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Tested and Testing: UC San Diego Health Expands COVID-19 Diagnostics

From the beginning, the ability of front line clinicians to test patients for COVID-19 — to determine whether a person is infected with the disease-causing novel coronavirus, SARS-CoV-2 — has been part and parcel of the pandemic.

Testing shortages have hindered health care systems around the world, spurring extraordinary efforts to find and implement testing strategies.

“Pandemics require an extra dose of determination, fortitude and innovation,” said UC San Diego Chancellor Pradeep K. Khosla. “Long distinguished by non-traditional thinking, UC San Diego is rising to the challenge of this current public health crisis to meet the needs of our local and global communities through cross-discipline collaborations and creative partnerships with industry. Together, we are inventing new technologies, developing effective therapies and treatments, and making fundamental scientific discoveries.”

At UC San Diego Health, teams of doctors, scientists and administrators have worked hard to fill gaps and needs in COVID-19 testing, making measurable, remarkable progress, moving from crisis mode in early days to a broader, more thoughtful approach that addresses not just the continuing and urgent needs of patients, staff and students, but the wellness and future of the larger community.

“One of the obligations we have as an academic medical center and a place with deep experience and expertise in times like these is how do we think about testing,” said Patty Maysent, CEO of San Diego Health. “We need to ask, ‘What is our moral position? How do we



A staff member at the Center for Advanced Laboratory Medicine at UC San Diego Health prepares samples for testing. COVID-19 tests are batched for maximum efficiency, with results generated in a matter of hours.

think about this crisis in a way that makes sense not just for us and our patients, but across the region?”

“I think we’re getting to the point, with our increasing testing capacity, that we can start figuring out how to use testing as a weapon to reverse the pandemic,” said Steve Gonias, MD, PhD, chief of pathology services for UC San Diego Health and chair of the Department of Pathology at UC San Diego School of Medicine. “More test results will start to create a clearer picture of what we want to do next, what we want to happen next.”

An emerging crisis

The path to this moment has not been long — COVID-19 was only officially named in early February — but it has been tortuous. In late-February, the U.S. Food and Drug Administration loosened rules to allow High Complexity CLIA-certified, university-based hospital laboratories to develop their own in-house tests for COVID-19. Previously, health systems had primarily relied upon the Centers for Disease Control for COVID-19 testing. But it was a time-consuming process, with results taking several days as need and demand grew.

In early March, the Molecular Microbiology Laboratory in the Center for Advanced Laboratory Medicine (CALM) at UC San Diego Health partnered with Carlsbad-based GenMark Diagnostics, to develop its first clinical assay. Within 10 days, CALM was performing approximately 20 Covid-19 nucleic acid detection tests per day.

On March 20, UC San Diego Health announced new partnerships with four additional leading *in vitro* diagnostics manufacturers to dramatically ramp up testing capacity to 1,000 to 1,500 tests per day by mid-April. That effort, said Gonias and David Pride, MD, PhD, an infectious disease specialist and the lead molecular microbiologist at CALM, is moving apace. Four of the five platforms are already online and current testing capability is approximately 700 tests per day.



A technician at the Center for Advanced Laboratory Medicine (CALM) at UC San Diego Health prepares a sample for testing. CALM is using multiple platforms to conduct COVID-19 testing, and can process hundreds per day.

“Typically, you would want a single test for this type of virus,” said Pride. “We took a diversified approach to meet our patient care needs. Having different platforms means we are able to maintain testing supply, even when one or more manufacturers can’t meet our testing needs.”

All testing for active infections is based on reverse transcriptase polymerase chain reaction (RT-PCR) technology, which extracts viral RNA from a test swab, converts it to DNA and amplifies DNA copies to detect the virus, if present. The tests are designed to diagnose acute infections in which the person is still shedding virus, and is considered infectious to others. All of the testing platforms used have proven to be comparable in reliability, with sensitivities in the range of 95 percent.

“They’re basically providing the same results,” said Pride.

