



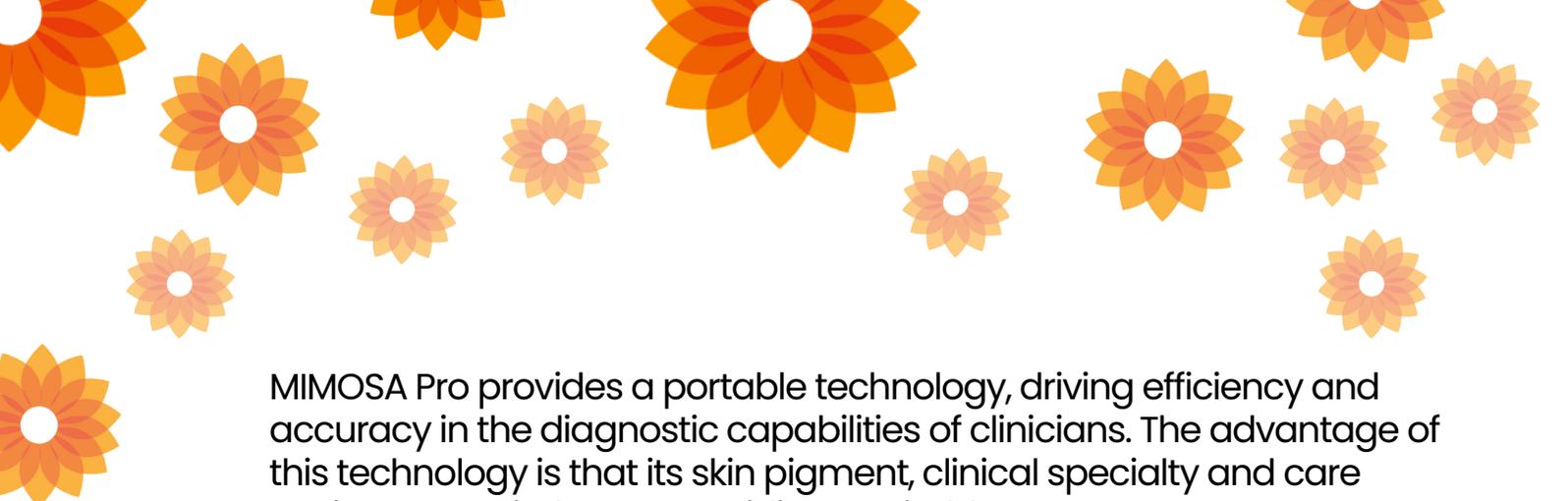
MIMOSA
e-book series

**The Importance of
Artificial Intelligence and
Imaging in Wound
Management**



Make the invisible, visible

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MIMOSA Pro provides a portable technology, driving efficiency and accuracy in the diagnostic capabilities of clinicians. The advantage of this technology is that its skin pigment, clinical specialty and care setting agnostic, hence providing equitable access.



Enable clinicians to assess any patient, anywhere and anytime



Enable clinicians to save limbs and lives through early detection.



Enable clinicians to make the invisible, visible.

