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SPECIAL COMMUNICATION

Ensuring Quality Care in the COVID-19 Era

Applying the Donabedian Model to Tertiary Wound Care Center Practices

Jenna C. Bekeny, BA*

Elizabeth G. Zolper, BS*

John S. Steinberg, DPM†

Jayson N. Atves, DPM†

Carol Deane Benedict, MD‡

Kenneth L. Fan, MD*

Cameron M. Akbari, MD, MBA§

Christopher E. Attinger, MD*

Karen K. Evans, MD*

*Department of Plastic and Reconstructive Surgery, MedStar Georgetown University Hospital; Washington, DC.

†Department of Podiatric Medicine; MedStar Georgetown University Hospital; Washington, DC.

‡Department of Rheumatology; MedStar Georgetown University Hospital; Washington, DC.

§Department of Vascular Surgery, MedStar Georgetown University Hospital; Washington, DC.

Corresponding Author: Karen Kim Evans, MD, Georgetown University Hospital, 3800 Reservoir Road, NW Washington, DC 20007. (E-mail: karen.k.evans@medstar.net)

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The COVID-19 pandemic has disrupted healthcare, with its far-reaching effects seeping into chronic disease evaluation and treatment. Our tertiary wound care center was specially designed to deliver the highest quality care to wounded patients. Pre-pandemic, we were able to ensure rapid treatment via validated protocols delivered by a co-localized multidisciplinary team within the hospital setting. The pandemic has disrupted our model's framework, and we have worked to adapt our workflow without sacrificing quality of care. Using the modified Donabedian model of quality assessment, we present an analysis of pre- and intra-pandemic characteristics of our center. In this way, we hope other providers can use this framework for identifying evolving problems within their practice so that quality care can continue to be delivered to all patients.

The COVID-19 pandemic has disrupted the healthcare system, reaching beyond medical specialties directly related to virus containment and treatment. Wound care has been uniquely impacted due to the collaborative nature of many wound treatment centers. Several studies have shown that a multidisciplinary team in a hospital-based center has better outcomes and is a superior model of care.¹⁻³ Our center has previously published our design process, which relies on co-localization of medical and surgical providers across multiple disciplines.⁴ This facilitates easy communication between all stakeholders and allows for rapid evaluation, collaboration and treatment of a wounded patient. The COVID-19 pandemic has split a chasm in this structure, and our practice has had to adapt in order to ensure patient and provider safety while not sacrificing quality of care. Wound care is an

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essential service, which slows morbidity and mortality for patients and reduces hospital admissions for traditionally comorbid patients. Therefore, wound centers must adapt, and must do so rapidly.

The Donabedian model of quality care evaluation was originally outlined in 1966.⁶ This framework takes a healthcare microcosm and divides it into its structure, process, and outcome. Each level can be assessed in granularity to identify weak links in the system and develop strategies for improvement. This model has undergone several iterations, with the addition of pertinent antecedents by Coyle and Battles in 1999.⁷ The antecedent category captures the influence of individual patient characteristics and their environments on treatment outcomes. As a patient-centric practice, this revised model serves our purpose of care quality evaluation well. **Figure 1** outlines the modified Donabedian schematic.

In this article, we use the revised Donabedian model – antecedents, structure, process, and outcome – to analyze the evolution of our tertiary wound care center during the COVID-19 pandemic. Even though the situation continues to evolve, it is important to institute quality care metrics from the start. As data from our center and others comes in waves, we hope that this framework can inform other departments to ensure quality patient care assessment in a challenging time (**Figure 2**).

