Wound Center Without Walls: The New Model of Providing Care During the COVID-19 Pandemic

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ABSTRACT

The COVID-19 pandemic poses a major challenge in delivering care to wound patients. Due to multiple comorbidities, wound patients are at an increased risk for the most extreme complications of COVID-19 and providers must focus on reducing their exposure risk. The Federal, State, and local governments, as well as payers, have urged hospitals and providers to reduce utilization of nonessential health services, but they also have given more flexibility to shift the site of necessary care to lower risk environments. Providers must be prepared for disruption from this pandemic mode of health care for the next 18 months, at minimum. The wound provider must accept the new normal during the pandemic by adapting their care to meet the safety needs of the patient and the public. The Wound Center Without Walls is a strategy to untether wound care from a physical location and aggressively triage and provide care to patients with wounds across the spectrum of the health system utilizing technology and community-centered care.

KEY WORDS

COVID-19, telemedicine, wound center, community-centered care, technology

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To start, a disclaimer must be issued for the reader. The information contained in this manuscript is current at the time of publication; since the pandemic crisis is fluid, the authors encourage all readers to confirm any recommendations that are based on regulatory or legal references with the most updated information.

Chronic wounds are prevalent and costly to the health care system.[1] In a large retrospective study of Medicare beneficiaries, nearly 15% had a chronic wound or infection during the course of a year.[2] The most common wounds are a result of diabetes, venous or arterial insufficiency, or pressure, making these patients particularly comorbid and at risk for death from COVID-19 infection.[3,4] Moreover, a chronic wound increases the risk of infection and hospitalization and represents a large percent of the cost of care for a patient with diabetes.[5]

Patients with chronic wounds are treated in virtually every health care setting. Multidisciplinary, team-based, structured care is known to produce the most desirable outcomes.[6,7] The most organized and protocol-driven care is usually performed in a hospital outpatient department (HOPD), frequently called a "wound center."[8] Patients often are treated weekly for their wounds in the center, which becomes a quasi-medical home in which vitals and blood glucose are measured frequently and triage for any non-wound-related symptoms also is performed. The wound center staff also functions as the case manager for the patient, organizing consults, studies, supplies, devices, and home health visits.

COVID-19: A MAJOR DISRUPTION TO WOUND PATIENTS

The COVID-19 pandemic has led to a major disruption in the care of wound patients in HOPDs. Wound centers are typically located inside the physical space of the hospital, which is unique among other hospital outpatient service lines due to billing (wound centers bill a facility fee) and safety (available response to hyperbaric oxygen [HBO] chamber emergencies). But in response to the pandemic, some hospitals have closed their wound centers, either because they have misclassified the service as nonessential[9] or they have limited visitors and outpatients from entering the hospital premises.[10] Analysis made public from Tissue Analytics, a wound-specific electronic health record software company, noted a 40% decrease in wound center visits in their dataset from weeks 12, 13, and 14 in 2020, versus 2019.[11] In some cases where wound centers remain open, there can be staffing shortages as some providers (eg, emergency medicine, infectious disease) are repurposed for pandemic response.

