VOLUME 2 ISSUE 3 • SUMMER 2014

WOUND CARE THERAPIES

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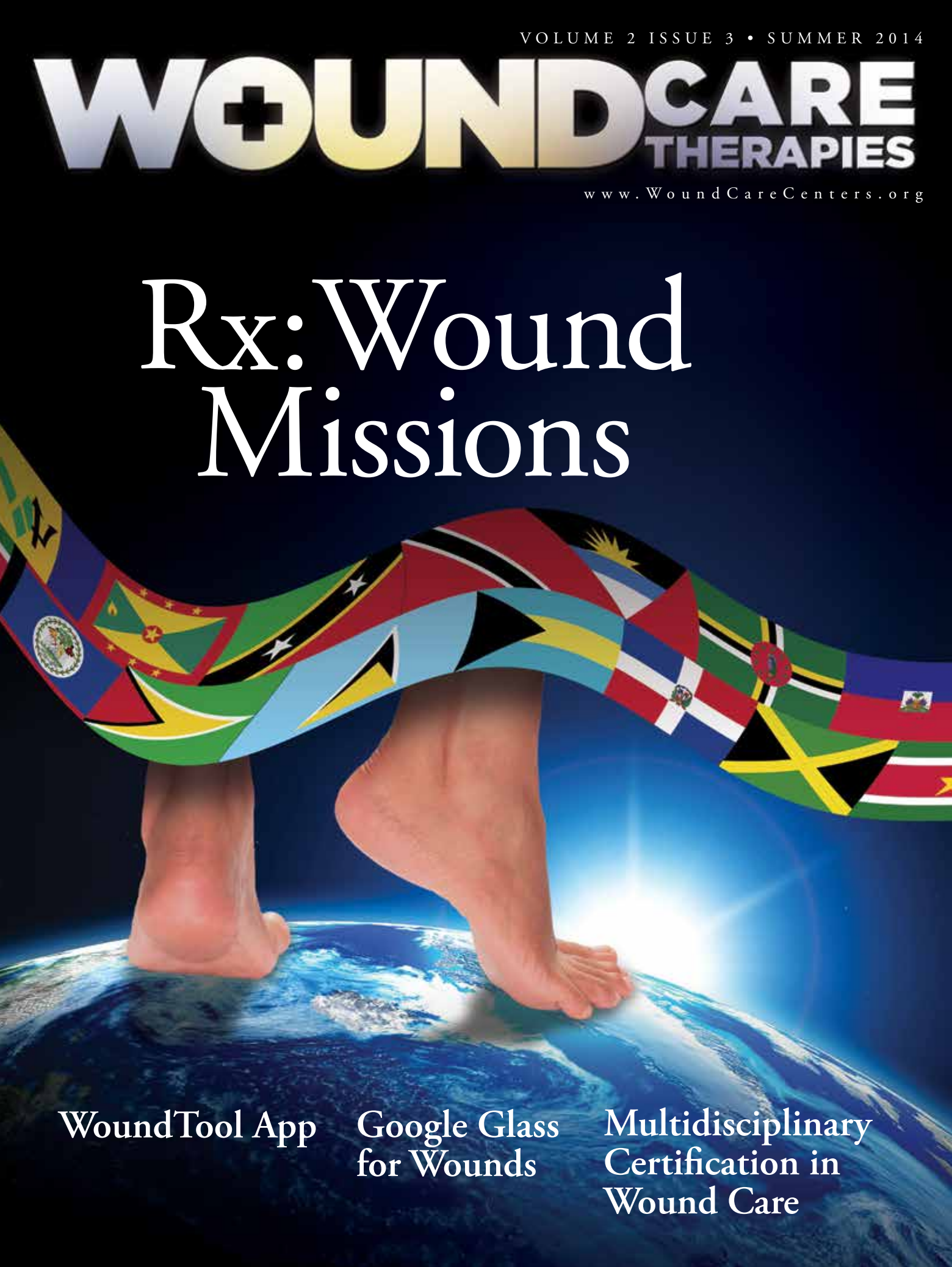
Rx: Wound Missions



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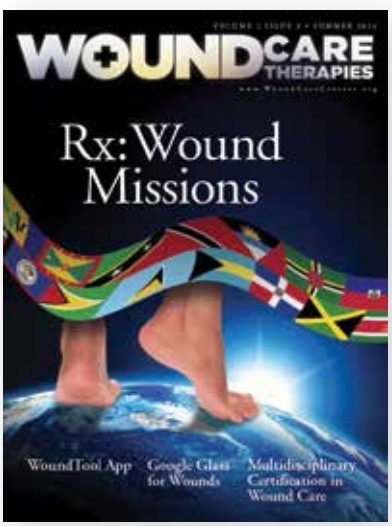
Cover Story

20 Mission: Wound — The World Walk Foundation

Started because of an observed need for specialty training teams in all regions of the developing world for treating diseases of the lower extremity, World Walk's mission is to help Third World children and adults to walk independently and without pain.

by Cornelius M. Donohue, DPM; Frederick B. LaVan, MD, FACS; and Owen Bernard, MSSCh, MBChA, Dip Crys, MHPC (UK)



On the Cover

Join us as we begin looking at what efforts are being made in the under-served and under-priviledged parts of the world of wound care.

Featured Reasearch

Education

Practice Management

Wound Industry Spotlight

Supermen and Wonder Women

I believe that some people are just "built" a little differently than others – as if they each are born with a certain kind of super power that glows from within them, waiting to show itself at the exact moment that it is most needed. Stepping outside one's comfort zone, coming to the aid or doing something extraordinary for another person isn't exactly "super," but dedicating one's life to the pursuit of caring for those in dire situations who live with practically no hope, well… that comes pretty darn close. Some just fall easily into this calling of giving of one's self freely, no matter what the cost to their own lives or their own safety. Heroes—they come in many forms.

Like generations of Americans, I grew up in awe of the iconic heroes in those colorful pages of comic books, each having an innate desire and supernatural gifts to save the human race. Superman, having been sent to Earth to save the human race with his strength, speed and that handy X-ray vision; Batman, with the endless financial resources and drive to create technologies to fight those bad guys who threaten mankind; Wonder Woman, representing an ancient, gifted race dedicated to the fight for truth and justice – each of these super beings giving freely of their abilities and resources to keep us mere mortals alive and safe from the bad guys. Stuff of legend.

This edition of Wound Care Therapies highlights some real-life super human beings and their super works in creating life and limb-saving missions that help those in desperate need of care. Inspiring works of selflessness and innovation – using those super powers of knowledge, technology and most importantly compassion – can be seen throughout the pages of this edition. They may not have their own graphic novels dedicated to telling their stories, but we'll do our best to highlight their very real, very needed efforts to make this world a better place for the countless citizens they have saved.

I hope you enjoy this issue, with its own stories of extraordinary, superhuman endeavors. Like The Daily Planet, our mission is to expose our readers to the truth of the matter – there really are heroes among us. Maybe you're one, too… we'd love to share your story with the world, so tell us about it.

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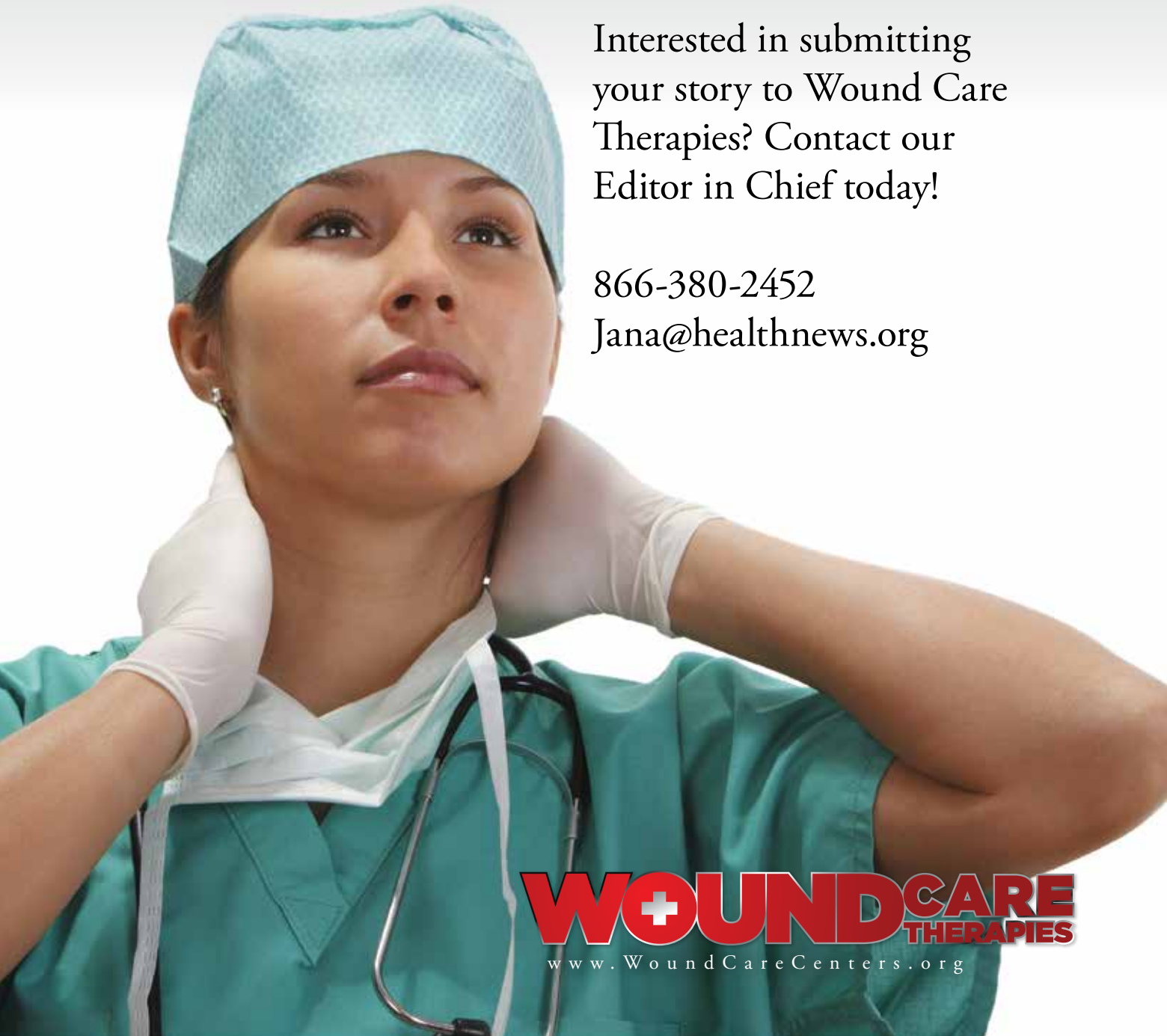

Interested in submitting your story to Wound Care Therapies? Contact our Editor in Chief today!