ANTECEDENTS

At its inception in 1999, our wound care center provided treatment to nearly 2,000 patients. This number swelled to over 11,500 patients by 2015. With this high patient volume, our population is inherently diverse, with varying socioeconomic backgrounds,

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comorbid conditions, wound etiology and severity, and ability to engage in treatment. On average, we serve a highly comorbid population who falls in lower socioeconomic status strata. Average Charlson Comorbidity Index (CCI) was 3.69 (SD 2.3) in 2013 and 3.77 (SD 2.5) in 2017. Notably, a CCI of 3.77 correlates to nearly 53% risk of mortality within 10 years, making our patients particularly at risk for disease complications.⁸

Our highly comorbid population is at increased risk for COVID-19 contraction and complications. Even if a patient avoids infection, many patients have undergone work status and insurance coverage changes. Patient access to telehealth options is highly variable within our group. Many patients do not own computers or smart phones with video-sharing options. When patients have access, ability to adeptly use these devices is variable. Our antecedent analysis shows carryover of pre-existing challenges and the addition of new barriers to achieving suitable wound care outcomes. In order to compensate for these added difficulties, our group has worked to adapt our structure and process.

STRUCTURE

The structural component of our tertiary wound care center can be broken down into 1) the facility and 2) the providers. Pre-pandemic, a major benefit of our service was the co-localization of a large multidisciplinary wound team. Our core team is comprised of plastic surgeons, vascular surgery, podiatry, rheumatology, and hyperbaric medicine. Our hospital-based setting allows for rapid access to surgical booking and other specialties

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needed for consultation. This model facilitated easy communication between all necessary members of a wounded patient's care team.

While our hospital-based wound center was ideal for both outpatient and inpatient care, we had to adapt to barriers imposed by the COVID-19 pandemic. Our intra-pandemic facility has evolved into what Rogers et al describe as the "wound center without walls⁹." These changes have been implemented to protect both patients and providers from disease spread while maintaining free and easy communication. We have reduced in-person appointments and shifted the majority of appointments to remote telemedicine visits. Two-way HIPPA secure video-based evaluation is preferred when available to the patient. Telehealth has been a valuable avenue for continuing patient care in a safe manner. As providers, we are able to perform thorough wound evaluation for patients who are able to access video-based platforms. We can walk patients through wound care regimens and provide feedback when images or video is used. However, telehealth is not without limitations. Phone-based visits prevent true evaluation of the patient, wound status and adequacy of treatments. As we accrue data on telehealth usage, disparate access to video-based services becomes apparent, and future work must identify strategies for keeping all patients equitably engaged in care. In order to keep communication lines open for the staff, operations have shifted to secure virtual methods, such as WhatsApp messenger (Mountainview, CA). All pertinent members are included in message threads to ensure continued communication between administration, nurses, and physicians. As the gravity of COVID-19 became apparent, we arranged meetings with our visiting nurse agencies in

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early April to proactively obtain access to their medical record systems. Now, we can remotely view visiting nurse measurements and photos of patient wounds.

We have maintained a “social distancing clinic” for patients who must urgently be seen by our providers. Changes to clinic operations involved 1) limiting office personnel 2) increasing time between appointments to prevent patients from being within the waiting room at the same time. Our hospital system mandates that all nurses and administrative staff take 30% paid time off. Staff and healthcare providers who are immune suppressed, elderly, or live with individuals at high risk for COVID-19 complications opted for 100% paid time off. Resident physician coverage alternates between a “one week on and one week off” schedule. This shift comes per graduate medical education guidelines; this schedule aims for one team to remain contact free for at least one week to prevent disease contraction and spread.

PROCESS

The process involved in wound center patient care can be divided into 1) evaluation and 2) treatment. Pre-pandemic, our service followed a reliable evaluation and treatment pattern to achieve definitive wound closure (**Figure 3a**). This process utilized members across medical specialties to achieve a clean wound bed in patients with corrected vascular and biomechanical abnormalities to allow for closure via local wound care or operative methods. Our pre-pandemic process was treatment driven. Our experienced team worked to develop individually tailored care plans with the goal of definitive closure. The American College of Surgeons (ACS) put forth intra-pandemic guidelines to limit unnecessary patient

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exposure to the hospital setting and to preserve limited hospital resources. These guidelines prevent immediate closure for every wounded patient, changing our process algorithm.