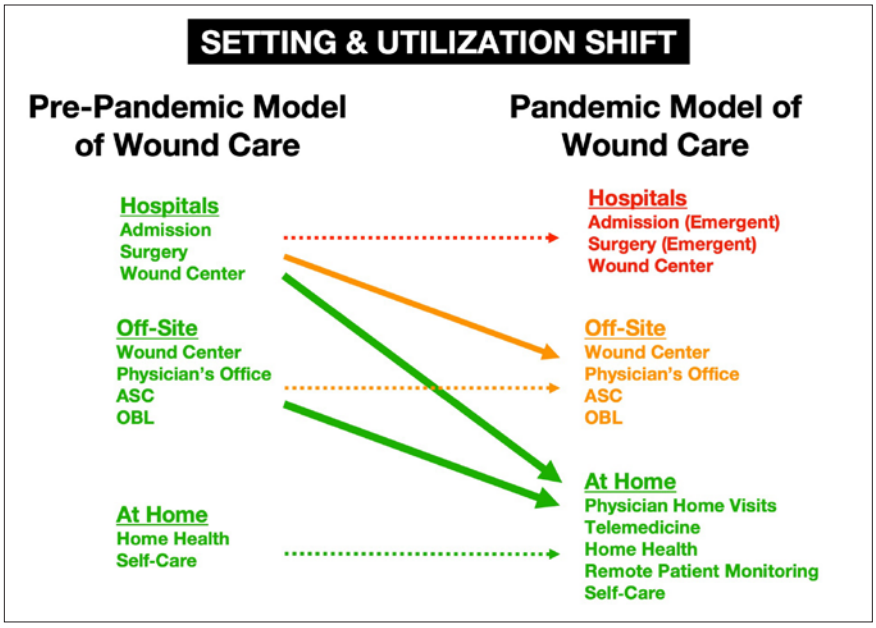

Figure 1. The setting and utilization shift of wound patients before and during the COVID-19 pandemic. ASC: ambulatory surgery center; OBL: office-based laboratory

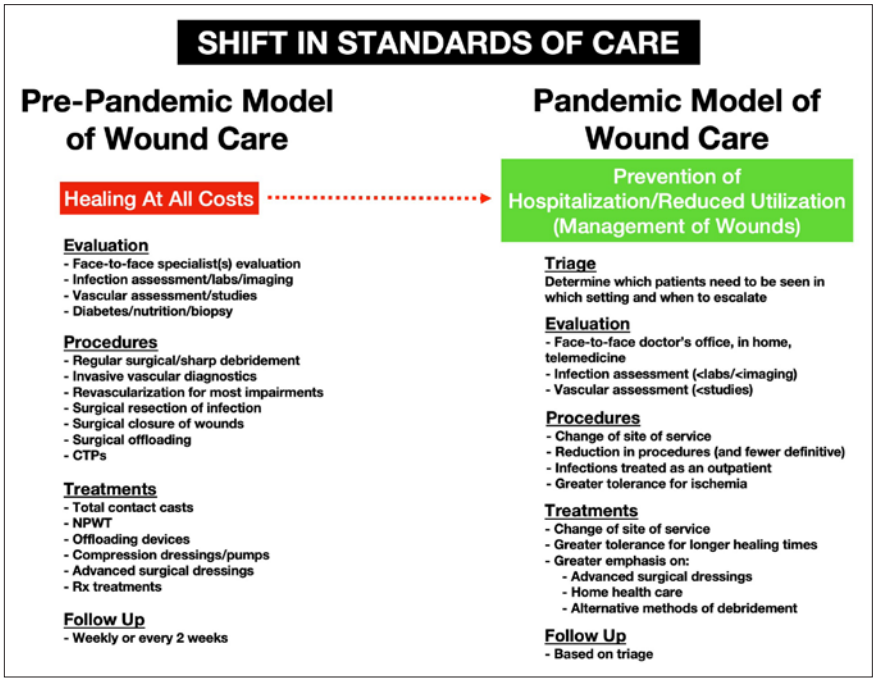

Figure 2. The shift in the standards of care before and during the COVID-19 pandemic. CTP: cellular- or tissue-based product; NPWT: negative pressure wound therapy

Providers should expect the disruptive effects of the pandemic to impact the health care system and wound patients for at least 18 months.[12]

The risks of this disruption of care to the wound patient cannot be overstated. In past examples in which patients have lost access to a care setting, provider type, or advanced modality, it has led to increased emergency room (ER) visits, hospitalizations, amputations, and other negative outcomes.[13,14] While the risks to the individual patient are certainly clear, these risks are now compounded onto the health system in a pandemic mode of care when the system needs to be unburdened and resources saved for COVID-19 patients.

Shifts in the setting and goals of wound care

In order to keep patients safer at home, the Centers for Medicare and Medicaid Services (CMS) have taken steps to promote the delivery of more medical care in the home setting.[15] The government request, and sometimes order, to postpone nonessential services and elective surgeries creates an obstacle to perform best practices in wound care in the usual setting. In the pre-pandemic model, wound care was performed in hospitals, at off-site health care facilities, and at home, but the scale was weighted at the top. But during the pandemic, more care in less risky environments (eg, the home), where not all procedures will be available, must be facilitated (**Figure 1**).

