring ways to leverage the devices beyond COVID-19 disease monitoring. The committee has also established the Pulmonary, Critical Care and Sleep Medicine Resource Fund to continue this initiative.

Originally published May 14, 2020

Gift from Ludwig Family Foundation Funds Urgent COVID Research

The Ludwig Family Foundation has made a substantial gift to support Yale’s response to the COVID-19 pandemic. The donation will fund the laboratories of at least six scientists on the Yale School of Medicine faculty, for work on vaccine development to prevent future outbreaks as well as treatments for people who are already infected.

“Given the time pressure to find treatments and ultimately prevent COVID-19 and the terrible loss of life and economic disruption that are damaging the well-being of individuals, families, and entire countries,” says Carol Ludwig, MD, president of the foundation, “we felt it was important to lend early support to this group of talented Yale scientists who are working tirelessly to find approaches with the potential to benefit large numbers of people.”

The gift includes funding for research led by Akiko Iwasaki, PhD, the Waldemar Von Zedtwitz Professor of Immunobiology, in collaboration with Aaron M. Ring, MD, PhD, assistant professor of immunobiology, and Craig Wilen, MD, PhD, assistant professor of laboratory medicine and of immunobiology. Their combined laboratories will analyze components of the blood and immune systems of COVID-positive patients via flow cytometry and other methods. They hope to develop targeted treatment strategies; use biomarkers to predict the success of each treatment option; and determine which immune system components will help protect the patient from disease and which may exacerbate it.

Wilen’s lab is also working to identify drugs and novel targets by screening 680 FDA-approved drugs for antiviral activity, and then testing

their efficacy with tests involving infectious virus. They will also analyze the human genome to identify genes that may open the door to SARS-CoV2 infection, with the hope that those genes can become targets for new therapies. They also hope to learn how the virus causes disease by using single-cell RNA sequencing to sort out the genes expressed by specific cells in the presence versus the absence of the virus.

The labs of Ring and of Andrew Wang, MD, PhD, assistant professor of internal medicine and of immunobiology, are collaborating on answering the important question of whether a patient’s cells are destroyed directly by the SARS-CoV-2 virus or by powerful elements of the infected person’s immune system that the virus triggers. That work will include defining the roles of several cell death pathways in the progression of COVID-19 disease, and the potential of making them therapeutic targets.

David A. Hafler, MD, chair and the William S. and Lois Styles Professor of Neurology, and professor of immunobiology, will work to develop immunotherapies to treat COVID-19, with a particular focus on the co-inhibitory receptor TIGIT. Hafler and colleagues have identified TIGIT as playing a central role in orchestrating T cell activation in autoimmunity, cancer, and viral expression. One of their goals is to

use multi-omics single-cell analysis to explore T cell immune profiles in patients with mild and severe manifestations of COVID-19 compared with those of healthy individuals. They hope this work will also have applications to pandemic viruses that might arise in the future.

Richard Bucala, MD, PhD, the Waldemar Von Zedtwitz Professor of Medicine (Rheumatology) and professor of pathology and of epidemiology (microbial diseases) and his laboratory staff hope to develop a vaccine based on an RNA replicon platform that can block transmission of SARS-CoV-2 and also limit future viral outbreaks. Bucala is particularly optimistic about this approach because it has shown promise when applied to other forms of viral infection; can be administered effectively in small doses; and can be produced rapidly in large quantities to enable mass vaccine distribution.

In addition to providing funding to these specific projects, the Ludwig Family Foundation has provided a generous gift to the COVID Research Resource Fund. This fund may be used at the discretion of Nancy J. Brown, MD, the Jean and David W. Wallace Dean of Medicine and C.N.H. Long Professor of Internal Medicine, in her role leading the coordination of research activities related to COVID through CoReCT, the campuswide COVID-19 Response Coordination Team.