Expanding capacity has allowed UC San Diego Health officials to continually adapt guidelines for when COVID-19 testing is appropriate, from only the most urgent cases involving symptomatic patients to more broad and frequent applications, including asymptomatic patients for whom contracting COVID-19 would be particularly perilous, such as those with immunocompromised systems, those undergoing surgeries or those being treated for some cancers.

UC San Diego Health is also supporting COVID-19 testing at other hospitals in the region.

Faster testing, different testing

The current turnaround for COVID-19 test results is approximately 12 hours, though it can be much shorter based on demand factors or special requests for expedited findings. UC San Diego doctors are now also employing a point-of-contact test from Abbott Laboratories, which could generate reliable results in as little as 15 minutes.

Gonias said these rapid-turnaround tests will primarily be used in cases where physicians need information quickly. “For example, if we test patients arriving in the emergency room with severe symptoms suggesting COVID-19 infection and who are likely to require hospitalization, we can more rapidly manage the patient and manage use of personal protective equipment by our health care workers.”

A different form of testing involves detecting antibodies to the coronavirus in blood samples. Serological testing, however, is not suitable for diagnosing acute, in-the-moment infections because the human immune system requires several days to weeks after infection to begin producing antibodies to remove the virus.

“The human immune response takes time to gear up,” said Francesca Torriani, MD, medical director of Infection Prevention and Clinical Epidemiology at UC San Diego Health and an infectious disease specialist.

Laboratory medicine physicians at CALM are exploring the potential use of a serological test in the clinical setting, but blood tests may make more sense as an epidemiological tool, a way to determine who has been previously infected and may have acquired immunity based on the presence of antibodies.

First responders

At the front lines of the pandemic, often before patients arrive at hospitals, are first responders — the firefighters, police officers and lifeguards who may be the initial contact with persons infected with COVID-19. Doing their duty places them at heightened risk of getting infected themselves.

Working with UC San Diego Chancellor Pradeep Khosla, UC San Diego Health and San Diego Sports Medicine, one of the health system’s largest affiliated practices and which already cares for San Diego Fire-Rescue Department employees, are now providing COVID-19 testing to all symptomatic first responders in the city of San Diego.

“It is paramount that we receive test results for first responders as soon as possible. The results not only guide our decisions for individual treatment, but determine city staffing algorithms to ensure there are enough first responders on duty to protect our community. Delayed results could mean slower response times for emergencies,” said Richard Parker, DO, CEO of San Diego Sports Medicine. “UC San Diego leadership stepped up during a crucial time. We will now be able to get results within 24 hours versus several days.”

San Diego City first responders who are symptomatic (fever, new cough, shortness of breath) will be assessed using telemedicine via San Diego Sports Medicine. If it is determined a COVID-19 test is needed, an order will be put in electronically, using a computerized system that San Diego Sports Medicine and UC San Diego Health share.

Once the order is placed, first responders will go to one of UC San Diego Health’s ambulatory drive-through testing locations where designated nursing staff will perform the test. The samples will then be sent to CALM for expedited processing.

“Our firefighters and lifeguards are taking precautions, but remain on the front lines caring for San Diegans every day, so it’s vital to be able to quickly determine whether any are sick with COVID-19,” said San Diego



Fire-Rescue Chief Colin Stowell. “We greatly appreciate the ability to now have our personnel tested and receive those results quickly.”

COVID-19 testing is complex, requiring extensive validation of different methodologies to ensure accurate results. UC San Diego Health uses five different platforms to conduct testing, reducing reliance on any single supply chain for needed testing materials.

What lies ahead?

Statistical models predicting the length of the pandemic and its consequences vary. There are more unknowns than knowns, both concerning the pathology of the coronavirus and its public health impact, said Randy Taplitz, MD, clinical director of infectious diseases at UC San Diego Health.

Only time will tell which model proves most accurate, though Gonias, Torriani and Taplitz said current mitigation measures, such as the state’s stay-at-home mandate and social distancing, appear to be slowing the virus’ spread, flattening the curve.

Torriani and Taplitz also noted that the end is not near, that rates of infection and cases of COVID-19 in San Diego will continue to rise for at least three to four more weeks. It’s a reality that will test resources and resilience, but increasingly there will be tests to help fight back.

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