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WOUND CARE THERAPIES
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The Right Course of Action

"What is the right course of action?" is a question you may ask yourself in many situations. To our readers, it can become a matter of life and death as it relates to their patient. If you're a general practioner treating the start of a superficial wound or a podiatrist dealing with the challenges of chronic wound treatment, the course of action taken can be a difficult decision.

In this issue of Wound Care Therapies, we explore the use of a Hyperbaric Oxygen Chamber when treating chronic wounds. As part of our research we went to the experts, our advisory board, to get their input on this particular course of action. We then went to the manufacturers of these devices to understand from a more technical aspect the differences in chambers and the effectiveness of their therapies. We capped off our exploration by connecting with the International Hyperbaric Medical Association. Please read on to learn what we discovered.

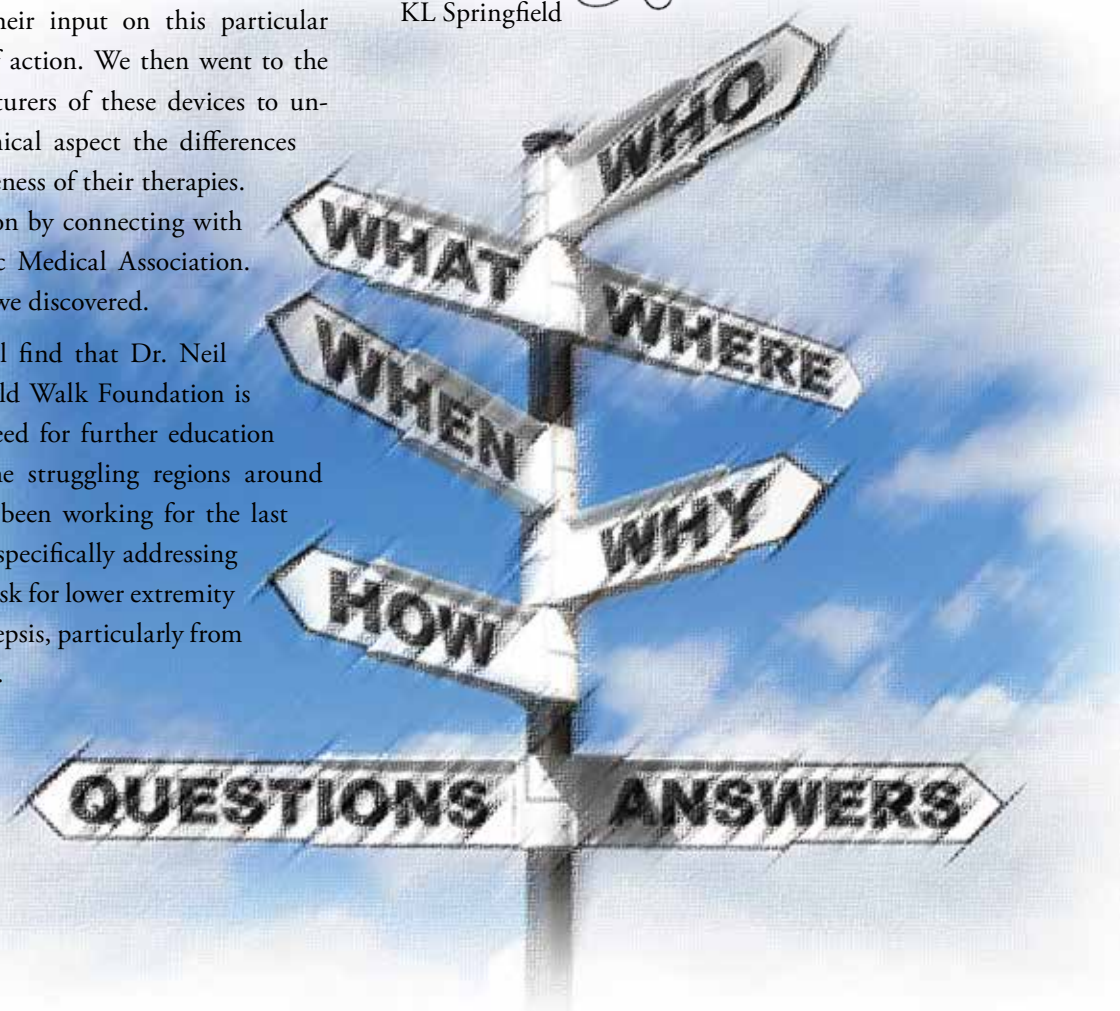
Also in this issue you will find that Dr. Neil Donohue's piece on the World Walk Foundation is an intriguing read on the need for further education in specialty treatment in the struggling regions around the world. World Walk has been working for the last 18 years to bring awareness, specifically addressing the needs of those people at risk for lower extremity amputation and death from sepsis, particularly from the complications of diabetes.

Lastly, I invite you to browse our news and new products section as a valued resource for industry trends and upcoming product launches. Don't forget to mark your calendars for upcoming events of interest for your continued educational growth.

As always, it has been an exciting journey putting this issue together and we hope you continue to enjoy our publication. Let us know what you think at *Kim@Healthnews.org.*

Best regards,

KL Springfield



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Mission Work *in* Wound Healing

by Cornelius M. Donohue, DPM, FACFAS

I don't think many life and career-changing events happen by accident. For me, one of those events happened in the middle of a blizzard, in January of 1996, in Philadelphia. On that day, I happened to be making wound rounds in a nursing home and was literally trapped there for several hours until the snow plows could clear the streets of three feet of snow. Visiting a friend of the nursing home administrator that day was a nun from the Sisters of Mercy order, who sat and talked with me about a mission program in Peru being planned for October of that year. The program needed a specialist team member with knowledge and experience in lower extremity wounds. I had been thinking about developing a relationship with wound mission opportunities, but I had never been a part of an international mission team.

Nine months later, and after six months of Spanish lessons, I was in Peru. After two weeks of encountering children and adults with chronic wounds, including diabetic foot ulcers, chronic osteomyelitis, fungal tumors ("mycetomas"), traumatic wounds from machetes, other farming injuries and plantar wounds due to the large number of people who work without shoes, I realized that a model was needed to begin to find solutions for prevention and healing of these painful, disabling and, in many cases, limb-threatening wounds. But, these solutions needed to be effective and low-cost.

After Peru, I founded the World Walk Foundation and continued to think about how that model would work. I began to accept invitations to join mission teams in Mexico, Cambodia, Brazil, Jamaica, Belize and Venezuela, for many reasons. I found that I enjoyed the work immensely and wanted to develop a sense of the nature of the chronic wound problem in other countries in the developing world to see if there was a universal model that could be developed to improve wound care.

After experiencing similar wound profiles in all of the countries I worked in, a model began to develop in my mind. That model began to crystallize after repeated trips to Jamaica, particularly after spending much time in rural public health centers and talking with medical doctors, public health nurses and surgeons there who were frustrated, not only with the lack of infrastructure and preventive diabetic ulcer education in the community, but also with the inability to accelerate the identification and transport of those diabetics with sometimes limb-threatening wounds and infections who needed urgent surgical and medical care.

Dr. Donohue

The model that we developed was unique in that it maintained the essential importance of joining the medical and surgical communities in any region or country in a partnership for seamless assessment, communication and treatment of diabetic foot ulcers and infections in a timely manner.

This model was actually the result of years of cumulative concepts and curriculum contributions to World Walk for diabetic wound healing and amputation prevention by, and in collaboration with, leaders like Karrel Bakker, MD, PhD, and Kristien Van Acker, MD, from the International Diabetes Federation (IDF); Owen Bernard from the Diabetes Association of Jamaica; Errol Morrison, MD, from the University of Technology in Kingston, Jamaica; Jose Moguel, MD, a surgical leader at Karl Huesner Hospital in Belize; Marcus Castro-Ferreira, MD, a plastc surgeon from Sao Paolo, Brazil; Rafael Barrios, MD, in Venezuela; David Armstrong, DPM, PhD, from International Working Group for the Diabetic Foot (Consensus Document on the Diabetic Foot) and the University of Arizona SALSA Program; Stephen Rith-Najarian, MD, from the U.S. Indian Health Service; Bal Jog, MD, from the Diabetic Foot Society of India; Patrick DeHeer, DPM, Wound Care Haiti; John Macdonald, MD, and Adler Francius, MD, from Project Medishare (Haiti), through the University of Miami; and Nancy Larco, MD, of the FHADIMAC (Haitian Foundation for Diabetes and Cardiovascular Disease), who collaborates with Hospital Bernard Mevs in Port-au-Prince, Haiti.

Of special note, is the contribution of Mellissa Knowles, a former PBS TV producer, who profiled the work of World Walk in Philadelphia and Venezuela, and later became a leader in World Walk, contributing on many levels for the past 15 years, including development, website design, public relations, and mission organization and planning. In addition, the contributions of health economist and epidemiologist Ronald Shannon, MPH—in educating Caribbean and Central American ministries of health in a new fiscal vision for diabetes and amputation prevention, as well as co-designing the prototype wound telemedicine app for smart phones—have been immeasurable. Our model—still today a work in progress—was literally built on the backs of these giants, without whom we would not have what we now have to offer to the world.

It is quite clear that there is a core group of wound types shared by every region of the world, certainly with region-specific wound types like tropical ulcers, ulcers from Hansen's disease, Buruli ulcers, and wounds and lymphedema from filariasis (parasitic), that cause Elephantiasis tropica. The universal nature of these wounds facilitates reproduction of our models, certainly with modifications based on certain specialty medication and treatment needs for difficult wounds, e.g, filariasis. I envision the basic wound model that we continue to develop will have value in any part of the world, especially if we allow it to remain in a state of flux—always looking for ways to improve it and sharing those model improvements with all similarly-modeled missions worldwide. The additional ability to build a simple team "community" system for mission planning, including credentialing, supplies, transportation, and room and board arrangements, as well as communication with in-country and U.S. mission team leadership, will facilitate optimal mission outcomes with those wound patients who are healed by these committed volunteers and, ultimately, make them the greatest beneficiaries of these integrated, educational, therapeutic and international bridge-building programs.

One of the most important tools to carry on international missions is patience and humility, which go a long way in avoiding alienation of in-country health officials. The lack of these positive character traits has historically proven to cause ill will and, ultimately, team failure. In the past, there has been the stigma of the "Ugly American" syndrome--creating the appearance that the U.S. team members think they have all the answers and are condescending to the local staff. In reality, every mission team member learns something from every other team member, every day of a mission, no matter where someone is from or where they were trained. It became clear to me early on during my work in Peru, that the common love of patient care and healing can transform a collaborating international wound team of former strangers into a collegial and productive group of like-minded human beings, whose communal joy of working together for the common good of the local wound patients in desperate need becomes an unmatched lifetime experience.

