Robot allows clinicians to reuse thousands of masks in the COVID-19 fight

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UVA Health obtained the robot, assembled it, trained staff on its use and put it to work over five days this month. Credit: Sanjay Suchak, University Communications

For health care professionals on the front lines of the COVID-19

pandemic, a thin layer of personal protective equipment—gowns, masks, gloves—stands between their ability to help patients and the prospect of becoming patients themselves.

At UVA Health, a newly acquired robot is helping maximize the life of some of the most critical personal protective equipment, or PPE, at a time when the surge of demand for such items has aggravated a national shortage.

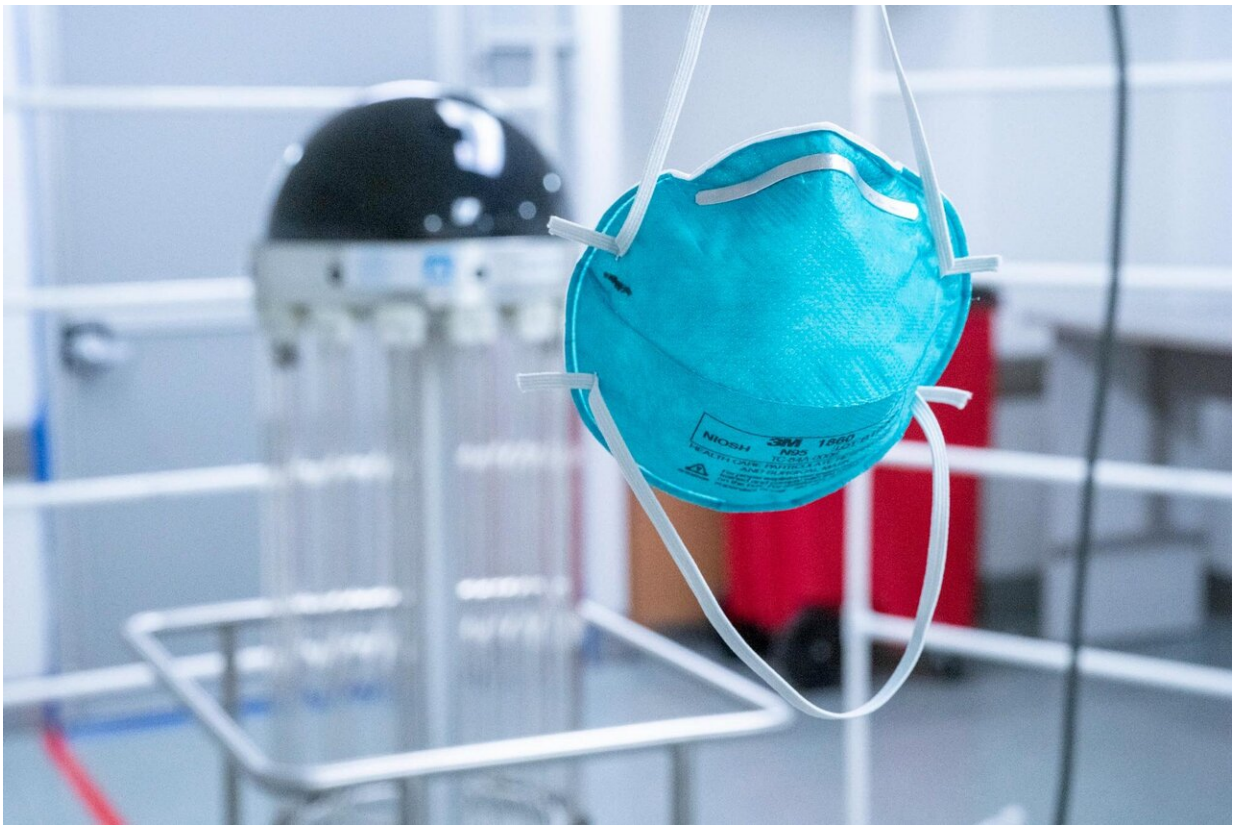
The robot, called "Tru-D," stands 5-feet-6-inches tall and uses ultraviolet germicidal irradiation (UV) or UV light vectors to disinfect porous and non-porous surfaces without toxic chemicals. UVA Health obtained the robot, assembled it, trained staff on its use and put it to work over the course of just five days this month.

Now it stands ready to disinfect up to 6,000 N-95 masks per day, an assist that could prove invaluable as UVA Health expects to provide care to the highest number of patients suffering from the coronavirus disease in the coming weeks.

"The safety of our patients and team members is, and always will be, our highest priority," said Dr. Carlene Muto, assistant professor of infectious diseases and international health, who focuses her research on infectious diseases and hospital epidemiology. "That said, we have been pushed to a place where merely purchasing the best products is no longer an option; there are none to purchase. There has never been a more crucial time, nor a need so great to become a thinker out of the box … Think, plan, do.

"As research began circulating on using UV to disinfect PPE, we went to work to determine what resources we needed to do it best, and people across the organization responded. Tru-D uses indirect UV sources," Muto said. "The robot uses size and density sensors to calibrate the exact

dose of energy necessary to disinfect the entire room. Light is emitted, then reflected back so all surfaces receive the required energy. This ensures "Total Room Ultraviolet Disinfection (Tru-D)' of all surfaces, including shadowed or hidden areas. Use of reflective surfaces increases the efficiency of the device, so the room was painted with reflective paint."



When the machine is operating, the racks surrounding it are fully loaded with masks for sanitizing. Tru-D can disinfect hundreds of masks per each 20-minute cycle. Credit: Sanjay Suchak, University Communications

The high energy from UV light is absorbed in the cellular RNA and DNA of microorganisms, damaging nucleic acids and preventing them

from reproducing; therefore, they cannot survive or infect humans. Set up to maximize efficiency, Tru-D can disinfect hundreds of masks per each 20-minute cycle. Total cycle time to prep masks for disinfection and recover them for repackaging is a little less than an hour.

The cutting-edge technology is being used here today thanks to the quick work of UVA Health's epidemiology, clinical engineering, procurement, clinical staff, environmental services, supply chain, central sterile processing team and senior leadership teams, who secured, transported, assembled, trained staff and operationalized Tru-D in less than a week.

"The robot is large, fragile and incredibly valuable, yet we needed to get it operational as quickly as possible," said Michael Friesen, director of clinical engineering.

Friesen and Patrick Headley, manager of Clinical Engineering Professional Services, traveled to Tennessee to retrieve the machine and be trained on its use.

"This is truly an all-hands-on-deck situation, and every hour and day is important as we work to prepare for a potential surge of COVID-19 patients here in Charlottesville," Headley said. "We were on our way Monday morning, returned home that afternoon with Tru-D in hand and had the robot's UV light up and running by Tuesday afternoon."

"By utilizing Tru-D, we can extend our current supply of personal protective equipment to meet the essential needs of our frontline faculty and staff," said Dr. K. Craig Kent, executive vice president for health affairs. "UVA Health will continue to do all we can—from supply chain management to clinical innovations—to ensure every person in our facilities is safe and protected. Doing so allows us to provide outstanding care to patients in need."

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