The pre-pandemic goal for most patients with wounds was *healing at any cost*. If a procedure or hospitalization could be performed to improve the likelihood or speed of healing, it was done. However, since the pandemic is shifting the site of wound care and reducing access to best practices, the goals also must change. During the pandemic, the major goal of wound care will be *management* of the wound in order to prevent serious wound complications and hospitalization. Avoiding procedures and hospitalizations reduces the COVID-19 exposure risk to wound patients and preserves needed equipment and supplies for the health system. Understandably, without access to some advanced diagnostics and procedures, there will be a notable effect on the expected outcomes (**Figure 2**). For example, the prevention, diagnosis, and treatment of infection in wounds must remain paramount, but there will need to be a higher tolerance for limb ischemia and longer wound healing times.

The risk of infection is very high in many subpopulations of patients with wounds. For instance, about one-third of study patients in the control arm of

diabetic foot ulcer (DFU) studies are treated for infection during the 12-week study period.[16,17] In all, more than 50% of patients with DFUs will get an infection during the course of their wound treatment.[18] Patients with diabetes often do not mount a normal inflammatory response to infection, so visual cues that are expected are often absent even with severe, deep soft tissue and bone infections. Infection is what drives increased resource utilization, readmissions, prolonged hospitalization, multiple surgeries, and proximal amputations.[19] These are the hospital events the COVID-19 pandemic priorities are designed to prevent.

The patients at highest risk will still need to be seen by a trained wound care clinician, so medical care can be shifted from the hospital to the clinic, office, or home.

It is worth noting that the disruption and planned shift in care may, in fact, reduce the quality of wound care, and quality indicators will be difficult to monitor on a large scale. Unfortunately, there already is a patchwork of quality reporting since it is site specific (hospital, home health, skilled nursing facility [SNF]) and not patient specific. There are wound-specific quality measures physicians can report through a quality clinical data registry, but few physicians utilize it.

WOUND CENTER WITHOUT WALLS

The CMS has promoted the concept of "hospitals without walls" giving flexibility to temporarily expand sites of care outside of the hospital (ie, hotel, dormitory, cruise ship, tents) to surge bed capacity to treat patients during the pandemic.[20] Given the push to provide as much care as possible in low-risk environments, the authors propose the concept of the Wound Center Without Walls (WCWW) as a model of care for patients with wounds during the pandemic.

The WCWW concept focuses on effective case management of the patient. Patients already require coordination of care from multiple parts of the health system, providers, home health, and suppliers, however this management becomes even more vital in a WCWW.

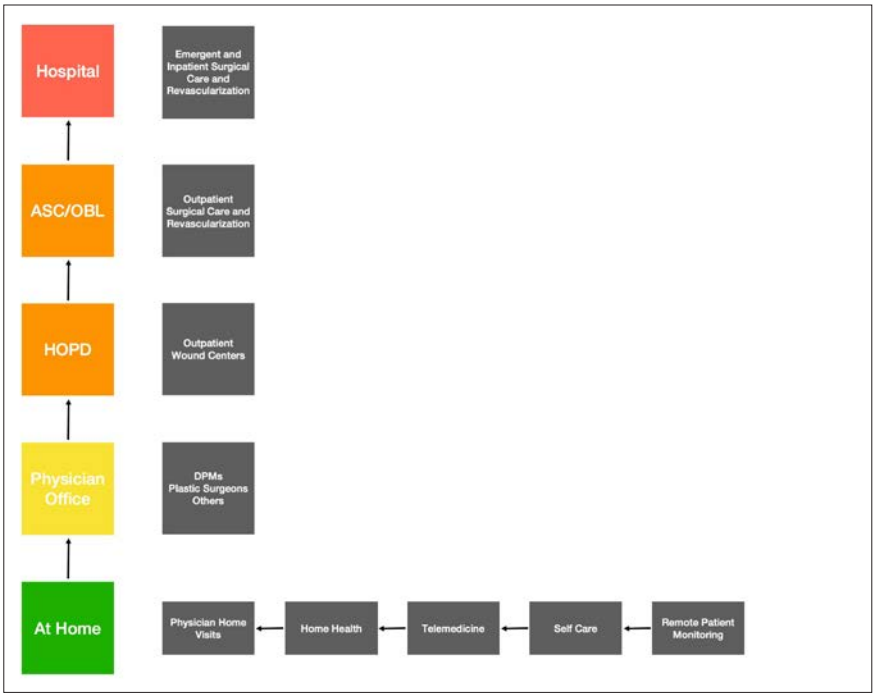

Figure 3. Pandemic triage system for wound patients. Adapted from Rogers et al.[22]
ASC: ambulatory surgery centers; OBL: office-based laboratory; HOPD: hospital outpatient department

