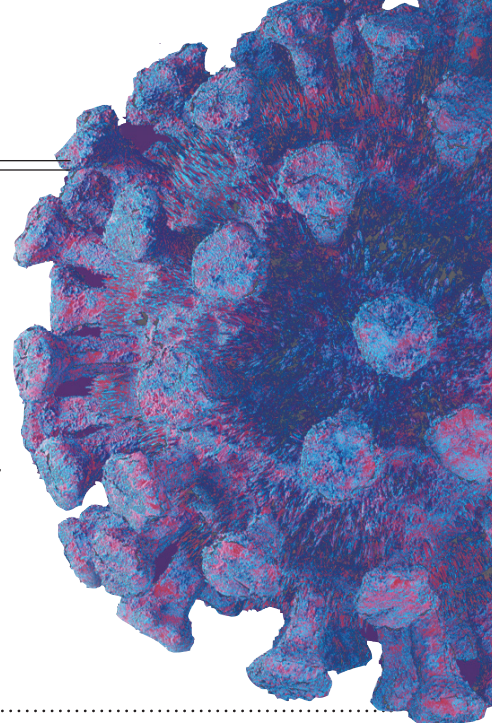


# Treating Patients in the COVID-19 Era

Medical tents offer a new way to reduce disease transmission.

BY LAURA SHIN, DPM, DIANA PERRY, DPM, AND JOHNNY WANG



## Abstract

The novel COVID-19 virus has presented significant obstacles to delivering efficient patient care. The infectious nature of the virus results in two to three infections for every

imize the risk of infection for healthcare workers and patients. Hospitals have begun using COVID-19 screenings and temperature checks in an effort to reduce the likelihood of an outbreak within the hospital. How-

tion units to eliminate and reduce the spread of SARS-CoV-2 in the air.

## Case Description

A 21-year-old male was admitted for left fibula and tibia open fractures with severe degloving of the heel and ankle and left Achilles tendon rupture following a pedestrian versus motor vehicle crush injury. He underwent Achilles repair, fracture stabilization, and external fixation placement; however, his ankle had significant extensive soft tissue necrosis with debris. After temporary fixation for a left pilon fracture with closed reduction, the patient proceeded to have multiple procedures for incision and drainage; ultimately a static circular external fixator with application of an ALT (anterolateral thigh) flap was placed over the post-operative wound.

65

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one person infected as well as the deleterious sequelae associated with it, such as acute respiratory distress syndrome and embolic events. Therefore, preventing transmission during patient care remains a priority for healthcare facilities. To manage inpatient care safety, hospitals have already adopted negative pressure rooms, ultraviolet radiation, and air filtration, in addition to protective protocols. However, many institutions do not have the resources to ventilate or filter the indoor spaces used for outpatient care.

A viable alternative may be construction of an outdoor ventilated apparatus with autoclaved or disposable equipment dedicated to outpatient care on COVID-19 positive patients.

## Introduction

Medical treatment in the advent of the COVID-19 pandemic has demanded the establishment of new healthcare protocols in order to min-

ever, the issue about how to provide adequate care to emergent patients who are positive for SARS-CoV-2 remains a persistent problem. Two-thirds of hospital rooms that house SARS-CoV-2 positive patients presented a significant viral contamination of the floors and exhaust vents;

## Hospital protocols require that all patients undergoing elective surgery must test negative for COVID-19 48 hours prior to the procedure.

one laboratory study showed that the SARS-CoV-2 virus is viable within aerosols for up to three hours.<sup>1</sup> To combat the transmission of COVID-19 through fomites or aerosolization, many hospitals have explored the use of additional precautions and inactivating agents such as ultraviolet germicidal radiation and HEPA filtra-

To increase stability of the patient, a concomitant left ankle arthrodesis with bone autograft was also performed. Although much of the anterior flap graft remained viable, a posterior medial and lateral portion necrosed and there was risk of posterior hardware contamination.