From time to time, sometimes at home or sometimes in a quiet moment while away on a mission, the words of Theodore Roosevelt remind me of why I do what I do when he said, "Far and away the best prize that life has to offer is the chance to work hard at work worth doing." W

Meet the Experts

Oscar M. Alvarez, PhD, CCT, FAPWCA
Director, Center for Curative and Palliative Wound Care at Calvary Hospital Inc., Bronx, NY;
Chairman, FRAIL, a panel For the Recognition of the Adult Immobilized;
Life Member, SCALE, an expert group to build a consensus proposal on Skin Changes At Life's End

Raghu Kolluri, MD, RVT, FSVM
Director of Vascular Medicine, OhioHealth System and Riverside Methodist Hospital, Columbus, OH;
Treasurer, Society of Vascular Medicine

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Vice President, Bates Jensen Wound Research Foundation;
Previous Board Member, Association for the Advancement of Wound Care

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Professor, UNC Department of Surgery, Chapel Hill, NC

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Medical Director, Comprehensive Wound Healing Center at Roxborough Memorial Hospital, Philadelphia, PA;
Atlantic Zone Medical Director for Healogics;
President and Founder, World Walk Foundation

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Chief of Surgery, Department of Surgery, Veterans Affairs Hospital, Portland, OR;
Professor of Surgery, Division of Vascular Surgery, Oregon Health and Sciences University, Portland, OR;
Treasurer, Venous Disease Coalition

Manoj Khandelwal, MD
Director of the Peripheral Vascular Disease Program, Aria Health

Arthur B. Stone, DPM
President, MedNexus, Inc.;
Board of Directors, National Pressure Ulcer Advisory Panel

2014

6-9 August, 2014
AADE - American Association of Diabetes Educators 14th Annual Meeting
Orange County Convention Center
Orlando, FL
www.*aade-365.ascendeventmedia.com*


AAD – American Academy of Dermatology Summer Academy Meeting 2014 - Chicago

6-10 August, 2014
AAD – American Academy of Dermatology Summer Academy Meeting 2014
Hyatt Regency Chicago
Chicago, IL
www.aad.org

13-16 August, 2014
Metabolic Endocrine Disease Summit (MEDS West)
Venetian / Palazzo Hotel
Las Vegas, NV 89109
www.medsummit-cecme.org/site/Default.aspx

7-10 September, 2014
CAP '14 - THE Pathologists' Meeting - College of American Pathologists
Hyatt Regency Chicago
Chicago, IL
www.cap.org

16-20 September, 2014
AATB Annual Meeting 2014 - American Association of Tissue Banks
Hilton San Diego Bayfront
San Diego, CA
www.aatb.org

17-20 September, 2014
WOW Wild on Wounds
RIO Hotel
Las Vegas, NV
www.wcei.net/wow-conference

5-8 October, 2014
AHCA/NCAL 65th Annual Convention & Expo - American Health Care Association/ National Center for Assisted Living
Gaylord National Resort & Convention Center
National Harbor, MD
www.eventscribe.com/2014/ahcancal/

8-11 October, 2014
ASCP 2014 - American Society for Clinical Pathology
Venue TBD
Tampa, FL
www.ascp.org/ascp2014

16-18 October, 2014
SAWC - Symposium on Advanced Wound Care Fall Meeting
Caesars Palace
Las Vegas, NV
www.sawc.net/fall

29 October – 1 November, 2014
ARN Annual Education Conference 2014 - Association of Rehabilitation Nurses
Disneyland Hotel
Exhibit Hall and Grand Ballroom
Anaheim, CA
www.rehabnurse.org

30 October – 1 November, 2014
Skin Disease Education Foundation's 15th Las Vegas Dermatology Seminar and 11th Psoriasis Forum
The Cosmopolitan Las Vegas
Las Vegas, NV
www.globalacademycme.com/topics/skin-disease-education-foundation-dermatology/conferences/sdef-las-vegas-dermatology-seminar-2014/conference-overview-las-vegas-dermatology-seminar.html


ACP – American College of Phlebology 2014 ACP Annual Congress

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5-7 December, 2014
2nd Annual Modern Wound Care Management Conference – La Jolla
Hilton La Jolla Torrey Pines
La Jolla, CA
www.modernwound.com

2015


AAOP – American Academy of Othotists & Prosthetists 41st Annual Meeting & Scientific Symposium

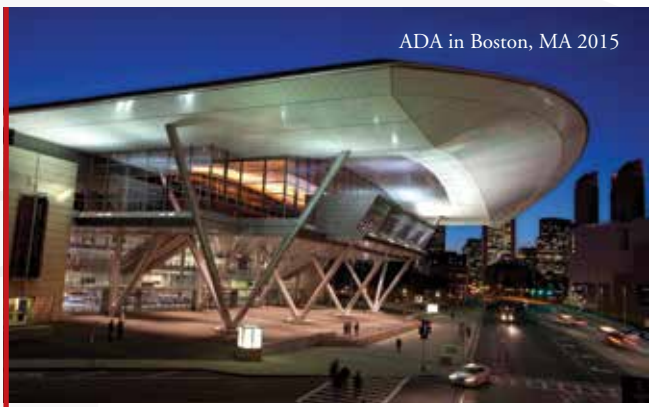
18-21 February, 2014
AAOP – American Academy of Othotists & Prosthetists 41st Annual Meeting & Scientific Symposium
Hyatt Regency New Orleans
New Orleans, LA
www.oandp.org/meeting2015

19-22 February, 2015
ACFAS – American College of Foot and Ankle Surgeons 73rd Annual Scientific Conference
TBD
Phoenix, AZ
www.acfas.org

20-24 March, 2015
AAD – American Academy of Dermatology 73rd Annual Meeting
Moscone Center
San Francisco, CA
www.aad.org

24-28 March, 2015
AAOS – American Academy of Orthopaedic Surgeons 2015 Annual Meeting
TBD
Las Vegas, NV
www.aaos.org

26-29 March, 2015
APWCA 14th Annual National Clinical Conference
Loews Philadelphia Hotel
Philadelphia, PA
www.apwca.org


ADA in Boston, MA 2015

5-9 June, 2015
ADA - American Diabetes Association
75th Scientific Sessions
Boston Convention Center
Boston, MA
www.professional.diabetes.org

Submissions to the calendar should be emailed to the editor at *Jana@HealthNews.org*. Please include the event's name, date, time, location, admission price and contact information. Inclusion in the calendar is subject to available space.

A Case Series Illustrating Conservative Management of Wounds that Expose Bone with a Microscaffold Collagen Sponge (MCS*)

Martin Wendelken, DPM, RN
Daphne Chivily, RN-BC, MS, CWOCN
Kim Colon-Cavallito, FNP-BC, CWCN
Oscar M. Alvarez, PhD
Center for Curative and Palliative Wound Care, Calvary Hospital, Bronx, NY
New York Medical College, Valhalla, NY

This case series illustrates management and healing of a variety of wounds with significant bone exposure. The first case involves a 90 year old male with a history of moderate PVD, osteoarthritis and impaired healing (dermal atrophy) secondary to prolonged systemic corticosteroid use. The wound had a 4-month history of chronicity and was located on the medial aspect if the right forefoot (involving the medial aspect of the base of the proximal phalanx, the first metatarsal phalangeal joint and medial shaft of the first metatarsal). In consideration of the patient's age and frailty, both patient and family opted for a conservative (palliative) approach to manage the wound. Angioplasty and stent corrected an occlusion of the left common and external iliac artery resulting in improved perfusion.

Left: Exposed medial aspect of the first metatarsal phalangeal joint of the left foot showing necrotic bone. Patient was treated with MCS* with local care.

Right: 100% wound closure without surgical intervention after 8 months of treatment.

Left: Traumatic wound on the anterior surface of the right calf. Years of non-surgical conservative therapy failed to close wound.

Right: MCS* with local care closed this difficult to heal wound without surgical intervention after 5 months of treatment.

Right: Chronic wound with exposed bone on the anterior tibial surface of the left. Again, patient was treated with MCS* with conservative local care.

Left: 100% wound closure without surgical intervention after 5 months of treatment.

Local wound care consisted of light debridement, and the application of a saline moistened MCS cut precisely to fit over the exposed bone. The MCS was anchored with steri-strips and immobilized with a foam bolster (secondary dressing). The foot was bandaged with rolled gauze and an ace bandage and fitted with a healing sandal and fitted custom insert. Dressing changes were performed twice weekly. Significant granulation (>50%) was observed by week 6 and complete granulation by week 12. The wound healed completely by week 32. Two other cases are presented involving exposed bone (tibia) and chronic osteomyelitis where conservative management with MCS resulted in complete healing. For maximum effectiveness, MCS should only be applied over a very clean wound bed and immobilized (anchored) to diminish shear. W

*Puracol® Microscaffold™ Collagen, Medline Industries, Mundelein, IL.

CALVARY HOSPITAL
Center for Curative & Palliative Wound Care
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New York Medical College

Anti-Embolism Stockings: The Evidence Shows They Work

What to Order and Why–Making the Best Product and Pricing Available

By Steven R Kravitz, DPM, FAPWHc
Medical Director, Carolon

The following article is from Carolon, the manufacturer of a full line of compression hosiery. All of their products are built from the ground up, from knitting and weaving the fabrics, to end-product development and packaging – all provided at one plant in the Winston-Salem area of North Carolina. This aspect of utilizing one site for complete production enhances communication and solves problems quickly and efficiently to ensure high-quality products while decreasing costs. This article is intended to provide general background and fundamental understanding of elastic compression therapy, and specifically anti-embolism hosiery.

Understanding the Fundamentals of Compression Therapy

It is important to understand the fundamentals behind compression therapy. The definition of compression takes into account the circumference of the limb to which therapy is to be applied. In short, compression can be defined as "the interface pressure between a compressive device (e.g. elastic wrap, hosiery, etc.) and the surface of the skin at a defined circumference of the limb."

The term "graduated compression" means that the calf pressure should not exceed 80% of the ankle compression level. In the same manner, the thigh compression should not exceed 80% of that for the calf. The optimum profile is a situation in which the smallest ankle compression should not be greater than the largest calf compression, based on a fitting chart.

