Addressing the Complexities and Disparities in Critical Limb-Threatening Ischemia Care

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Critical limb-threatening ischemia (CLTI) refers to the most severe form of peripheral artery disease (PAD) characterized by inadequate blood flow to the extremities, often leading to tissue damage and the risk of limb loss.[1,2] Given the significant morbidity and mortality associated with CLTI, early diagnosis and intervention are crucial for preserving limb function and overall health.[3] Management typically involves a multidisciplinary approach, including vascular surgeons, interventional radiologists, interventional cardiologists, wound care specialists, podiatrists, and vascular medicine specialists. Treatment strategies typically start with medical management through optimization of cardiovascular health by addressing hypertension, hyperlipidemia, diabetes,[4,5] and smoking cessation in addition to antiplatelet agents.[2,6-8] More invasive interventions are needed to prevent limb loss, whether open surgical or endovascular approaches to revascularization.[1,6]

Recent years have witnessed a significant surge in attention and advancements in the care of CLTI. There is a growing recognition of CLTI as a pressing issue within the realm of cardiovascular health, prompting heightened efforts from health care professionals, researchers, and policymakers to adopt a comprehensive approach. Initiatives by the American Heart Association (AHA), for example, have aimed to reduce nontraumatic lower extremity amputations by 20% in 2030.[8] Joint initiatives, such as the "Get a Pulse on PAD" initiative supported by the Society for Cardiovascular Angiography & Interventions and the Society for Vascular Surgery, aim to more directly communicate with the patient. The AHA's PAD National Action Plan has mobilized multidisciplinary action plans to address the urgent needs surrounding management of PAD and CLTI.[9,10] As a result, there is progress in the recognition and management of CLTI, underscoring the importance of continued collaboration and investment in this critical area of cardiovascular health.

While strides have been made in the attention that CLTI is afforded, there continue to be challenges regarding a lack of equipoise in the management of CLTI. Addressing the significant disparities in CLTI care, especially in underserved communities, necessitates a multifaceted approach. First, it is imperative to identify and understand the barriers hindering access to timely and effective CLTI treatment. These barriers may range from limited health care infrastructure to financial constraints and lack of awareness regarding CLTI.[11-13] Attracting physician investigators who care for disadvantaged populations to enroll these patients in clinical trials is an important component of making advances in therapy accessible to all.

Additionally, socioeconomic factors play a pivotal role in exacerbating disparities in CLTI care. Issues such as poverty, limited education, race,[14,15] lack of access to broadband internet connectivity, and inadequate access to health care resources disproportionately affect underserved communities, leading to delays in diagnosis and treatment.[13,16,17] Addressing these socioeconomic determinants is paramount in ensuring equitable access to CLTI care for all individuals, regardless of their background or geographic location. These public health measures to increase awareness for both patients and physicians hopefully will play a role in reducing these delays to diagnosis. There also may be a role for artificial intelligence in meeting this public health need.[18] However, this is just the beginning and more must certainly be done.

Strategies aimed at reaching and effectively managing CLTI, particularly in these individuals, involve a multifaceted approach that considers socioeconomic factors, access to health care, and cultural sensitivities. Initiatives focused on preventive care, risk management, and patient education play a crucial role in this endeavor, emphasizing the importance of early detection, lifestyle modifications, and adherence to treatment regimens. Specific initiatives set by the AHA's PAD National Action Plan[10] will be imperative in improving outcomes for all individuals.

For optimal management and timely intervention in CLTI to enhance patient outcomes, it is also crucially important to