	Conditions	Site of Care	Urgency
Critical	- IDSA Severe and some Moderate diabetic foot infection - Gas gangrene - SIRS/Sepsis - Acute limb-threatening ischemia	Hospital	Priority 1 *Urgent*
Serious	- IDSA Mild and some Moderate diabetic foot infections (including osteomyelitis) - Chronic limb-threatening ischemia (CLTI) - Dry gangrene - Cellulitis extending more than 2 cm - Worsening ulcer - Malignancy or suspected malignancy - Failing flap - Ulcer with necrotic tissue	Outpatient Clinic Office-based Lab Surgery Center Physician's Office	Priority 2
Guarded	- Improving foot ulcer - Bleeding ulcers - Highly exudative ulcer - Cellulitis extending 2 cm or less	Physician's Office Home Telemedicine	Priority 3
Stable	- Uncomplicated venous leg ulcer - Stable pressure ulcer - Recently healed foot ulcer - Healed amputation	Home Telemedicine	Priority 4

Figure 4. Wound Center Without Walls escalation algorithm of care for wound patients based on triage category and setting.
Red: critical; Orange: serious; yellow: guarded; green: stable; IDSA: Infectious Diseases Society of America; SIRS: systemic inflammatory response syndrome

In a pandemic situation, it is important for any outpatient wound program to rapidly identify the entire patient cohort that it has been managing and determine optimal strategies to manage patients, preferably at home, based on the resources available to each and the system.[21] An effective and easy-to-use triage system

can aid in the decision-making. Rogers et al[22] presented the Pandemic Diabetic Foot Triage System, which is herein modified to include a majority of wound etiologies and complications (**Figure 3**). Patients can be triaged by phone or telemedicine, placed into the appropriate site for care in the WCWW, and escalated based on changes in condition and need (**Figure 4**).

Depending on where the local health care system is in the pandemic curve, nurses and other staff previously caring for clinic patients in the facility can be pivoted to communicating with patients, families, and home health services to evaluate the best plan of care, with the goal of keeping the patient at home whenever possible. The health system leadership must be educated on the importance of maintaining resources to perform these evaluations and enact these care plans, despite the lack of clinic volume, in order to minimize wound complications that would result in ER visits and the need for hospitalization at a time when the health care system may be stretched to capacity with patients suffering from COVID-19.

Home: remote patient monitoring

The Internet of Things and smart devices in the home are creating a renaissance of opportunities for remote patient monitoring (RPM) in the prevention of ulcerations and their complications.[23] The Veterans Administration has rolled out the use of a temperature sensing mat, which can detect 97% of DFUs with as much as 5 weeks' notice.[24] During the pandemic, it is advisable to implement strategies for a wider use of RPM, which essentially uses technology and artificial intelligence to screen patients at home and provide early warnings of ulcers or complications. While being a better predictor of complications than human examinations, it also reduces the burden of face-to-face screenings.[25]

Home: self-care

Given the possible exposure to COVID-19 infection, the lowest-risk environment for patients to receive care is in their home. But even within the home there are several strata of care. Self-care for wounds is an acceptable practice for patients (or lay caregivers) who are able to perform the necessary tasks and have the ability to rapidly communicate with their provider should complications arise. Several strategies can be used to improve patient understanding and adherence to recommendations in self-care of their wounds, such as implementing video instructions.[26]

Advanced wound dressings (AWDs) provided by a durable medical equipment (DME) supplier are needed for many wound patients in all sites of care, but especially for those at home. Dressings supplied in single-dose packaging can limit confusion and improper usage. Video instruction for dressing changes may be a more useful tool than paper or verbal instructions. Providers often find prescribing dressings a confusing task since there are more than 700 on the market, but the process can be simplified by considering the major categories of dressings and employing a standardized approach[27] or by using technology to aid in the decision-making.[28]

It is useful to assign 1 staff member to coordinate interactions with DME providers. Depending on the severity of the pandemic in local areas, some DME providers may be closed or providing limited services. Traditional suppliers of dressings, orthotics, and other key adjuncts to wound care may be limited in local areas or need sourcing from other suppliers. National mail-order suppliers may prove to be a useful alternative. In addition, internet sourcing of some products may be needed to supplant local sources temporarily.