Fitting charts and standard hosiery measurements describe ranges of compression in millimeters of mercury (mmHg) at a specific anatomical location. For hosiery, standard measurements are taken at the level of the ankle. For example, 20-30 mmHg means that within a fitting range, the ankle compression is no less than 20 mmHg and no greater than 30 mmHg. To further break it down, for an ankle circumference fitting range of 8-9 inches, compression is no less than 20 mmHg for an 8-inch ankle and no greater than 30 mmHg for a 9-inch ankle.

Understanding the three principles described above, one can see why it is extremely important to have accurate measurement of the circumference of the ankle. The standard of care and the standard in the industry have defined these principles. Millimeters of mercury associated with compression therapy are applied based upon a measurement of the ankle circumference. Without an ankle measurement, it is impossible to determine what level of compression is being applied.

For anti-embolism stockings, fitting charts will provide compression measurements at the level of the ankle and calf for knee-length garments, and will add thigh measurements for thigh-length garments. Carolon is the only hosiery company to use an independent lab to assure accurate compression levels on anti-embolism and other products.

History of Anti-Embolism Hosiery: This Therapy Works

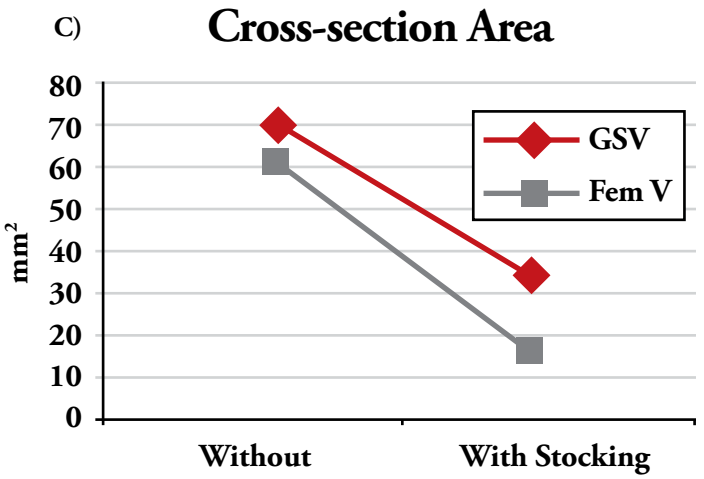
In 1975, Sigal and his associates published their landmark paper, which established 18 mmHg as the desired compression at the level of the ankle for anti-embolism therapy. (Archives of surgery, 1975; 110 (2); 171-175). In reality, however, the defined number should reflect a range anywhere between 15-21 mmHg.

There are numerous scientific articles demonstrating the effectiveness of anti-embolism hosiery for the treatment of deep vein thrombosis (DVT). Borow and Goldson

A)

B)

C)



Thigh Compression: Image with permission from H. Partsch, G. Mosti Phlebology 2008:23:252-258

demonstrated that combining hosiery and one pharmacologic agent (e.g. heparin or warfarin), greatly reduces the incidence of lower extremity thrombi. Amarigiri and Lees in 2000, found that graduated compression stockings are effective in diminishing the risk of DVT in hospitalized patients. Meyer et al. 2004, found that graduated compression stockings can reduce postoperative DVT and that their use is recommended by expert committees. Furthermore, substantial evidence that elastic compression reduced the occurrence of post-thrombotic incidence after a DVT was reported in 2004 by Kolbach et al. Anti-embolism stockings increase venous outflow, as has been shown in numerous articles, such as that from Schmitt and Wienert 1990.

The cross-sectional scan of the thigh in the photograph below, demonstrates that as little as 6 mmHg can reduce the thigh circumference significantly, enhance to a more normal contour and reduce significantly the enlarged great saphenous and femoral veins.

The above discussion reflects a very small sampling of significant scientific research that demonstrates the effectiveness and value of the elastic anti-embolism hosiery.

Complications and Precautions

Complications are rare and avoidable (Agu et al., 1999). The risk can be reduced tremendously, and these problems can be avoided by selecting high-quality garments that are both constructed and fitted properly.

Examples of complications include, but are not limited to, the following:

- Tourniquet effect due to poor design and/or improper compression levels, which cause knee-length garments to slide down the leg to the mid-calf. This can lead to secondary ulcerations at the mid-calf.
- High compression cuff levels are inappropriate, as found in some garments, and can enhance venous reflux. The knee and thigh cuff must contain compression levels that allow the principle graduated compression to drive venous return.
- Skin irritation and breakdown can occur at the anterior ankle and dorsal aspect of the foot and plantar midfoot. This can occur due to poor stocking design, improper fabric compression and fabric slippage over the skin.

Anti-embolism hosiery complications are tremendously reduced with proper garment design and fitting

Carolon anti-embolism hosiery construction includes the following key elements:

- The stocking fabric has two-way stretch, helping the garment to stay in place on the leg, decreasing the mid-calf tourniquet effect and increasing patient comfort
- A compression level of 18 mmHg at the ankle and graduated compression proximally on the leg, certified by independent outside laboratories, reassuring the prescriber and patient
- The floating blue heel and easy stretch foot inspection hole, ensuring proper placement of the garment in the leg and easy access for foot inspection
- The largest fitting range available, fitting up to a 39-inch thigh circumference, with shorter size options for shorter legs
- Seamless construction
- 100% latex free components

Measuring and Applying Carolon Anti-embolism Stockings

According to the National Institute for Clinical Excellence in the UK, all surgical patients should be fitted with thigh-length stockings upon hospital admission. A knee-length stocking should be used for those patients where thigh-length is inappropriate, due to such factors as compliance or fitting problems.

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When prescribing knee-length anti-embolism stockings, ankle circumference measurements should be taken just above the ankle malleoli (smallest circumference of the ankle), circumference at the mid-calf level and length from the bottom of the heel to just below the popliteal space. When utilizing a thigh-length garment, measurements should include the ankle, mid-calf and upper-thigh circumference, as well as the distance from the plantar heel to the gluteal crease. After measurements are made, the appropriate garment size is selected from the sizing chart. It is a simple process, one that only takes a few minutes and is simplified with a measuring tape that is included within the hosiery box. It is important to recognize that stocking sizes are not standardized from one manufacturer to another. It is, therefore, important to use the fitting chart that comes from the hosiery company being used.

When the Fitting Chart does **NOT** Apply

There are times when the calf measurements will vary more than one size from the ankle measurement on the fitting chart.

If the ankle measurement indicates a different size garment than the calf measurement, the prescriber should use the ankle measurement to select the appropriate size. For example, if the ankle measurement indicates a "large" garment and the calf measurement indicates a "medium," choosing the larger size will provide appropriate ankle compression and easy application.

If the calf measurement is one size larger than that on the fitting chart, the garment should not be used. Alternately, the garment should not be used if the calf measurement is two sizes smaller or more than that indicated on the fitting chart, because graduated pressure will be compromised. However, if the calf measurement is up to one size smaller than that on the fitting chart, use the ankle measurement to determine the proper size. The garment can still be used; compression will be less at the calf, but still graduated.

When applying the thigh-length anti-embolism stocking, remember that Carolon incorporates a uniquely designed thigh band gusset that provides a pressure break to prevent restriction of blood flow. It is important to turn the gusset to the inside of the thigh and over the femoral vein. This will ensure proper placement and unrestricted venous return.

Continuing Care

Upon hospital discharge, patients should be provided information on care for the compression hosiery in both written and verbal formats. All patients should be educated regarding the risk of developing a DVT, and should continue to use their anti-embolism stockings 24 hours a day, until they are fully mobile. Patients should remove the stockings for bathing. Consultation for continued compression therapy following return of ambulation is advised.

Contraindications

Contraindications for anti-embolism hosiery are as follows:

- Dermatitis with open wounds
- Dry or wet gangrene
- Massive leg edema with limb measurements two sizes or greater than that on the fitting chart
- Diabetic feet and others with severe ischemia

Manufacturing Best Practices

Best practice occurs when the manufacturing plant is controlled for both humidity and temperature, allowing for the textiles in the fabrics to respond in a consistent manner. This helps ensure that each garment will be of similar and best quality, from the first pair ordered through many years of reordering. Knitting machines are constantly being developed with new technologies and computerization, which allows for improvement and fabrics to fit the demands of the compression hosiery. It is important that the appropriate yarn is selected to design fabrics that best meet the specifications and other parameters required to produce effective, comfortable and properly fitted garments. In-process, independent lab testing for fabric compression, in addition to specific end-product testing, work together to assure consistent and accurate therapeutic application of the elastic compression hosiery.

Some last factors to consider are that the two-way stretch of the fabrics, the floating blue heel seat and the leg contour to match the calf belly and shape of the limb (most of the garments use a cylinder shape), are only a few aspects that enhance fitting and decrease the risk of the hosiery slipping down the leg or producing secondary skin irritation. Appropriately designed knee-length and thigh-length cuffs maintain a graduated compression profile and do not restrict venous return. **W**

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World Walk "Teaching the Teachers" Model

A first step to integrating primary care and surgeon training for wound healing and amputation prevention with wound telemedicine for patient therapeutics and caregiver education in the developing world

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The World Walk Foundation, or World Walk (*www.worldwalkfoundation.org*), started because of a need for specialty training teams in all regions of the developing world who can treat diseases of the lower extremity that would otherwise prevent both children and adults from having the ability to walk independently and without pain.

Countless children in the developing world live their entire lives with the deforming and disfiguring effects of clubfoot, polio, cerebral palsy, and other neurologic and genetic diseases that keep them from experiencing the simple joy of walking and running. To that end, over the years, World Walk has collaborated with incredible programs such as Healing the Children, projects such as the Baja Project for Crippled Children and surgical leaders Luke Cicchinelli, DPM, and Todd Gunzy who have carried out clubfoot and wound healing missions in Venezuela, Mexico, El Salvador and Honduras. By collaborating with these and other similar organizations, the leadership of World Walk has learned not only how to perform successful surgical procedures—sometimes working in modest medical and surgical facilities—but also how to organize team members, supplies and transportation, as well as communicate effectively with in-country medical, surgical, nursing and administrative staff. We are using this knowledge to tackle diseases like leprosy, diabetes, pressure necrosis, and arterial and venous disease—all of which cause unspeakable suffering.

Patients with diabetes, arterial disease and leprosy (Hansen's disease) are at particular risk for limb amputation and death due to sepsis (blood poisoning).

Regarding the wound healing and diabetic amputation initiatives of World Walk, over the past 18 years, we have been building a curriculum that specifically addresses the needs of those people at-risk for lower extremity amputation and death from sepsis. The focus of our work, at this time, relates to the continuing development of the teaching, prevention and treatment programs described in this paper—specifically those dealing with wound healing, amputation and diabetes.