Originally published June 19, 2020

Department Leadership

CHAIR



Gary V. Desir, MD
Chair, Internal Medicine

VICE CHAIRS



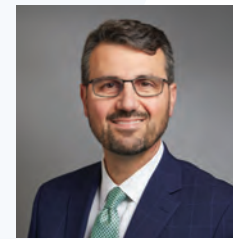
Lloyd G. Cantley, MD
Vice Chair, Basic Research



Mark Holter, CMPE, CPA
Vice Chair, Finance & Administration



Michael Kozal, MD
Vice Chair, Veteran Affairs



Aldo Peixoto, MD
Vice Chair, Quality & Safety



Vincent Quagliarello, MD
Vice Chair, Education & Academic Affairs



Robert Soufer, MD
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Lynn Tanoue, MD, MBA
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Lawrence Young, MD
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Adam Mayerson, MD
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Cardiovascular Medicine



Loren Laine, MD
Digestive Diseases (Interim)



John Wysolmerski, MD
Endocrinology & Metabolism (Interim)



Patrick O'Connor, MD, MPH
General Internal Medicine



Mary Tinetti, MD
Geriatrics



Erol Fikrig, MD
Infectious Diseases



Stephanie Halene, MD, PhD
Hematology



Roy S. Herbst, MD, PhD
Medical Oncology



Stefan Somlo, MD
Nephrology



Naftali Kaminski, MD
Pulmonary, Critical Care & Sleep Medicine



Richard Bucala, MD, PhD
Rheumatology, Allergy & Immunology

CLINICAL CHIEFS



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Allergy & Immunology



Nihar Desai, MD, MPH
Cardiovascular Medicine



Daniel Price, MD
Cardiovascular Medicine



Loren Laine, MD
Digestive Diseases (Interim)