optimize the accuracy of diagnosis, especially concerning pedal and digital ischemia. Unfortunately, there exist many challenges in the management of CLTI that make this difficult (**Figure**). The widely used ankle-brachial index (ABI), while recommended for PAD diagnosis, is not consistently reliable for predicting wound healing, appropriate levels of amputation to promote rapid healing and recovery, or other adverse limb events, particularly in the approximately 30% of patients with angiographically documented CLTI who exhibit normal or noncompressible ABIs.[19] Moreover, significant proportions of patients with suspected CLTI undergo lower extremity angiography and revascularization without pre-procedure ABI assessment.[19–21] Alternative tools such as digit pressure and toe-brachial index show promise, especially in patients with isolated below-the-knee disease, yet their availability is limited and their diagnostic accuracy varies.[21] Challenges also arise from pathophysiological complexities, such as medial arterial calcinosis and noncompressible vessels in patients with comorbidities such as diabetes mellitus and chronic kidney disease.[20–22] Furthermore, the presence of infrapopliteal PAD poses additional diagnostic complexities, as ABI and ankle pressures often fail to correlate with disease severity in this subgroup.[19] Despite these challenges, the integration of advanced diagnostic modalities and the adoption of angiosome-based or direct wound-based revascularization strategies may offer potential solutions to enhance diagnostic accuracy and guide targeted interventions, ultimately improving patient outcomes in the management of CLTI.[19,23]

Clinical trials are poised to play a pivotal role in advancing the care of patients with CLTI, acting as catalysts for innovation and improvements in overall treatment strategies. Ongoing research initiatives aimed at refining the process of care for patients with CLTI are addressing critical gaps in knowledge and practice. One notable example is the ELEGANCE trial, a global, prospective, multicenter registry focusing on women and under-represented minorities (URMs) who are at heightened risk of severe PAD but are under-represented in research.[24] By aiming to enroll at least 40% women and 40% URMs, ELEGANCE seeks to address disparities in PAD research and understand the differences in treatment responses among various demographic groups. Such studies are indispensable in establishing the evidence base needed to enhance early recognition, team-based care, and tailored comprehensive management strategies for individual patient needs. Furthermore, it is increasingly vital to uncover disparities in baseline disease characteristics, which may arise from factors such as delayed diagnosis, undermanaged comorbidities, and unequal access to care.[25] Through collaborative endeavors and inclusive research practices, initiatives like ELEGANCE are propelling progress toward more equitable and effective care for all CLTI patients.

In conclusion, while considerable progress has been made in recognizing and addressing CLTI, significant challenges persist, particularly regarding disparities in access to timely and effective treatment. The multifaceted barriers hindering equitable CLTI care, such as socioeconomic factors and limited health care access, necessitate targeted interventions and public health measures to improve outcomes for all affected individuals. Efforts to enhance early recognition, team-based care, and tailored management strategies are paramount, with initiatives such as the ELEGANCE trial serving as crucial endeavors in bridging gaps in knowledge and practice. Despite challenges in accurate diagnosis, ongoing research and the adoption of advanced diagnostic modalities offer promising avenues to improve patient outcomes. Additionally, proactive population health management strategies, focused on preventive care, risk management, and patient education, are vital in addressing disparities and improving overall vascular health. By collectively addressing these challenges and fostering collaborative efforts, health care systems can strive toward achieving more equitable outcomes in CLTI management and ultimately enhance the health and well-being of affected populations.

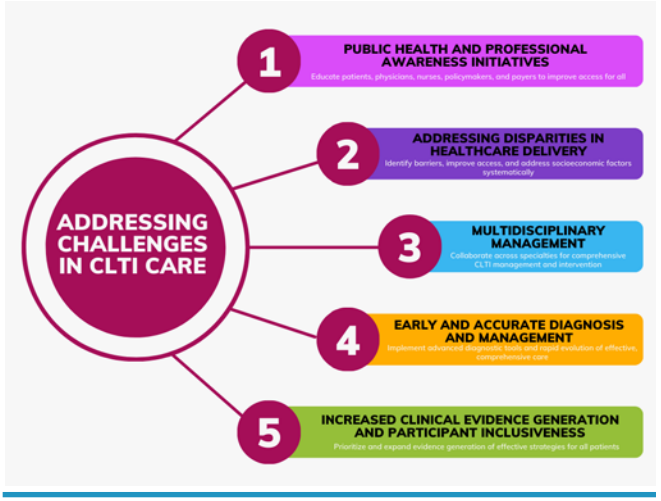

FIGURE. Addressing challenges in CLTI care.

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