The model described here is unique in that it maintains the importance of joining the medical and surgical communities in any given region or country in a partnership for seamless assessment, communication and treatment of diabetic foot ulcers and infections in a timely manner. Historically, it has been the lack of timely assessment by the medical and surgical community that has prevented early intervention in these wounds. As a result, the patients' odds of having a limb amputation or dying from sepsis are increased, and their chances of healing properly are reduced.

Fundamentally, the World Walk model for diabetic patients includes several important elements, each one contributing to the educational and therapeutic impact of the entire program on both a local and regional level. Note that although the outline below relates largely to diabetic wounds, elements #4 and #5 apply to primary care physician and surgeon training, which are applicable to all wounds, not only those related to diabetes (Figure 1). In addition, element #1 is an outline of a general wound clinic with a built-in specialty diabetic wound clinic. The latter acts as the fundamental unit of out-patient infrastructure, and is necessary for a successful wound care program.

Essentials of a Comprehensive Diabetic Foot (DFU) Ulcer and Amputation Prevention Program: Collaboration between the Primary Care Physicians and the Specialty-trained Surgical Staff

The "Teaching the Teachers" model relies on the commitment of each trained ***medical and surgical caregiver*** to strive to train up to 100 caregivers throughout his or her career. If each of the recipients of this training makes a similar pledge, thousands of well-trained caregivers could result from this effort. Combining this with the creation of ***"Regional Centers of Excellence for Diabetes and Wound Healing"*** will allow for a self-sustaining unique educational model.

Primary Care Physicians Specialty-trained **Surgical Staff**

Figure 1. By bringing together committed medical and surgical leaders in a country (e.g., here in Haiti), World Walk's "Teaching the Teachers" model can be realized. From these meetings, the specific primary care physician and surgical curricula can be taught and then disseminated throughout the country from this first tier of medical leadership.

A new addition to the World Walk model is a healthcare app for smartphones that allows for intelligent management of chronic wounds. The application permits the user to acquire images, enter and share data, browse the web for wound analyses and reviews and compile information in a database system that has cloud-based tools which can be used to manage images and patient records (Figure 2).

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World Walk Model for Prevention, Diagnosis and Treatment of Diabetic Wounds

Primary Care Physician Edu./Com.
Surgeon Education Edu./Com.
Public Health Nurse Education Edu./Com.
Physical Therapist Education Edu./Com
Community Health Aid (CHA)
Foot Care Assistants' Education Edu./Com
Patient and Community Education

Wound Telemedicine App: Wound Tool

Facilitating Communication Among Wound Caregivers

Figure 2. The specialists and partners in the World Walk model all connected in space and time through WoundTool, a smartphone app that allows medical professionals to communicate and collaborate with one another so that patient care can be improved.

World Walk Wound Healing and Amputation Prevention Center of Excellence

In the past year, World Walk has been invited to collaborate with the University of Technology (U Tech) in Kingston, Jamaica, to create a World Walk Wound Healing and Amputation Prevention Center of Excellence (COE), which will act as a classroom and clinical education hub for the Caribbean and Latin America (Figure 3).

Throughout this process of developing the World Walk COE model, mission team leadership will be encouraged to develop and nurture communication with other local and regional volunteer programs that have similar goals. These include NGOs (Non-Governmental Organization) such as PAHO (Pan American Health Organization), IDF (International Diabetes Federation), Medicins Sans Frontieres (Doctors Without Borders), and the International Red Cross. Leadership is also urged to foster working relationships with governmental health agencies in an attempt to develop provisions that will ultimately lead to efficient wound prevention and healing programs on a local, regional and national level.

Reaching out and collaborating with like-minded organizations can reduce the redundancy of educational and treatment programs, and can begin to create a system that could use the World Walk COE hub at the University of Technology in Kingston, Jamaica, to create a Pan-Caribbean network of wound training and care professionals who are digitally connected by way of the smartphone telemedicine app technology (Figure 4). The larger vision is for every country to have a satellite COE for wound healing and amputation prevention, where local in-country leadership can schedule caregivers for training at U Tech in Kingston. They can also maintain webcasts with CME and CEU, as well as keeping wound telemedicine channels open at all times for remote consultations.

World Walk Center of Excellence for Wound Healing and Amputation Prevention

University of Technology Kingston, JamaicaWest Indies

Figure 3.

Figure 4. The World Walk vision of creating a Pan-Caribbean network of wound training and care professionals who are digitally connected by way of smartphone telemedicine app technology

Outline of World Walk Curriculum

1. General wound clinic with specialty diabetic wound clinic

A. Case management format in wound clinic
B. Recordkeeping (photographic record of wound healing progress for each patient)
C. History and physical exam of the wound patient
D. Wound differential diagnosis
E. Diagnostics (e.g. labs, x-rays, culture and sensitivity)
F. Optimal wound care principles (John Macdonald, MD):
- Enhance systemic conditions:
  - Thorough history and physical examination/wound differential diagnosis
- Protect wound from trauma:
  - Chemical, physical, off-loading, dressings
- Promote clean wound base and prevent infection:
  - Debridement
  - Proper use of antibiotics
- Maintain a moist wound environment
- Control peri-wound edema/lymphedema:
  - Compression therapy

G. Out-patient medical management of diabetes by primary care physicians
H. Decision on admission to hospital for medical and / or surgical management by lower extremity reconstructive surgeons
I. Follow-up appointment/referral for preventive diabetic foot care
J. Orthotics and prosthetics with physical therapy

2. Primary diabetic foot care

A. Glycemic control
B. Diet and weight control
C. Exercise
D. Smoking cessation
E. Self-inspection of feet and legs for wounds, drainage or infection
F. Regular appointments with primary care physician and preventive diabetic foot care provider
G. Educating the patient and community about diabetes and diabetic wounds

3. Media resources to support patient and community education elements

A. Television (for an example, click on the "media" tab on *www.worldwalkfoundation.org*.
B. Newspapers
C. Magazines
D. Radio

4. Training primary care physicians on wound diagnosis, healing and amputation (On-site classroom and clinical instruction) (Figures 5,6.)

Training for Primary Care Physicians:Outline

Figure 5: Bringing together the diabetes medical leadership in Haiti (FHADIMAC: Haitian Foundation for Diabetes and Cardiovascular Disease) and the surgical leadership to commit to build a partnership to develop the Haiti Diabetes Wound Prevention, Healing and Limb Preservation Project. October, 2012, Port-au-Prince, Haiti.

World Walk Model

The model is unique in that it maintains the importance of joining the medical and surgical communities in any region or country in a partnership for seamless assessment, communication and treatment of diabetic foot ulcers and infections in a timely manner. Historically, it has been the lack of timely assessment by the medical and surgical community that has prevented early intervention in these wounds, reducing the chance of optimal healing outcomes, including amputation prevention.

Patient #1

Decision to treat patient at public health center with no need for surgical referral

Patient #22

Communication with surgeon for immediate referral

Figure 6: Decision-making in the wound clinic, regarding continuation of local clinic care or need for surgical referral

Figures 7A-7D demonstrate the outline of the World Walk curriculum for primary care physicians and their nursing staffs, including the basic science and clinical fundamentals of wound prevention and healing, the H&P of the wound patient, basic treatment protocols and decision-making on the level of care needed by a patient.

Essentials of a Comprehensive Diabetic Foot (DFU) Ulcer and Amputation Prevention Program: Primary Care Physicians and Nurses

- **Primary Care Physician and Nurse Teams** trained in all aspects of diabetes, especially the awareness of:
  - Ulcer and wound classifications
  - Risks of ulcers, infections and amputations in the diabetic patients
  - Epidemiology of diabetic ulcers and amputations
  - Pathophysiology of DFU's
  - Evaluation of the patient with a diabetic foot ulcer
  - Treatment of DFU's (including TCC)
  - Prevention of DFU's
  - Determination of the need for level of care once a DFU is present (**WoundTool**).

Central to prevention and early uncomplicated healing of the DFU is for the Community Physician and Nurse Team to determine if they are able to prevent or treat an existing DFU in their clinic or if a particular patient needs a more advanced level of care, e.g., in the hospital. The timing of these decisions is critical to ulcer healing, and amputation and sepsis prevention (WoundTool).
DFU prevention by the Physician and Nurse Team can be optimized by determining if their diabetic patient is a high or low risk for DFU and referring those patients for Preventive Diabetic Foot Care (Debridement of corns, calluses, toenails and skin care).

Figure 7A

Essentials of a Comprehensive Diabetic Foot (DFU) Ulcer and Amputation Prevention Program: Primary Care Physicians and Nurses

- **Patient and Community Education** materials (clinic take-home material) and media programs (TV, newspapers, magazines) regarding:
  - Patient responsibility for managing their diabetes, e.g., diet, medications, exercise and smoking cessation
  - The importance for diabetic patients in seeing their physician regularly
  - The daily routine suggested for diabetic patients in:
  - Wearing proper socks and shoes
  - Not cutting their own calluses and toenails
  - Examining their feet and legs for ulcers, cracks in the skin, signs of infection or foreign bodies and the importance of immediately seeking physician care when they do find one of these conditions present

Figure 7B

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Essentials of a Comprehensive Diabetic Foot (DFU) Ulcer and Amputation Prevention Program:
Primary Care Physicians and Nurses

Primary Care Physicians and Nurses trained in all aspects of diabetes, especially:

- The History and Physical Examination of the at-risk or wounded diabetic patient:
  - Physical Examination:
    1. Orthopedic
    2. Neurologic
       - Reflexes
       - Vibration
       - Pain:
       - Semmes-Weinstein Monofilament testing for sensory neuropathy (LOPS)
    3. Vascular
    4. Dermatological examination:
       - Skin
       - Nails
       - Wound assessment:
         - DFU assessment (if present; Wagner and UTHSC Classifications)
         - Wagner I (Dermis intact)
         - Wagner II (Subcutaneous tissue to deep tissue but without infection)
         - Wagner III (A Wagner II with infection, with or without osteomyelitis)
         - Wagner IV (Forefoot necrosis and/or infection)
         - Wagner V (Total foot necrosis and/or infection; non-salvageable foot)
- Risk assessment of diabetic patients for DFU's and referral for preventive diabetic foot care

Figure 7C

Essentials of a Comprehensive Diabetic Foot (DFU) Ulcer and Amputation Prevention Program:
Primary Care Physicians and Nurses

- **Basic principles of wound healing**
  - Basic off-loading techniques to heal a simple DFU
  - Basic DFU care and debridement surgical skills
- Basic antibiotic management of the infected DFU
  - Principles of Rehabilitation
  - Emergency Management of the Acute Diabetic Foot
  - Research
- Decision-making regarding appropriate location for continued care, i.e., clinic or hospital for surgical treatment, e.g., incision and drainage of abcess, debridement of osteomyelitis or necrotic and/or infected soft tissue (WoundTool) (The delay in referring appropriate patients for urgent or emergent surgical care has been the historical, universal road block to limb preservation among the diabetic community, anywhere in the world).