Intra-pandemic, a set of steps has been added before the previously described workflow. All patients now start at triage; all wounds are evaluated remotely to determine need for further in-person evaluation or management. Triage is of particular importance for our patient population; recent data indicate that diabetes is one of the most significant risk factors for ventilator use and death in Covid-19 positive patients¹⁰. The majority of our patients have switched from the treatment pathway into a management track. Our goal is to treat emergent cases, while preventing progression in wounds that have treatment necessarily postponed. Our updated algorithm, which is outlined in **Figure 3b**, builds on the suggestions of the ACS. We continue to perform amputations for the non-salvageable necrotic, infected leg or foot. For more distal defects, our team evaluates severity of infection. The ACS recommends postponing toe amputations, but our group hesitates to give wet, necrotic toes the opportunity to progress to a more devastating proximal pathology. Similarly, surgical debridement in the setting of exposed hardware, joint, or bone is not postponed. We suggest following the triage system outlined by Rogers et al for site of care for various wound conditions¹¹.

For patients who must receive urgent operative treatment, our process has changed significantly. Patients who would previously be sent to the intensive care unit (ICU), such as patients with free tissue transfer, are now sent to the regular floor for monitoring. Our team has been increasingly proactive about discharge planning. We aim to have patients

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exeunt when medically ready to prevent continued hospital exposure. Coordination with other medical specialties needed for patient care requires a few additional days for planning. All surgical teams have been reduced in personnel and operating privileges, so procedures can only occur when schedules are synced. Providers involved in inpatient care have suspended in-person daily rounds; we have transitioned to online platforms for informing all team members for changes to the inpatient census and treatment plans. In-person rounds are limited to patients in need of urgent evaluation and all others have been transitioned to virtual rounds via phone or video-based devices. Our group has established weekly online town halls to keep all providers and administrators up to date with patient care and operations.

OUTCOMES

Pre-pandemic our wound center outcomes focused on 1) patient satisfaction 2) definitive wound closure 3) preservation of limb length and 4) maintenance of or return to ambulation. These outcomes were driven by a structure and process that facilitated rapid multidisciplinary care, complex surgical intervention, and consistent provider follow-up. Intra-pandemic, our outcomes have shifted. The main target is to limit wounded patient exposure to the hospital environment. For patients who were able to be managed remotely, we want to ensure that communication lines have been open and effective. On the provider-side, we want to determine if patient volume has been maintained in a responsible way.

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Our group is establishing metrics that evaluate the efficacy of our structure and process adaptations during the pandemic. Data are needed to ensure equitable patient treatment, and constant evaluation of pathology progression, complications from persistent wounds, and patient safety and satisfaction are needed. Our team has been significantly reduced to barebones members. With mandated paid time off for certain team members, our operating rooms have been covered by non-wound teams who are not as familiar with our procedures and equipment. We have anecdotally observed changes in operating efficiency that must be evaluated to ensure that patient outcomes are not impacted in this time. Reduction in ICU utilization for free tissue transfer patients must be evaluated. If flap survival, complication occurrence, and reoperation numbers are unchanged, this could be key in the future of postoperative flap monitoring, with cost-saving for both patient and system. While robust data needs to be collected, our team has anecdotally noted decreases in emergency room visits and hospitalizations for wounded patients. We believe that this may be in part to two very different courses – patients with low-risk pathology are rightfully avoiding hospital contact and patients with high-risk comorbid conditions are avoiding contracting Covid-19 but are at risk for worse wound outcomes.

CONCLUSIONS

Although the impact of the COVID-19 pandemic is continually evolving, initial assessment and early adaptation is necessary for continued quality patient care. Wound care patients are a distinct population, and visual evaluation and prompt treatment from multiple

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specialists is needed to prevent disastrous effects of disease progression. Our initial care model has necessarily changed to maximize patient safety and resource utilization. By using a validated quality assessment tool, such as the Donabedian model, we hope that other practices can similarly adapt in these challenging times.

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Conflict of Interest: None reported.