Silvio Inzucchi, MD
Endocrinology & Metabolism



Matthew Ellman, MD
General Internal Medicine



James M. Lai, MD
Geriatrics



Vincent Quagliarello, MD
Infectious Diseases



Roy S. Herbst, MD, PhD
Medical Oncology



Aldo Peixoto, MD
Nephrology



Jonathan Siner, MD
Pulmonary, Critical Care & Sleep Medicine



Vaidehi Chowdhary, MD
Rheumatology

PROGRAM DIRECTORS



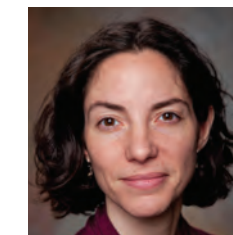
Mercedesita Villanueva, MD
AIDS Program



Cary Gross, MD
National Clinician Scholars Program



Carrie Redlich, MD, MPH
Occupational & Environmental Medicine



Tracy Rabin, MD, SM
Office of Global Health



Matthew Ellman, MD
Yale Internal Medicine Associates

POST-GRADUATE EDUCATION & TRAINING PROGRAMS

Medicine/Pediatrics Residency Program



Benjamin Doolittle, MD, MA, MDiv
Program Director

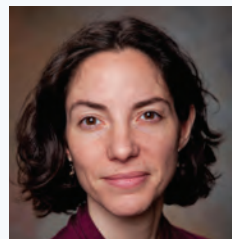


Jaideep Talwalkar, MD
Associate Program Director

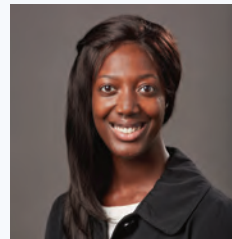
Primary Care Residency Program



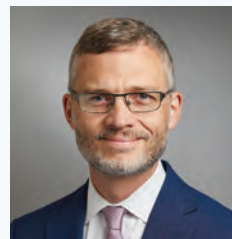
John Moriarty, MD
Program Director



Tracy Rabin, MD, SM
Associate Program Director



Aba Black, MD, MHS
Associate Program Director,
Diversity and Inclusion

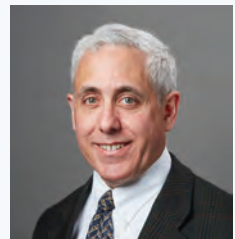


Stephen Holt, MD, MS
Associate Program Director,
Ambulatory Education



Sarita Soares, MD
Associate Program Director,
Coaching and Wellness

Traditional Residency Program



Mark Siegel, MD
Program Director



Katie Gielissen, MD, MHS
Associate Program Director



Christopher Sankey, MD
Associate Program Director



Seonaid Hay, MD
Associate Program Director



Manisha Juthani, MD
Associate Program Director



Alfred Lee, MD, PhD
Associate Program Director

Yale-Waterbury Residency Program



Ruth Weissberger, MD
Program Director

Investigative Medicine Program



Joseph Craft, MD
Program Director



Eugene Shapiro, MD
Deputy Director

Not pictured: Pamela Fucci, Registrar

Yale Affiliated Hospitals Program



Silvio Inzucchi, MD
Program Director

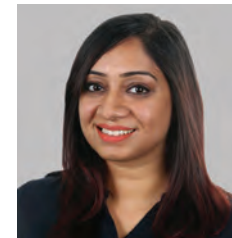
2019-2020 CHIEF RESIDENTS



Ethan Bernstein, MD
Traditional Program



Janelle Duah, MD
Veterans Affairs, Center
of Excellence



Hafsa Farooq, MD
Yale-Waterbury Program



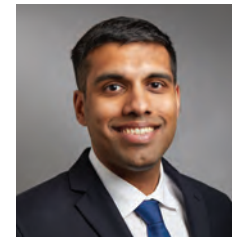
Bailey Fitzgerald, MD
Traditional Program



Elizabeth Guadalupe, MD
Yale-Waterbury Program



Leila Haghghat, MD
Traditional Program



Sumit Kumar, MD
Primary Care Program



Andrew Levin, MD
Traditional Program



Megan McCullough, MD
Veterans Affairs, Quality
and Patient Safety



Emilie O'Neill, MD
Primary Care Program



Mario Ochoa, MD
Yale-Waterbury Program



Emily Pinto Taylor, MD
Primary Care Program



Hannah Rosenblum, MD
Primary Care Program



Rebecca Slotkin, MD
Traditional Program

Department of Internal Medicine Vital Statistics

#9
NIH Funding in
Internal Medicine

2.06%
Clinical Income
Increased

\$124M
in Sponsored
Funding

\$300M+
Total Operating
Budget

533 Ladder Track Faculty

128 Research Faculty

63 Instructors

25 Lecturers

222 Hospital Residents

484 Other (Voluntary 404; Adjunct 43; Visiting 10; Emeritus 27)

328 Postdoctoral Associates/Fellows (Includes Clinical Fellows)

64 Postgraduate Associates/Fellows

389 Staff (Medical Oncology, Hematology, and PA Program staff not included)

Afterword

As this report is distributed, the rollout of the Pfizer and Moderna vaccines continues. As of February 22, 2021, over 99,535 people across Yale School of Medicine, Yale Medicine and Yale New Haven Health have received their first vaccine dose. Over 37,042 have had their second dose. The vaccine launch has injected a renewed sense of hope and cautious optimism across the department, as COVID-19 rates continue to fluctuate across the state. While we continue our fight against this pandemic, we applaud the resolve and commitment of our clinicians, researchers, educators, and staff.

Julie Parry, Editor

Director of Communications
Department of Internal Medicine



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Yale's Internal Medicine Residency Programs Ranked Number

10

Yale School of Medicine's Department of Internal Medicine's training programs were ranked 10th in the nation on *U.S. News & World Report's* 2020 Best Internal Medicine Programs list.

"Having our internal medicine training programs recognized in this way highlights the dedication of our faculty to building and maintaining exceptional educational opportunities for medical students, residents, and fellows," said Department chair Gary V. Desir, MD, the Paul B. Beeson Professor of Medicine and Vice Provost for Faculty Development and Diversity. "We aspire to train and inspire the next generation of leaders in medicine through education that fosters creativity and a personal commitment to excellence, and that equips our trainees with exemplary skills and attitudes for a life's work in medicine."



*Manisha Juhari, MD
Infectious Disease*

*Josafias M. De Mello
Pulmonary & Critical Care*

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