Figure 7D

Short symposium outline for primary care physicians for COE training can be seen in Figure 8. This type of course material can also be disseminated through satellite COE's in partner countries.

Training for Primary Care Physicians (Short Symposium Outline

1. Diabetic Foot Exam / DFU risk assessment
2. Diabetic Ulcer grading
3. Ulcer debridement
4. Ulcer dressings
5. Off-loading (TCC)
6. Preventative foot care
7. Diabetic Charcot Foot (TCC)
8. Diabetic shoes/orthoses/prosthetics
9. Antibiotics and the diabetic foot
10. When surgery is preventative medicine in the diabetic foot
11. Functional amputations in the diabetic foot
12. When to refer a diabetic foot condition
13. Diabetic Foot - Overview of the harsh numbers
14. PAD and neuropathy in the diabetic patient
15. Wound Telemedicine (WoundTool)

Figure 8

5. Surgical raining on wound diagnosis and treatment, including lower extremity reconstruction, with the ultimate outcome being amputation prevention (On-site classroom and clinical instruction)(Figure 9).

Training for Surgeons: Outline

Figure 9: Training for Surgeons: Outline

Figures 10A-10E demonstrate the outline of the World Walk curriculum for surgeons and their nursing staffs, including the basic science and clinical fundamentals of wound prevention and healing, the history and physical examination of the wound patient, wound assessment, and surgical techniques, including debridement, incision and drainge of abscess, levels of reconstruction within the foot, skin grafting, anesthetic techniques, infection management, off-loading and ambulatory rehabilitation.

Essentials of a Comprehensive Diabetic Foot (DFU) Ulcer and Amputation Prevention Program: Specialty-trained Surgical Staff

Surgical Training for Diabetic Foot, Ankle and Limb Preservation and Rehabilitation:

- Molecular, Cellular and Tissue Principles of Wound Healing
- Clinical Principles of Wound Healing
  - Preventive Diabetic Foot Care Programs, Community education strategies and patient take-home literature (Complementing and supporting the same initiatives among the primary care staff).
  - Optimal Wound Care Principles (John MacDonald, MD):
    1. Enhance Systemic Conditions
    2. Protect Wound From Trauma (TCC)
    3. Promote Clean Wound Base and Prevent Infection
    4. Maintain A Moist Wound Environment
    5. Control Peri-wound Edema/Lymphedema
  - History and Physical Examination of the diabetic wound patient:
    1. Vascular examination
    2. Neurological examination
    3. Orthopedic examination
    4. Dermatological examination:
       - Skin
       - Nails
       - Wound assessment (Wagner, UTHSC Classifications)

Figure 10A

Essentials of a Comprehensive Diabetic Foot (DFU) Ulcer and Amputation Prevention Program: Specialty-trained Surgical Staff

Surgical Training for Diabetic Foot, Ankle and Limb Preservation and Rehabilitation:

- Wound debridement
- Wound cleansing
- Dressing materials
- Infection management:
  1. Simple incision and drainage of abcesses
  2. Toenail surgery for ingrown, deformed (mycotic) and infected toenails
  3. Approaches to deep space (compartment) infections in the foot and leg
     - Fasciotomy
  4. Post-op irrigation and packing techniques
  5. Culture & Sensitivity techniques
  6. Biopsy techniques:
     - Soft tissue
     - Bone
  7. Diagnosis and management of osteomyelitis

Figure 10B

Essentials of a Comprehensive Diabetic Foot (DFU) Ulcer and Amputation Prevention Program: Specialty-trained Surgical Staff

Surgical Training for Diabetic Foot, Ankle and Limb Preservation and Rehabilitation:

- Levels of reconstruction in the diabetic foot
  1. Partial toe amputation
  2. Toe amputation
  3. Partial ray resection
  4. Ray resection
  5. Multiple ray resections
  6. Transmetatarsal amputation
  7. Lis Franc amputation
  8. Transtarsal amputation
  9. Choparts amputation
  10. Piragoff amputation
  11. Boyd amputation
  12. Syme amputation (ankle)
  13. Diabetic Charcot (Neuroarthopathic) foot reconstruction
- Fixation:
  1. Internal
  2. External

Figure 10C

Essentials of a Comprehensive Diabetic Foot (DFU) Ulcer and Amputation Prevention Program: Specialty-trained Surgical Staff

Surgical Training for Diabetic Foot, Ankle and Limb Preservation and Rehabilitation:

- Wound closure strategies:
  1. Simplifying wounds from bone-based to soft-tissue based as staged (Delayed closure strategy)
  2. Flaps:
     - Principles of angiosomes in the planning of soft-tissue flaps
  3. Split-thickness skin grafts
  4. Combinations of 2 and 3, above
  5. Secondary healing
- Principles of drain use, wound syringe irrigation and packing techniques
- Principles of surgical hemostasis
- Achilles tendon lengthening for reducing peak pressures in the diabetic neuropathic forefoot:
  1. Biomechanics of weight-bearing gait
  2. Equinus and the human foot
  3. Equinus and the diabetic, neuropathic foot
- Negative Pressure Wound Therapy (NPWT)

Figure 10D

Essentials of a Comprehensive Diabetic Foot (DFU) Ulcer and Amputation Prevention Program: Specialty-trained Surgical Staff

Surgical Training for Diabetic Foot, Ankle and Limb Preservation and Rehabilitation:

- Local and regional anesthetic techniques:
  1. Local infiltration
  2. Digital block
  3. Mayo (Ray) block
  4. Ankle Block
  5. Common Peroneal Block
  6. Tibial Nerve Block
  7. Tibial-Common Peroneal (Popliteal)-Saphenous Nerve Block (9):
     - Valuable for soft-tissue and boney debridement below the knee joint (tibia, fibula, foot and ankle), including application of external fixators to tibia and fibula, fasciotomies for compartment syndromes, closed reductions and ORIF of ankle fracture and debridement of necrotizing infections and necrotic wounds of the foot, ankle and leg
- Multidisciplinary Approach to Limb Preservation in the Diabetic
- Emergency Management of the Acute Diabetic Foot
- Off-loading strategies, materials and devices (TCC)
- Principles of Rehabilitation
- Research
- Telemedicine (WoundTool)

Figure 10E

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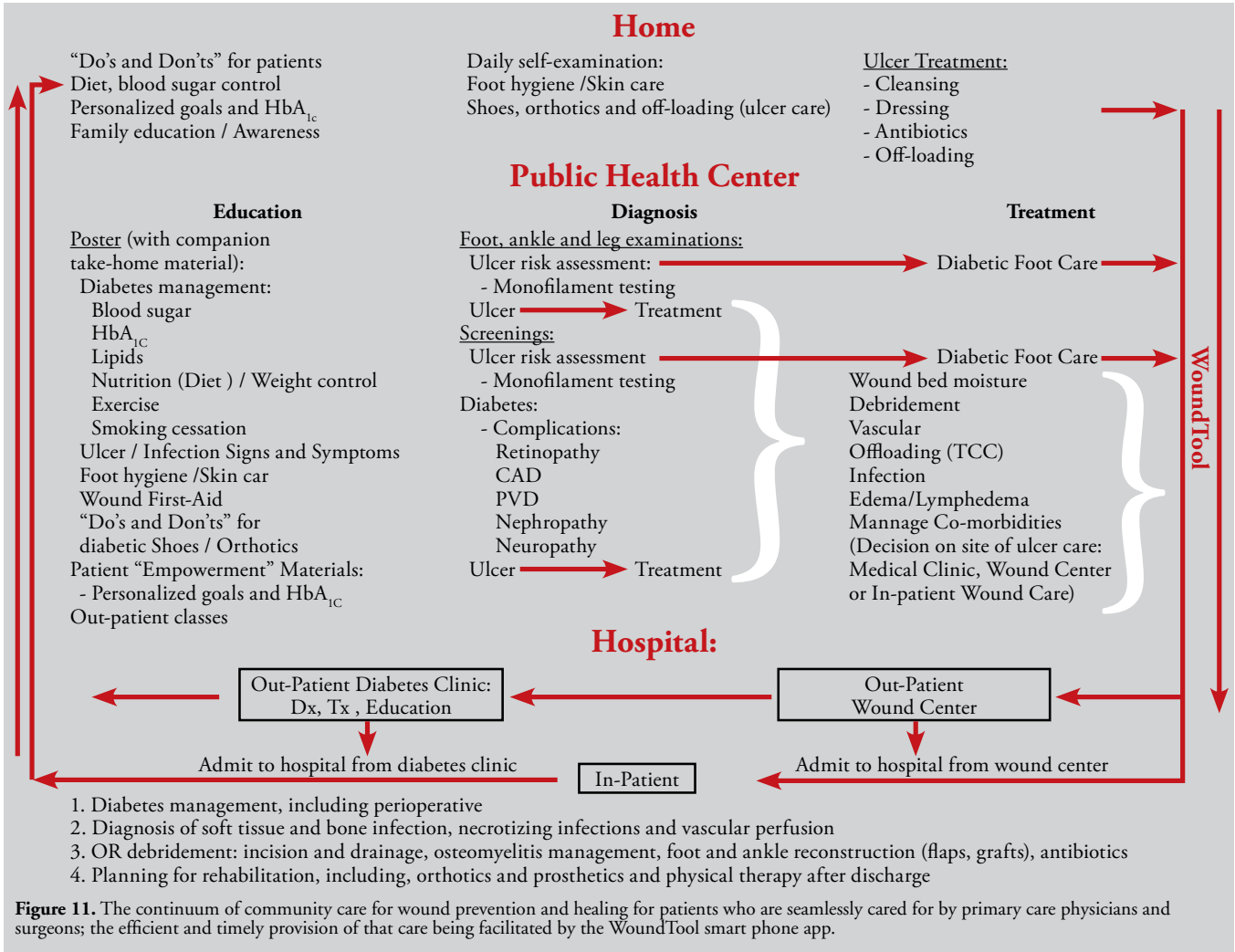

Figure 11. The continuum of community care for wound prevention and healing for patients who are seamlessly cared for by primary care physicians and surgeons; the efficient and timely provision of that care being facilitated by the WoundTool smart phone app.

A composite of primary care, surgery and telemedicine used to prevent, diagnose and treat wounds, can be seen in Figure 11.

6. Rehabilitation staff training for independent, pain-free ambulation and return of diabetic patients to the community.

7. Live webcasts on all aspects of primary care, surgical care, rehabilitation, patient and community education for the diabetic patient (with archiving on website).