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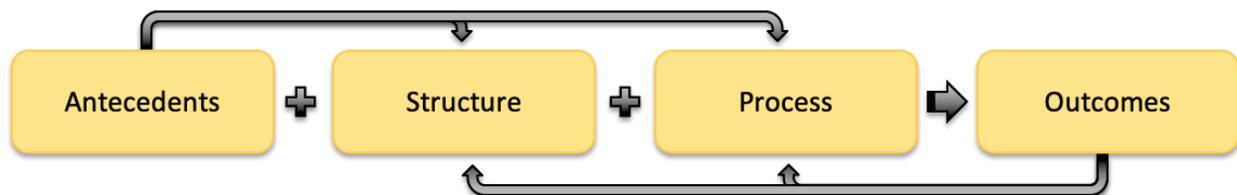


Figure 1: Revised Donabedian Model of Quality Care

The Donabedian Model of quality care outlines how the sum of structure and process influence outcomes within the healthcare setting. Modifications to this schematic involved inclusion of antecedents, or patient characteristics. In our model, we constantly evaluate how antecedents and outcomes inform structure and process development.

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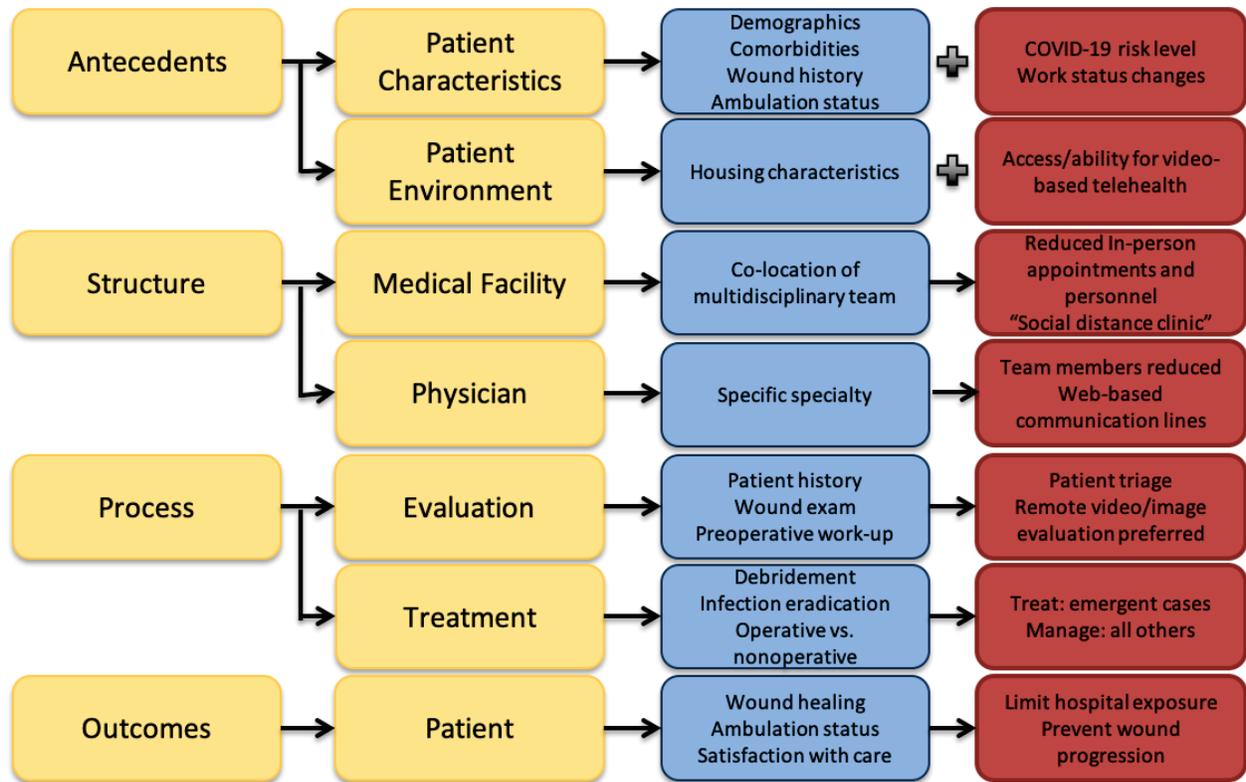


Figure 2: Modified Donabedian Analysis of Wound Care Design Pre- and Intra-Pandemic

Our center’s response to the COVID-19 pandemic uses the modified Donabedian schematic. We break down our practice into the four categories – antecedents, structure, process, and outcomes – to identify the impact of the pandemic and develop strategies for improvement.