Home: telehealth

For telehealth, CMS is encouraging its use if at all possible, and they have provided many waivers to the barriers of use.[29] They describes 3 levels of virtual visits: Medicare Telehealth Visit, Virtual Check-ins, and E-Visits. Medicare Telehealth Visits seem to be the most useful in evaluating the wound patient. Providers can now see both new and established patients for telehealth visits in any setting and region of the country. In the home, CMS is directing providers to use the higher reimbursing office evaluation and management codes (9920X and 9921X) with Place of Service 02 for Medicare Telehealth Visits. Wound consults by telehealth also can be performed on hospital inpatients, in the ER, or in a SNF. Since it is not feasible to perform all the components necessary to properly code for visits, providers will use time-based coding. The Department of Health and Human Services has also relaxed rules regarding the use of HIPAA-compliant software to perform telehealth visits. Now, as long as the provider is acting in good faith, they can use any 2-way video communication software on their computer or phone, such as FaceTime, which has been shown to be a useful tool to evaluate wounds.[30] One additional barrier CMS has lifted regards state licensure. For reimbursement, a provider can be licensed in a state other than the patient's state of residence. However, providers must check with the state medical board to determine if the practice is legal. A large majority of states have issued waivers to licensure and telemedicine during the emergency. The Federation of State Medical Boards maintains an up-to-date listing of states providing such waivers.[31]

Albeit, telemedicine has limitations in the evaluation and treatment of wounds. Unless there is a health care professional on site during the visit, most of the encounter must rely upon the history and visual inspection by video. Fortunately, in most cases video and/or photos can be used to evaluate for infection, the major cause of wound-related hospital admission. For those with mild infections, empiric antibiotics prescribed electronically can be effective. The history is often unreliable, and visual inspection lacking in the evaluation of ischemia. Some telehealth software programs can calculate the area of the wound, which is useful in determining if the wound is on trajectory for healing. Counseling on pressure relief/offloading, compression, basic care of wounds, and prescribing AWDs also can be accomplished by telehealth.

Home: home health

For some patients with wounds, telehealth alone may be appropriate, but for most a combination of approaches in the home is anticipated. For more complex patients

and those unable to engage in self-care, a visiting home health nurse is appropriate. The CMS has provided a temporary change to the definition of "homebound," which now includes patients who are confined to home with confirmed or suspected COVID-19 or those who a physician has determined are medically contraindicated to leave the home due to a condition that may make him or her more susceptible to contracting COVID-19.[32] Most patients with wounds would qualify under this new definition. While there is some risk for transmission of COVID-19 in having in-home visits from nurses or physicians, having a health professional with appropriate personal protective equipment (PPE) enter the home is less risky than patients commingling in other health care settings.[33] Home health nurses can perform more complicated wound care and dressing changes, such as deep packing, negative pressure wound therapy (NPWT), or multilayer compression dressings. Additionally, CMS now allows simultaneous visits for home health and a provider by telehealth. This combination may be desirable for the provider to get a clear picture of the wound and accurate measurements, including depth.

Home: physician home visits

Providers also can perform home visits during which more complete examination and advanced wound procedures could be performed. In the home, providers can draw blood for laboratory assessments or take a wound culture if necessary. Providers making home visits for wound patients should have some method of vascular screening available, like a handheld Doppler for ankle-brachial index calculation, despite its known drawbacks in those with diabetes, because it is quick and easy to perform.[34] Procedures such as surgical debridement, application of a cellular- or tissue-based product, or total contact cast can be performed in the home and may aid in wound healing. Certainly, providers will need to take precautions to prevent wound infections and have necessary PPE to reduce the risk of COVID-19 transmission.

Physician office

When physician home visits cannot be performed, or in the case of more complex wounds, patients will need to visit the physician's office. In the office, a more complete exam can be performed by the physician with laboratory analysis, imaging, and vascular screening. Procedures such as surgical debridement, local anesthesia, graft application, and other therapies can be performed. Given that the primary goal is to provide high-quality care while reducing the utilization of hospital services, it is desirable to expand the capability of procedural care in the office. Space in the office that would be suitable for performing more extensive debridement, minor toe amputations, abscess drainages, and similar procedures that typically require outpatient or inpatient management at the hospital can be identified. Identifying the equipment and medications that would be required to successfully and safely perform these procedures can assist in reducing both hospital burden and exposure for high-risk patients with wounds.