*Continued on page 66*

COVID-19 (from page 65)

The patient required continued local wound care and additional surgical debridement. On the eve of surgery for repeat debridement, the patient tested positive for COVID-19.

Hospital protocols require that all patients undergoing elective surgery must test negative for COVID-19 48 hours prior to the procedure. Further issues arose as home healthcare agencies were unable to provide local wound care. Outpatient clinic policy also prevented the patient from having an outpatient visit. With limited care options, there was significant concern for development of a limb-threatening infection. The need for outpatient treatment sites for COVID-positive patients was apparent.

## Methods

A ventilated medical outdoor tent was utilized for outpatient visits. Our physical therapy wound care team equipped with personal protective equipment and disposable instrumentation performed care in the tent for

## Discussion

Most current methods to circumvent the risk of contracting SARS-CoV-2 in a hospital setting include using N-95 masks and full PPE to provide care for COVID-19 positive patients; however, not all facilities are equipped with plentiful personal protective equipment nor negative

of patient cross-contamination. Furthermore, HEPA filtration units are used to remove  $\geq 99.97\%$  of  $0.3 \mu$  and  $100\%$  of larger particles, including droplet nuclei from the air. They are also able to filter a seven-hundred-sixty cubic foot room within five minutes.<sup>3</sup> The SARS-CoV-2 is observed in aerosolized particles

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pressure rooms. Droplets and airborne particles are also able to move through hospital ventilation systems that recirculate air, increasing the possibility of contaminated air entering other patients' rooms.<sup>6</sup> Therefore, moving non-surgical and non-emergent operations into a ventilated outdoor space with autoclaved or dis-

posable supplies, as well as stopping the recirculation of air, could reduce the risk of infection to healthcare workers who treat COVID-19 positive patients with separate, serious healthcare needs. An outdoor negative pressure apparatus protocol could be designed in which all disposable materials are put into waste receptacles and all metal tools are sterilized with ultraviolet radiation or autoclaves. Using ultraviolet germicidal radiation within ventilation could also be effective against SARS-CoV-2, as it's shown to be effective against MERS-CoV, although research has not been done specifically pertaining to SARS-CoV-2.<sup>2</sup>

## Conclusion

UV germicidal radiation may be most useful for repeated use of the negative pressure apparatus in cases from  $0.25\mu\text{m}$  to  $0.5\mu\text{m}$ <sup>5</sup> and human to human transmission occurs when close contact is made with an infected person's respiratory droplets or aerosols.<sup>4</sup> Therefore, employing HEPA filters in areas where known COVID-19 patients reside has the potential to greatly reduce the chance of contamination within the hospital and infection of workers who come into contact with these patients.

An outdoor ventilated apparatus managed by trained personnel in personal protective equipment is a viable option for outpatient care in patients with a positive COVID-19 test. Moving forward, the addition of UV germicidal radiation and HEPA filtration may provide safe and consistent care for complex wound care patients who remain COVID-19 positive and possibly infectious. Where appropriate, a more permanent structure can be used, as COVID-19 transmission rates remain high throughout much of the U.S. and patients continue to require complex wound care, especially in the setting of high trauma. **PM**

*Special thanks: Jeff Thompson, Scott Russell, and Stephanie Woelfel*

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## Not all facilities are equipped with plentiful personal protective equipment nor negative pressure rooms.

multiple visits until the patient was cleared for surgery. All personal protective equipment was disposed of properly. Once the patient was symptom-free for over 10 days and tested negative, he was taken back into the operating room for debridement and was placed on a wound VAC to promote granulation.

## Results

None of the healthcare workers treating the patient developed COVID-19 symptoms or received a positive COVID-19 test after the treatment. The patient did not develop an infection and the post-operative tissue necrosis was treated. The external fixator remained in place without complication and osseous alignment was maintained. Ultimately, the patient went on to full healing and limb salvage.

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*Continued on page 68*

## COVID-19 (from page 66)

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