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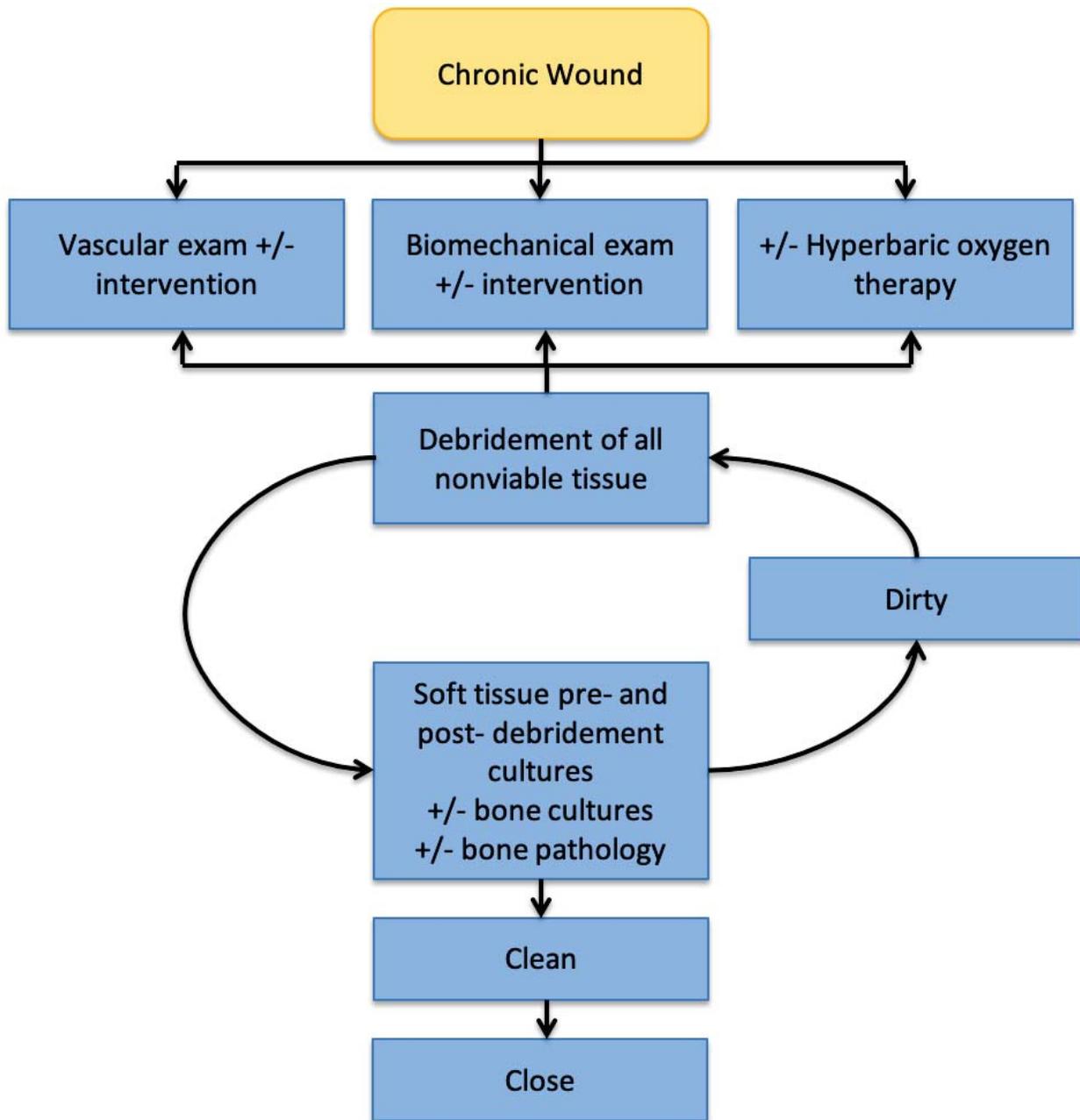


Figure 3a: Pre-Pandemic Approach to Wound Evaluation and Treatment

Our pre-pandemic approach to patient care was treatment driven. We relied on validated protocols for evaluation and treatment to achieve definitive closure in our patients.