HOPD wound center

If a wound or patient is too complex to be managed in the physician's office, it will be necessary to escalate the patient to a wound center. The organized, multidisciplinary approach with specialized personnel in a wound center is a key benefit. Often there is better access to infectious disease specialists and surgical subspecialties like vascular and podiatry. Equipment and supplies are also more plentiful in the wound center than a physician's office.

Noninvasive studies for perfusion or oxygenation are readily available and part of protocolized care pathways. More aggressive debridement and sharp debridement on extensive ulcers can be performed since hemostasis is better achieved in the wound center. The application of tissues and grafts, HBO therapy, platelet-rich plasma, NPWT, shockwave therapy, offloading devices, and specialized compression dressings are all treatment options that can be performed in a wound center.

Many wound centers are classified as an HOPD and a majority are located within the physical space of the hospital. These co-located centers pose an increased risk of COVID-19 exposure. One solution, if available, is to move the wound center to a medical office building or other adjunct location outside the hospital. Some HOPDs are located outside of the hospital space, where there is less risk of exposure.

Other risk reduction strategies in the wound center include: avoiding a crowded waiting room (through scheduling or having patients wait in the vehicle); using surgical masks for staff, patients, and family members; expediting the evaluation and wound treatments; and frequent, thorough cleaning of exam rooms and surfaces. Some centers phone patients the day before visits and triage them for COVID-19 symptoms.

ASC and OBL

Ambulatory surgery centers (ASCs) and office-based labs (OBLs) can provide patients and providers access to surgical care for revascularization, infection treatment, wound complications, wound closure, and revascularization. These settings can help offload the hospital demand for these procedures, which are frequently performed in the acute care setting.

On March 15, 2020, CMS issued a recommendation to limit all nonessential surgeries and procedures until further notice.[35] However, there is some degree of interpretation on which wound procedures are essential. Recently the American College of Surgeons (ACS) published guidance on Elective Case Triage during the COVID-19 pandemic.[36] The goals of triage and reduced utilization are to minimize potential COVID-19 exposure to staff and patients, conserve critical supplies and equipment for acute patients with COVID-19, reduce ICU and inpatient bed usage, and free up staff to be re-deployed for pandemic patients. The ACS recognized that the pandemic's effects on hospitals will present in phases:

- **Phase I** (**Preparation Phase**)**:** Few COVID-19 patients, hospital resources not exhausted, and ventilators and ICU are available for use

Table. The urgency of wound-related surgical procedures during the COVID-19 pandemic.

CATEGORY	CONDITION	TIER CLASS
Wounds/ Gangrene/ Amputation	Lower extremity disease with non-salvageable limb (amputation)	3 Do not postpone
	Amputations for infection/necrosis (TMA, BKA, AKA)	3 Do not postpone
	Amputations for infection/necrosis (toes)	2b Postpone if possible
	Deep debridement of surgical wound infection or necrosis	2b Postpone if possible
	Wounds requiring skin grafts	2b Postpone if possible
Venous	Procedures for ulcerations secondary to venous disease	2a Consider postponing
Peripheral Vascular Disease	Acute limb ischemia	3 Do not postpone
	Limb ischemia, progressive tissue loss, acute limb ischemia, wet gangrene, ascending cellulitis	3 Do not postpone
	Fasciotomy for compartment syndrome	3 Do not postpone
	Peripheral vascular disease: chronic limb-threatening ischemia - rest pain or tissue loss	2b Postpone if possible
	Peripheral angiograms and endovascular therapy for claudication	1 Postpone
	Surgical procedures for claudication	1 Postpone

Adapted from the American College of Surgeons.[36]
TMA: transmetatarsal amputation; BKA: below-knee amputation; AKA: above-knee amputation

- **Phase II (Urgent Setting):** Many COVID-19 patients, ICU and ventilator capacity limited, and operating room supplies are limited
- **Phase III:** All hospital resources are routed to COVID-19 patients, no ventilator or ICU capacity remaining