8. Remote wound telemedicine consultations from international experts

In addition to the central theme of collaboration, medical and surgical training, and the importance of on-going patient and community education (Elements 1, 2, 3, 4, 5 and 7, above), these academic and clinical educational programs may be facilitated by the integration of a smartphone app wound telemedicine system, which is being developed to augment not only the clinical efficiency in decision-making among medical and surgical caregivers, but also as an educational tool in improving the quality of the wound prevention and care in any country or region.

Through primary care physician training on the diabetic foot, and early awareness of the patient's wound condition, a public health center can facilitate the PCP—either knowing the proper treatment for less complex wounds locally, or by allowing the PCP to recognize when to transfer that patient for surgical care as promptly as is required by the particular condition of the patient and the wound. In Figures 12 and 13, the model for a referral network in Jamaica and Belize can been seen in these regions, with communication carried out by the smartphone wound telemedicine system.

As noted above, the delay in referring appropriate patients for urgent or emergent surgical care has been the historical, universal road block to limb preservation among the diabetic community. We feel that the decision-making regarding appropriate treatment and location for continued care (i.e., clinic or hospital for surgical treatment, incision and drainage of abscess, debridement of osteomyelitis or necrotic and/or infected soft tissue) will be assisted greatly by integrating the smartphone wound telemedicine system into this wound healing clinical pathway.

Figure 12. Watershed public health center and hospital communication with the WoundTool in Jamaica.

Figure 13. Watershed public health center and hospital communication with the WoundTool in Belize.

Piloting of the WoundTool among a select leadership group of medical and surgical partners in the countries of Jamaica, Belize, Trinidad and Tobago, and Puerto Rico is currently in the planning stage. The test will simply be a submission of diabetic or other difficult wound cases that caregivers will submit using a Rapid Data Entry element on the smartphone app, which is also accessible through their laptop or desktop. Basic history and physical examination information will be requested as part of the submission data set, including results of wound and/or infection evaluation, clinical vascular and neurological (neuropathy) examinations, medications, and laboratory/radiographic studies.

After evaluation of this incoming case history, our networked international wound team will develop an electronic wound management plan that will be returned to the submitting caregiver(s) at the point of care. In addition, other elements can be added to the plan such as instructional videos, which are chosen by the expert to augment the value of that particular management plan to optimize healing outcomes in that case. Each case record will contain patient history, healing outcomes and analytics (e.g. cost-effectiveness of care), and will be filed through the server for easy access.

In essence, this network of wound experts who are using the smartphone app technology, can participate as international wound mission volunteers without ever leaving their office or home. All participants will be able to see all of the submitted cases and can respond to these other case submissions as well. In this way, a dialogue is created among participating wound caregivers, with the ultimate goal being to provide advice on individualized diagnostic and care plans. Also, by having the other participants contributing comments about the other cases, they can participate in the development of the individual's care plan by offering their knowledge and experience with such cases. We would hope that those wound caregivers who participate in submitting cases would consider our expert-network members as equal partners they can work together with to forward the goal of a new standard of global wound prevention, wound healing and amputation prevention.

The smartphone wound telemedicine system may contribute to the expansion of educational opportunities that will facilitate improvements in the standard of wound diagnosis and treatment within the Caribbean and Latin American regions, particularly as it relates to wounds and amputation prevention. With the wound specialist available by computer, a wound consultation is only an email away. The vision is for this system, after being tested in this hemisphere, to be tested in other regions of the world.

The software built into the device allows the medical professionals involved to assess the rate of wound healing at 4-weeks, 8-weeks, 12-weeks and 16-weeks. Those rates can then be compared to a chronicity benchmark (Chronicity Algorithm). The internal benchmarks within the system

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can then initiate a systematic review of the reasons why the wound is slow to heal and suggest the evidence-based diagnostics and treatment protocols necessary to create a more effective healing trajectory for that particular wound. A gradient of "triggers" has been designed to either instruct the medical and nursing caregiver to proceed with an evidence-based treatment, or to direct certain patients with an acute wound for more advanced care in a hospital setting, including medical management of diabetes, debridement, incision and drainage of abcess, IV antibiotics, followed by foot reconstruction including skin grafts and flaps.

The Intelligent Registry incorporated into the app would allow the appointed caregivers to track the patient through the continuum of care, whether they are sent to the hospital and then are discharged, or readmitted to the hospital again. This permits seamless management of chronic wounds in the community, regardless of where the patient is living at a particular time.

The fiscal implications to public health centers, hospitals, ministries and departments of health, may be significant. Including wound product and treatment data in the patient's database can allow for cost-effectiveness studies on products paid for by institutions. For instance, by assessing a patient's treatment plan and wound healing rate, facilities can use this data to choose products that are fiscally sound and promote optimal healing.

Ultimately, this hand-held device will caregivers to intervene early in wounds that are becoming chronic. It will also guide patients to the appropriate venue of wound care in a timely manner (essential for diabetic amputation prevention), which will allow for the overall rates of healing to increase dramatically and the prevention of new wounds to accelerate over time, in any given patient population.

This technology can also regularly transmit live (and then archived) webcasts to all participating international mission staff. These webcasts can potentially be used as continuing education credits, as they cover the basic science of wound healing via a systematic presentation of lectures on wound prevention, diagnosis (history and physical examination of the wound patient) and treatment (e.g. surgical principle presentations). In addition, there are videos on subjects such as debridement of infected and necrotic soft-tissue wounds and osteomyelitic bone, incision and drainage of abscesses, principles of flap preparation and closure, and skin grafting.

In summary, the World Walk model includes several important elements, each one contributing to the educational and therapeutic impact of the entire program on both a local and regional level. The ultimate goal being: to improve wound healing and patient quality of life in underserved areas, as well as prevent wound occurrence, sepsis and amputation. By beginning with a Pan-Caribbean model, our hope is to encourage caregivers from Latin America and other regions to participate in training and this connection-based model of care. As a measure of the success of this model, over time, the expected outcome is that, in any given country or region, a gradual change will occur, including fewer complicated Wagner III, IV and V diabetic wounds, with movement, on a population level, to more less complicated diabetic Wagner I and II wounds, which is what we call a "Wagner Shift" (Figure 14). W

"Wagner Shift"

A statistical shift, in a given geographical study area (population), from large numbers of severe diabetic wounds to fewer numbers of severe diabetic wounds because of community prevention programs, early wound intervention, and improved wound healing and amputation prevention protocols.

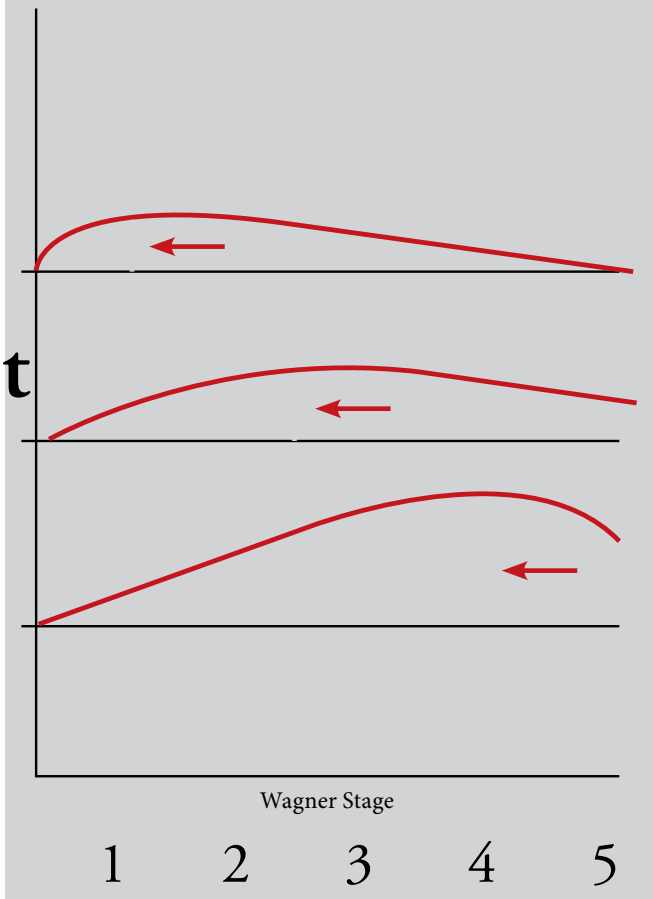

Figure 14. "Wagner Shift"

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Google Glass + Wound Care = ?

by Kyle Samani
Cofounder and CEO of Pristine

Google Glass is somewhat of an enigma. It's been available in a beta "Explorer" program for a year; it recently went on sale to the general public, though it still caries the beta Explorer tag. Some consumer tech pundits hate Glass and detest it as the beginning of the end of humanity, privacy, and as a sign of the age of Internet addiction. Others find it to be magical and brimming with potential to connect humanity like never before by making technology invisible so that we can focus on the people in our lives.

The healthcare universe is equally split. There are a few prominent traits of Glass that make it particularly enticing for use in healthcare: a hands-free, omni-present heads up display and a hands-free, always-there 1st person camera. In June of 2013, Dr. Rafael Grossmann, a trauma surgeon and personal friend, live streamed the first surgery through Glass (using Google's own live streaming solution that isn't HIPAA compliant). Many providers look at Glass as a way to free themselves from the keyboard and mouse that detracts from the physician-patient relationship. Others detest Glass as just another object obstructing the physician-patient relationship.

Glass is clearly a polarizing object. It has the potential to unleash a huge amount of innovation in healthcare, enterprise, and consumer markets. And yet it creates more questions than it answers. As a pioneer in this space, I'm out to help wound care providers make sense of what's possible today and where things are going in the healthcare Glass universe.

There are a handful of companies that have developed HIPAA compliant apps that are in live clinical use today. Pristine began testing its HIPAA compliant telemedicine solution for Glass in live surgery at UC Irvine in October of 2013, and is now installed in nearly a dozen healthcare organizations across a variety of use clinical settings. Other companies in the space such as Augmedix, Vitals Medical, and Phillips are also testing different HIPAA compliant Glass apps in live patient care settings.

There's a lot of movement in the healthcare Glass universe today. In fact, too much in my opinion. It can be difficult to make sense of it all. I've devised a simple framework to make sense of all of the types of healthcare Glass apps being developed: data-in and data-out. There's also a 3rd category of apps that aren't quite ready for primetime: augmented reality.

Data-in apps are apps that grab data from a source - for example the EMR, a vitals monitor, a PACS imaging system, an endoscopic camera feed - and display it on Glass. Vitals Medical and Phillips are pioneering this. The primary value of data-in Glass apps is accessing data when it would be otherwise impossible to access the data from a traditional computer - a laptop, tablet, or smartphone (because one's hands are tied up delivering care!). Instead, healthcare providers should be able to access the information desired from Glass in a hands-free manner.