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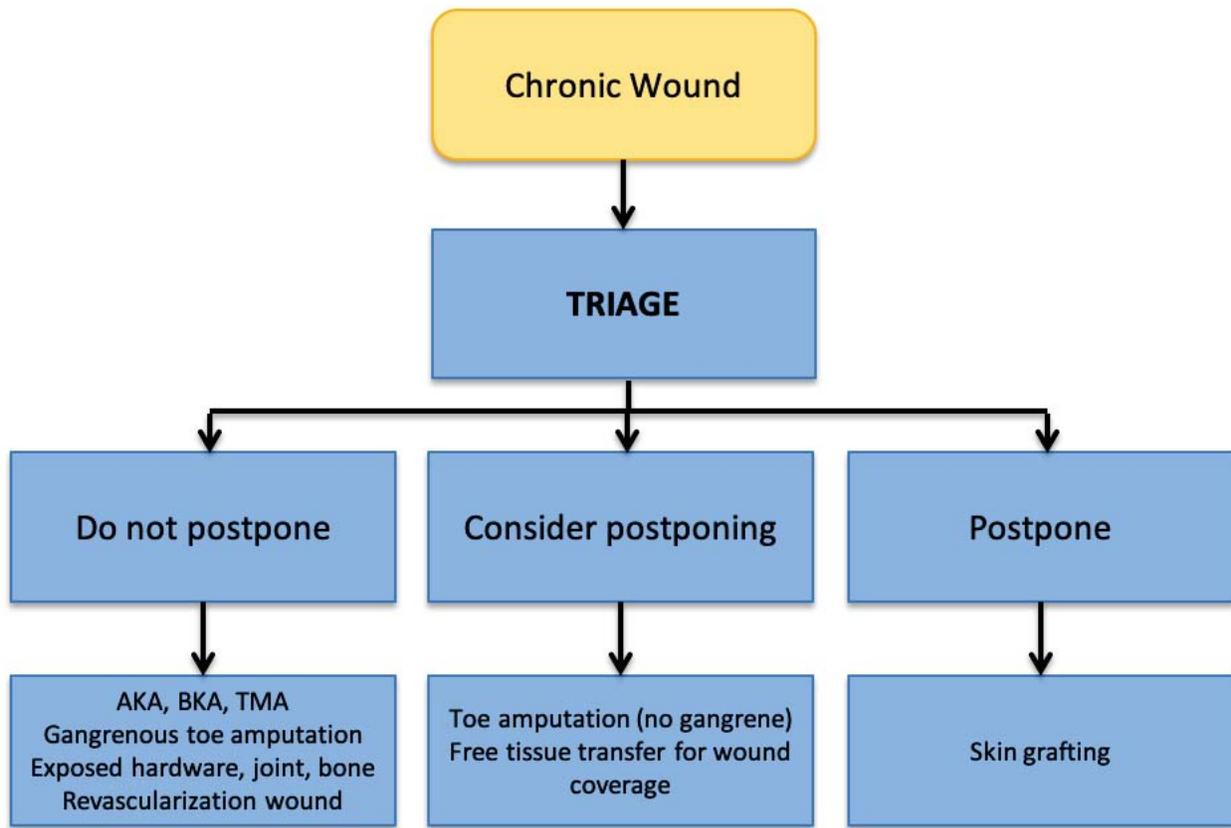


Figure 3b: Post-Pandemic Approach to Wound Evaluation and Treatment

Our post-pandemic protocol has evolved to comply with necessary restrictions on in-person evaluation and operative privileges.