

Post the Pandemic: How will COVID-19 Transform Diabetic Foot Disease Management?

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I have learned that traditional healthcare delivery models for managing chronic illness like diabetes are not at scale to handle situations like the global COVID-19 crisis. For instance, because of the drastic containment and mitigation measures, other parts of the healthcare system are leaving fragile patients including individuals with diabetes without necessary services. This is disrupting the best practices for preventing diabetes-related complications including diabetic foot syndrome (DFS), such as diabetic foot ulcer (DFU), infection, and gangrene.¹

Furthermore, because people with diabetes represent a fragile population that is at increased risk of mortality from COVID-19, it is recommended to avoid unnecessary diabetes-related hospital admissions to reduce the risk of COVID-19 exposure in the hospital. One of the major reason for hospitalization in people with diabetes is DFU, which is estimated to affect up to one-third of people with diabetes.² Globally, it is estimated that 20 million people currently have an active DFU; an additional 130 million have precursor risk factors to develop a DFU without intervention.^{2,3} A study on the economic burden of DFD and amputation showed that DFU patients were seen in outpatient facilities 14 times per year and hospitalized approximately 1.5 times per year.⁴

While the traditional barriers—reimbursement, patient and provider buy-in, and technology—have always been there, the accelerated pace of the nation’s response to the COVID-19 emergency has allowed providers to jump in and try things out new solutions to facilitate care delivery to patients with acute or chronic illness, while supporting drastic containment and mitigation measures to limit spread of COVID-19 and preserve hospital beds for COVID-19 patients. Thanks to advances in smartphones, mobile applications, smart wearables, telehealth, and internet of things, new solutions are emerging to smartly manage DFD.^{5–8} While still in infancy, in the future I predict these technologies will be quickly adopted at scale to improve remote management of DFD, smartly triaging those who need to be

seen in outpatient or inpatient clinics, and supporting “hospital-at-home” care delivery model. These opportunities have been discussed in the following.

In light of the impending diabetes epidemic combined with challenges associated with COVID-19 pandemic, the need for enhanced prevention of DFUs is clear. In the current model of care to prevent DFUs, providers frequently reappoint patients and guide and monitor treatments using their clinical intuition of the patient’s average build-up of their preulcerative callus from activity and footwear.⁵ However, regular visits during the pandemic is not practical and its resumed implementation post pandemic in the current form could be difficult because of significant backlog in providing standard care during the pandemic. Thus, a better referral model is needed to manage DFD during and beyond the pandemic.

During this global pandemic, remote patient monitoring (RPM) is emerging as an effective and sustainable solution for precaution, prevention, and treatment to stem the spread of COVID-19. Thus, this pandemic can accelerate the adoption of wide range of RPM technologies for DFS management as well. For instance, for high-risk patients without active DFU, RPM shows great promise in identifying areas of impending injury/tissue loss, presence or absence of infection as well as in other areas of cardiometabolic care.⁵ RPM could also facilitate reinforcement of adherence to effective therapy such as alerting those who have poor compliance to their prescribed footwear.^{5,9} RPM through temperature

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sensing devices meets Centers for Medicare and Medicaid Services guidelines for a physiologic measure and has robust data as an early warning system for DFU in high-risk patients.^{1,5,10} Recently several technologies from smart socks to smart insoles to smart mat to smart offloading to smart thermography imaging systems have been developed enable monitoring risk factors and have potential to scale up and transform the future of DFS management.^{5,11-13}

Telemedicine and telehealth both describe the use of medical information exchanged from one site to another via electronic communications to improve the patients' health status.¹⁴ Telehealth is already making a very positive contribution to healthcare during the pandemic, and is being used in a variety of ways. But telehealth technologies do have certain limitations when it comes to treating patients with DFS. Further, there is a chance telehealth could add to hospitals being overwhelmed, unless it's used well. Several barriers may give healthcare executives pause when it comes to the adoption of telehealth for DFS management.¹⁴ These include: (1) patient acceptability, awareness, and trust in virtual care offerings; (2) effectiveness; (3) quality of care delivery for remote wound management; (4) reliability compared to in-person clinic visits; and (5) concerns around the cost to implement. In future, I predict this paramedic will improve patient acceptability vis-à-vis telehealth/telemedicine and will accelerate its cost-effective adoption in hospitals and outpatient clinics. Some of key applications of telehealth for DFS could be providing remote support in wound dressing change, support home nurses in managing wounds, sharing high-quality wound images with clinical providers for triaging those who need to be immediately hospitalized or seen in outpatient clinics, manage and identify signs of infection, and provide support care coordination to manage DFS and its risk.¹⁴

Long before the COVID-19 pandemic disrupted care delivery to patients with acute or chronic illness, new innovative solutions were emerged to provide care for the subset of patients who could receive hospital-level medical services in the comfort of their own homes.^{15,16} Prior studies have demonstrated that "hospital-at-home" care is feasible, acceptable, and efficacious in delivering hospital-level care to patients at home¹⁶; has 21% reduction in mortality and 24% reduction in readmissions¹⁷; and has on average 11% lower cost¹⁸ compared to similar in hospital acute or subacute care. Despite these promising results, the adoption of hospital-at-home is still limited. In future, I predict, the adoption of hospital-at-home will be accelerated in the hopes of having as many hospital beds available as possible for patients whose care can only be delivered in the hospital, especially those who will require a ventilator. I also predict that post pandemic, home-based medical care will be mainstreamed into the US healthcare delivery system for wide ranges of acute and subacute conditions including managing severe cases of DFS. For instance, some of giant service companies such as BestBuy has already expanding their

healthcare digital wellness efforts and moving from selling wearables and devices to adding services needed to help patients with chronic illness.¹⁹

In summary, in future, I predict in response to COVID-19 pandemic, we will see a new wave of innovations in the area of digital health, smart wearables, telehealth technologies, and hospital-at-home care delivery model. These innovations will transform the current model of care post pandemic and will facilitate triaging those who need to come to hospitals, supporting care at home, and even creating mobile hospitals to provide acute or subacute care for the subset of patients who could receive hospital-level medical services in the comfort of their own homes.

Declaration of Conflicting Interests

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