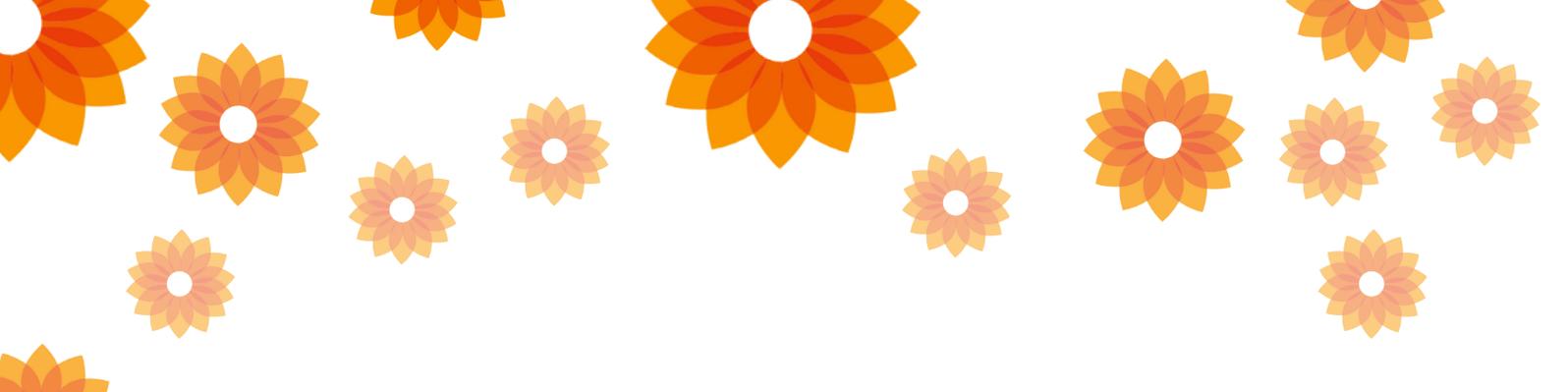


Newer more portable imaging technologies are providing a practical solution to seeing under the skin. Through multispectral means such approaches are improving the diagnostic capabilities of clinicians in all healthcare settings.



Karen Cross, MD, PhD

Innovator in Residence at the Nova Scotia Health Authority (NSHA)



Digital health care is not new. It has been evolving for several decades now, but as always, its adoption within wound care is much slower when compared with other clinical arenas.

“ MIMOSA is a game changer ”



Keith Harding
Dean of Medicine
Cardiff University, Wales, UK



Artificial Intelligence in Wound Care

Artificial Intelligence (AI) and Machine Learning (ML) are modern day buzzwords, but like most of the general population, many wound practitioners do not fully understand their meaning and, more importantly, their potential role in the management of wounds. Essentially, these concepts mean “data-driven” or “experientially driven.”

Artificial intelligence (AI), “is the ability of a machine to perform cognitive tasks to achieve a particular goal based on provided data”. Technologies using AI are revolutionizing and reshaping our healthcare landscape. The increasing computational power of AI, highly developed algorithms and advanced image processing is changing the way of assessing and diagnosing patients. Data trained algorithms enable computers to scan billions of unstructured data, extract the relevant data and recognize complex patterns with increasing confidence through mass iterative learning. Sounds complicated and it is, but the “machine” does the hard labour. Such technologies tend to be practical and easily used by practitioners.

Healing prediction is one of the most challenging issues in wound management and is a key component to achieve wound closure. Most health conditions are complex. The multifactorial complex nature of wounds, in particular those that are chronic, makes prediction by clinicians difficult (i.e. not an exact science.). This complexity arises not from the linear interaction between isolated and predictive factors (e.g. size), but from the complex interaction of many interrelated factors (i.e. comorbidities). As often stated by those who care for patients with wounds, “it’s not about the hole in the patient but rather the whole patient”. Therefore, this complex web of factors includes other health information outside of the wound itself and exponentially increases the complexity of their management.

Machine-learning models can be trained with the use of tens of millions of patient charts stored in electronic health records, with billions of data points; this is impossible for a human as they may only see a few tens of thousands of patients in their entire career.

AI will be a catalyst for the evolution of more informed wound care practice and will therefore help with the specialization of the clinical area. Through the use of technology systems such as “apps,” clinicians can capture large volumes of data and then, through AI/ML techniques, have the transparency of approach to begin to truly understand the areas of focus and changes required to standardise the practice.

Importance of Imaging in Wound Care

Wound imaging has fast become the norm as part of everyday wound documentation for most clinicians. It remains the most significant part of regular wound documentation as it is the best record of change, both negative and positive. The adage of “a picture paints a thousand words” is so true in this circumstance. It is difficult, when seeing many patients daily, to remember how the wound looked from visit to visit. Even the most accurate of descriptions would not suffice when compared to a photographic record. Like all medical imaging, the standardisation of the environment during image capture, is important as the smallest difference can produce errors in the interpretation of the image.