The ACS recommends utilizing the St. Louis University Elective Surgery Acuity Scale (ESAS) in assisting in the decision of whether a surgery should be postponed during the pandemic. The ESAS has 3 tiers of surgical acuity: (1) low acuity, (2) intermediate acuity, and (3) high acuity. Each tier is modified by (A) healthy patient or (B) unhealthy patient. Considering wound-related treatments, the ACS recommendations are listed in the **Table.**[36]

In Phase I of the pandemic, wound-related procedures may be appropriate in the ASC setting. However, in Phases II and III, the CMS Hospital Without Walls surge allows ASCs to support overwhelmed hospitals by performing atypical functions, such as offsite ICUs, maternity suites for non-COVID-19 patients, and offload other inpatient surgical volume.

Hospital

Ultimately, the goal of the WCWW is to provide good care for wounds to reduce utilization of hospitalization. The acute care hospital has a higher risk of COVID-19 transmission for wound patients when compared with other health care settings. Shifting care away from the hospital and postponing nonessential services helps to free up beds and resources for pandemic patients. Some hospitalizations, however, will be unavoidable. This is especially true for those at higher risk for infection, such as those with DFUs, who may suffer more from disruption of normal wound treatments like regular debridements and offloading (pressure reduction) procedures. In this vulnerable population, focus should be given to reducing the length of stay by performing needed procedures and coordinating discharge planning through the WCWW as soon as possible upon admission. Admitting patients to hospitals that have organized teams to care for wound or diabetic foot patients also may help to improve the outcome and utilize scarce resources more effectively.[37]

Hospital-based diagnostic studies, including vascular ultrasound, radiographs, computed tomography, and magnetic resonance imaging, are critical to the successful management of wound patients. In general, most management protocols indicate that necessary diagnostic studies should be obtained as soon as possible to identify the factors involved in delayed healing to inform the best treatment plan. However, in times when direct contact is dangerous to the patients and technologists performing these studies, providers must consider whether these studies are critically necessary or whether they can be postponed until the pandemic has eased. Clinical judgement is critical. Obtaining an arterial Doppler study on the lower extremities of a patient who has minimal evidence on physical exam of arterial insufficiency might be justifiable, but in a pandemic situation these tests should be done only when they will have a high likelihood of changing patient management.

Providing IV antibiotic therapy at home can help reduce the length of stay, however in most cases, IV antibiotics can be converted to an oral route earlier.[38] In addition, the urgent need to limit hospitalizations and reduce length of stay may be a good opportunity for newer antibiotics that require only 1 dose, or administration once weekly.[39] Furthermore, care in lower acuity centers such as ASCs and OBLs may free up resources and further increase hospital-free days.[40,41]

Novel care strategies also might be considered where patients with infected wounds receive surgical debridement in a

wound clinic procedure room or an ASC or OBL and then receive daily IV antibiotic infusions at the wound clinic or office if home infusion is not feasible, similar to the method for chemotherapy infusions.

SNFs

Patients in long-term care facilities are at extreme risk of death from COVID-19. Thus, nursing homes have taken considerable measures to prevent infections in their residents, including lockdowns and complete bans on visitors,[42] which sometimes includes wound care providers. Patients in nursing homes already provided significant challenges to performing wound care, but during the pandemic, it will be even more difficult. The authors encourage nursing home staff to utilize wound experts by telemedicine to obtain management recommendations and orders for medications and supplies. Proper documentation, photographs, and risk assessment can assist providers performing virtual consultations. The authors also encourage staff to operate at the top of their licenses and become the "on-site hands" of the provider so that residents may receive necessary debridement, procedures, and wound infection prevention.

CONCLUSIONS

During this crisis, ingenuity is required to find solutions that will work to care for patients with wounds while minimizing their exposure risk. The goal is to provide treatment to these patients while they are safe and at home. Patients with wounds fit several of the high-risk criteria for COVID-19 infection and mortality. They are often older, obese, and immunosuppressed, as well as have multiple comorbidities. The answer is not to avoid clinical evaluation and wait for wound infection, but to mitigate the risk of COVID-19 and ulcer infection. Governments and payers have given providers new freedoms to care for their patients in lower-risk settings. As providers adjust to the new model of care during the pandemic, the WCWW concept can help manage patients through the continuum of care in all settings.

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