Newer technologies have been developed to capitalize on the quality and efficiency of smart devices for the capture of wound photographs. Some of these technologies capture other wound-related information and integrate directly with EMRs (Electronic Medical Records). While designed to increase quality and efficiency of capture, human interaction is still required and is often the area of failure. Quality in, Quality out.

Decision support systems based on machine learning (ML) have the potential to revolutionize medicine by performing complex tasks that are currently assigned to specialists, improving diagnostic accuracy, increasing efficiency, improving workflow, decreasing costs and improving treatment choices. Wound imaging is only part of the story. This provides an indication of what is going on at the wound/skin surface. Where this approach fails is providing an understanding of what is going on under the surface. Often other physiological processes are impacting the wound.

Machine-learning models can be trained with the use of tens of millions of patient charts stored in electronic health records, with billions of data points; this is impossible for a human as they may only see a few tens of thousands of patients in their entire career. These characteristics could be especially helpful in the management of wounds, with growing applications in diagnostic imaging, interventions, skills training and assessment, digital pathology and “seeing under or into the skin”. Newer more portable imaging technologies, based on tried and tested laboratory technologies, are providing a practical solution to seeing under the skin. Through hyperspectral means such approaches are improving the diagnostic capabilities of clinicians in all healthcare settings.

Clinicians think clinically, not technologically. By designing technologies to think clinically, solutions will better fit their “norm.” However, it is also important that, even in a more niche clinical arena, such as wound care, the technology must integrate into practice and as with other wound assessment solutions be used regularly in care environments.

Consistency of image and reliability of data require awareness of input. While technology can provide efficiency and guidance, it cannot replace “good practice”. Just like with other medical photography, a good practice process for taking consistent wound photographs ensures accuracy of measurement.



“ MIMOSA is a modern day TRICORDER ”

David Armstrong

Prof Surgery, Keck School of Medicine,
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Today, care, for the most part, is being delivered by a more technophobic generation, but that is changing rapidly, and within only a few years, the true technological generation (ie, millennials) will be delivering most of the care. This will truly change the delivery of care to the benefit of all, and wound care is an important part of that change. As a poorly understood but significant hidden and growing epidemic, the change is rapidly needed and should be embraced willingly.

Wound photographs provide a visual reference not matched by memory or the written word. As patient load and work stress increases, time and memory comes under strain. Technology can provide high efficiencies in wound imaging and documentation. However, such benefits should not obviate best practice. Remember Quality In, Quality Out.



How AI Based Imaging is Improving

Sharing is caring. Sometimes, this is a system issue rather than an individual issue. As many of the system approaches do not factor in wound care models, there is little or no ability for effective and consistent data capture. Modern technological approaches can, however, influence both the service delivery and the data capture and sharing. The most obvious way of innovating care in practice is to focus exclusively on new technology that offers new treatment options to improve patient outcomes. However, new technological approaches that automate process and data capture can provide transparency of approach and lead to significant change.

Artificial Intelligence focuses on designing and programming machines to act like humans by continuously learning from collected data using digital media and sensors. Recent advancements in technology have enabled machines to understand natural language, identify objects in video, generate artistic designs, and extract relevant information to find efficient solutions and support decision making. Learn how the human mind works and develop computational algorithms to create machine intelligence.

AI will be a catalyst for the evolution of more informed wound care practice and will therefore help with the specialization of the clinical area. Using technology systems such as “apps,” clinicians can capture large volumes of data and through AI/ML techniques, have the transparency and insight to begin to truly understand the areas of focus and change required to standardise the practice. AI married to human intelligence is allowing a more rapid standardisation and specialisation of wound care. This is delivered through two main areas: first, the actual ability to standardise practice across the care continuum and second, the ability, through the application of technology, to “up-skill” its delivery even through less-trained resources (eg, family or patient).

Wound Care Clinicians Diagnostic Abilities



Using effective assessment, documentation (including image capture), and AI/ML techniques, allows wound care to be standardised, made more objective, and augmented with the experience of millions of patients and billions of data points. AI married to human intelligence allowed more precise, patient-centric care, resulting in better outcomes.

To date, AI has revolutionised how we operate and will do for the foreseeable future. In wound care, AI will impact all areas, from prognosis, diagnosis, and treatment to workflow efficiency and broadening access to quality care. Engaging with technology will realise the promise of better outcomes for patients through the enhanced delivery of care by their care team.

Technology has already begun to change the delivery of wound care practice in many facilities, across the health care continuum. Using data, AI techniques, and technology, with integration into larger EMR solutions, the transparency of approach is providing the catalyst for change.

Keep an open mind to the evolution of approach and/or technology. Sometimes, as clinicians, we do not easily identify the need that the technological solution may solve. It is an evolutionary journey between both consumer (ie, clinician) and solution (ie, technology or product). Clinicians think clinically, not technologically. Stand up and be counted. Seek technological change to make your practice more efficient today but, more importantly, lay the foundation for change tomorrow.

As AI-based wound assessment tools become more common across wound care settings, it will be important to rigorously validate their performance in helping clinicians obtain accurate wound assessments to guide clinical care.

MIMOSA Pro and its potential in Wound Assessment & Management

MIMOSA Pro is a handheld device that uses near-infrared light to accurately and non-invasively assess tissue health. It can be easily used by a patient or a caregiver, and the images produced will help inform the next steps within patient navigation and management (e.g. you need to see a podiatrist, or a vascular surgeon to help with the blood flow, or you may need more urgent treatment to prevent severe complications like limb loss). One significant area where vascular assessment can have significant clinical impact is in the management of patient with diabetes.

Today, monitoring your diabetes generally takes about three hours a day. Add in inspecting your feet especially if you have difficulty with your sight, or mobility issues, and a loss of feeling, management of this disease can feel overwhelming. This burden and sometimes lack of knowledge can mean that problems become advanced without caregiver or patient knowledge. Family caregivers can help, but they don't always know what they're looking for, and getting to a healthcare provider just may not be possible, especially in rural communities, who patients are two to three times more likely to lose a leg.



Between 15 and 25 percent of people with diabetes will have a foot ulcer at some point. These ulcers often become infected and as a result, diabetics are 23 times more likely than the general population to have a lower limb amputation. Of those who have an amputation, 30 percent die within one year. After five years, the mortality rate jumps to 70 percent. With more accurate monitoring and early diagnosis, patients are getting better treatment, and as a result the amputation rates can be reduced dramatically. Not only can this approach save limbs, but rather lives.

MIMOSA Pro detects tissue oximetry and temperature in tissue by imaging the skin with near infra-red and infra-red light, just beyond the range of human vision. MIMOSA Pro makes the invisible, visible. This is just above the visible region, so it's safe, but also has deep penetration into the skin. It can see things that humans can't, so it can detect whether the skin is perfused, if it has an adequate oxygen supply, if it's viable, and measure important physiological parameters within the assessment region.

The novel thing about the MIMOSA Pro and the platform is its capacity to relay images into a web portal for remote viewing. It is a HIPAA compliant & secure cloud-based platform that enables communication amongst clinicians and tracking patient's physiology over time. The mission of the company is to break down barriers in access to care by first removing geographic boundaries. Patients with vascular disease who live outside an urban area are 2-3 x more likely to lose their leg based on where they live. Access to appropriate care is a fundamental human right.

MIMOSA Pro can help break down these barriers to care by remote monitoring of important parameters that can help clinicians make decisions in real time, communicate with each other and most importantly provide care in a timely manner. At MIMOSA, we are bringing hospital grade medical technology to the patient. MIMOSA Pro will make a huge impact as we move forward in a new normal.



Diabetes is one area of vascular medicine where MIMOSA Pro can help. There are similar compromised vascular diseases where such an approach can make a huge difference. For example, these devices allow for early assessment and diagnosis for patients who have peripheral vascular disease PVD. The deoxyhemoglobin level has been shown to have a positive correlation to the severity of PVD.

So, this emerging assessment and diagnostic tool will have huge impact in the management of patients with compromised vasculature. MIMOSA Pro is going to change the way in which many of these patients are managed.

Key Resources Used

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Additional Resources

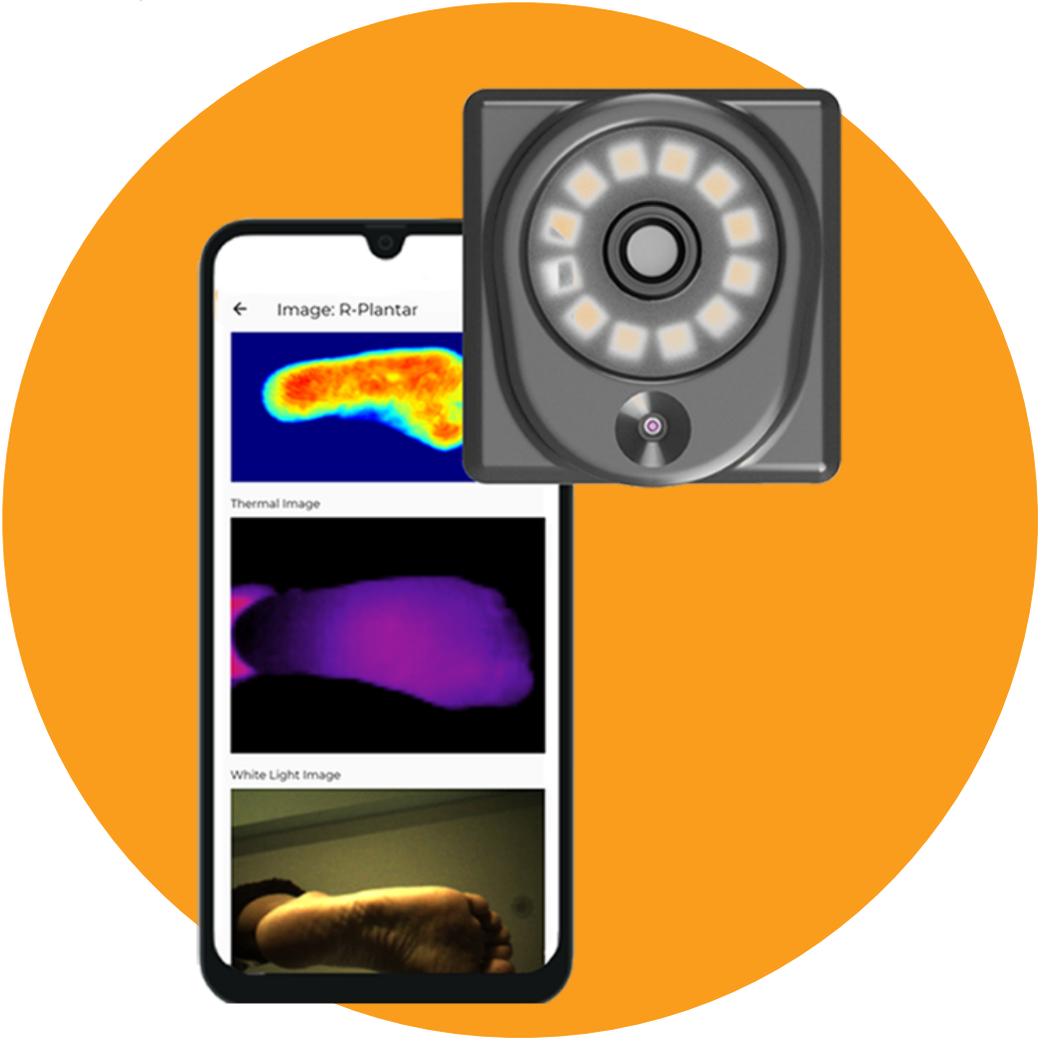
Association for the Advancement of Artificial Intelligence [[LINK](#)].

Canadian Artificial Intelligence Association: [[LINK](#)]

Artificial Intelligence in Medicine: [[LINK](#)]

Society for Imaging Informatics in Medicine: [[LINK](#)]







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