The other major category of apps are data-out apps. Pristine falls into this category. The primary value proposition for data-out apps is to help providers communicate with one another or to send data computer systems (i.e. for picture/video documentation) while maintaining use of both hands for care delivery. These apps are focused on capturing sensor data on Glass - such as the camera and microphone - and relaying it to another person or computer system such as the EMR, PACs, etc. Many providers who are optimistic for Glass' future hope to one day run the entire EMR through Glass. That day is still probably years from now for a number of technical and business reasons, although Augmedix is trying to tackle that problem today.

Dr. Christopher Kaeding, an orthopedic surgeon at The Ohio State University Wexner Medical Center, makes adjustments to Google Glass before performing surgery on August 21, 2013.

The third major category of apps for Glass are augmented reality (AR) apps. For the uninitiated, augmented reality refers to overlaying images, objects, or data on top of one's vision to augment what one is seeing. AR apps can theoretically overlay anything or data on reality, or perhaps even more interestingly, hide anything. AR apps aren't practical on Glass today for a few technical reasons: 1) the screen on Glass doesn't align in one's direct line of sight, making it difficult to overlay meaningful data on the physical world (the Glass screen rests in one's peripheral vision) and 2) Glass doesn't have enough computational power to run meaningful computer vision applications. Despite these limitations, there are dozens of skunk works AR projects in development for Glass. These will likely begin to manifest in a few years as Glass hardware matures. You can play with AR apps for smartphones today though; just check out Layar in the iOS App Store or Android Play Store.

We are still in the early days of developing healthcare Glass apps. Software developers and providers are still figuring out what they can and can't do with Glass, and what's practical. Many companies have placed their bets and are now refining their ideas so they can scale to support a large number of providers. There is still a lot of noise and uncertainty in the space though.

But what about the future? Where is Glass headed in healthcare? What's going to be possible tomorrow?

There are a lot of obvious things to do with Glass in wound care. The low hanging fruits include: taking pictures and videos and uploading them to the EMR; intelligent wound measurements; telemedicine consults (particularly for inpatient and home care settings); remote-scribing; referencing images of historical wounds for comparison. Some of these are more technically challenging than others. But perhaps the greatest challenge is EMR integration. Integrating 3rd party apps into existing EMRs is expensive. That cost will drive companies to explicitly avoid EMR integration. Some companies, such as Pristine and Augmedix, have chosen to avoid EMR integration in the short term for exactly that reason.

Given how nascent the healthcare Glass industry is, in the immediate future, only simple Glass apps will take hold. The early apps will focus on a narrow set of features that effectively capitalize on the unique traits of Glass. Both Augmedix and Pristine are leveraging the handsfree, omni-present 1st person camera. Vitals Medical, on the other hand, is taking advantage of the omni-present screen.

In a few years, we'll begin seeing nascent AR apps and more robust data-centric apps that integrate heavily with EMRs. But between now and then, we're in the wild west and anything can happen. Exciting times await us. **W**

Feel free to contact me at kyle@pristine.io with any questions.

Full disclosure: the author of this article, Kyle Samani, is cofounder and CEO of Pristine, a startup pioneering healthcare applications on Google Glass. Pristine's solutions are used in nearly a dozen hospitals, ambulances, med schools, and wound care centers today.

Multidisciplinary Certification
A Vision Realized

by Joseph McCulloch, PhD, PT, FAPTA, CWS
President, Board of Trustees
American Board of Wound Management Foundation

Introduction

Almost 20 years ago, three podiatric surgeons (John Prior, Jack Nelson and Chet Evans) were talking in a doctor's lounge, when they had a vision. Concerned about the rapid growth of knowledge in wound care and the broad variety of healthcare disciplines caring for patients with wounds, they questioned why there wasn't some form of certification to indicate to the public that practitioners had a common core of knowledge in the field. At that point in time, the only certification that existed in wound care was for bachelor prepared nurses, and was offered by the Wound, Ostomy and Continence Nursing Certification Board (WOCNCB). Nothing existed for certification of other wound care providers. The need for a certification process in wound management broad enough to encompass all those professions involved in this burgeoning field was evident.

From this initial conversation, the American Academy of Wound Management (AAWM) was formed. The founders set out to establish a multidisciplinary board consisting of thought leaders in the field. Guidelines were established to be used for the initial certification of diplomates of the academy.

The Founding Board

The founding board came together in Miami in 1995 to undertake the arduous process of portfolio review for the first cohort of potential certificants. The portfolio review examined letters of reference, college transcripts, licensure status, proof of ongoing continuing education and personal statements attesting to at least three years of involvement in wound management. It wasn't long before it was determined that the portfolio process needed to be quickly replaced by a comprehensive written examination. Dr. Liza Ovington, an acclaimed scientist and lecturer in wound care, championed the task of convening the initial examination committee. Contractual arrangements for test development and administration were made with New York-based Professional Testing Corporation (PTC). PTC worked with the AAWM to develop the initial test blueprint. Test development required that a national survey of wound management practitioners be conducted. Known as a job analysis or description of specialty practice, the results of the survey enabled the examination committee to construct a content outline descriptive of wound care practice. From this outline, the first test would be developed. Task analysis is repeated frequently today to assure that specialty certification is in line with contemporary practice.

With the test outline or blueprint established, subject matter experts were solicited to develop multiple choice questions addressing all of the prescribed content. These questions were vetted and edited by another group of subject matter experts and PTC psychometricians until deemed ready for use. The first multidisciplinary certification examination was administered in 1999 and resulted in 35 practitioners becoming certified and awarded the Certified Wound Specialist (CWS®) credential. The pass rate on the first examination was 78%. Initial certification was for a 10-year period with annual requirements for continuing wound management education and re-registration.

Recertification and Growth

In 2005, the first cohort of specialists was due for recertification. A case-based take home examination was developed, which required test takers to interact with a variety of disciplines in order to successfully pass the examination. This was designed to reinforce the multidisciplinary focus

of certification, while making the process a learning experience. Several years later, policies were changed, requiring all specialists to take the same examination administered to individuals undergoing regular certification.

Growth in the field of wound management led the AAWM to the realization that the single CWS® certification was not addressing the certification needs of many wound care providers. The AAWM board subsequently decided that in order to take the CWS® examination, candidates would need to possess the minimum of a bachelor's degree in a healthcare field and have at least three years of wound care experience. The needs of individuals with an associate degree, or who might be involved in wound management through industry or not holding a healthcare-related degree, were handled by the development of the Certified Wound Care Associate (CWCA®) certification. This certification examination covered much of the content of the CWS® examination, but addressed it at a different level—content was more appropriate for the broad group being tested. The first CWCA® examination was administered in 2007 and resulted in 43 wound care associates becoming certified. The pass rate on the first administration of the CWCA® examination was 77%.

One of the initial reasons for the development of a certification process was to move wound care to a recognized specialty within the practice of medicine. The AAWM board, while not wanting to stray from the multidisciplinary certification concept, realized the importance of segregating physician specialists into a subset of wound specialists that could one day be recognized by the American Board of Medical Specialties (ABMS). The ABMS is a not-for-profit organization comprising 24 medical specialty member boards and oversees certification of physician specialists for many groups in the U.S. In an initial effort to address the goal of ABMS recognition, a separate examination needed to be developed that was open only to physicians (MD, DO, DPM). To accomplish this while maintaining the integrity of multidisciplinary certification, required that all physicians be tested on the content of the CWS® examination, but additionally be competent in physician specific content dealing with diagnosis, surgery and physician-level therapeutic interventions. Upon successful completion of the examination, the physician would receive the credential of Certified Wound Specialist Physician (CWSP®). The first cohort of physicians took the test in 2009 and 25 individuals received their certification. This represented a pass rate of 71%.

In 2011, with interest in certification growing, the AAWM saw the need to broaden its certification reach by making testing more available to interested practitioners. Up until this time, examinations were offered in each of the three specialty categories two times per year. Trends toward more frequent testing opportunities and instant notification of passing status, led the AAWM to develop an agreement with Applied Measurement Professionals, Inc. (AMP), a testing agency based in metropolitan Kansas City. AMP is a wholly owned subsidiary of the National Board of Respiratory Care (NBRC) and has more than 30 years of experience in certification. In working with AMP, test takers were given year-round access to testing centers located predominantly in H&R Block facilities nationwide.

The AAWM, realizing the benefits of having all of its certification programs evaluated and accredited by an external agency, sought accreditation through the National Commission for Certifying Agencies (NCCA). The NCCA works to assure compliance with accreditation standards related to quality certification, and adds another layer of assurance for the public regarding the validity of the certified credential. All three certification programs were evaluated by the NCCA and became fully accredited. The accreditation remains in effect until 2018, at which time all will be re-evaluated.

From Academy to Board and Foundation

Over the years, one of the things asked most by individuals seeking certification is: "How can I prepare for the test?" Since the AAWM was established as a 501 (c) (6) not-for-profit organization for the purpose of certification, it was not in a position to provide education or teach individuals

Continued on page 34

1995	1999	2005	2007	2009	2011	2012
Multidisciplinary Accreditation Conceived/ Portfolio Assessment Begins	First CWS® Exam	Recertification Begins	First CWCA® Exam	First CWSP® Exam	AMP Takes Over	ABWM & Foundation Begin

Continued from page 33

how to study for the exams other than by telling them to be familiar with the items on the test blueprint. The AAWM board felt that some of the inquiries regarding study material may have come from the fact that the organization name included the word "academy." It also believed that a mechanism should exist to provide quality education to test candidates. Therefore in 2012, two changes occurred. The first change in January of that year was to officially change the organization's name to the American Board of Wound Management (ABWM). Adding the term "board" to the name appropriately addressed the focus of the organization as a certification entity. Secondly, in July of 2012, the board approved the development of an independent 501 (c) (3) foundation for the sole purpose of promoting certification by development and provision of quality education and promotion of sound research to support wound care. All trustees of the ABWM Foundation are either certified wound specialists, certified wound specialist physicians, or public members—none have any direct involvement in examination development or administration; this rests solely with the ABWM.

The ABWM Foundation brought many positive changes that have greatly increased the educational opportunities for individuals preparing for certification. The first is the offering of online practice exams in each of the three specialty areas (CWS®, CWCA®, CWSP®). These practice tests consist of actual questions from previous examination administrations that have now been decommissioned as new items have been added to the test item data bank. This gives potential test takers the opportunity to see the type of questions that appear on the tests, and hopefully allays some of the fears of anxious test takers.

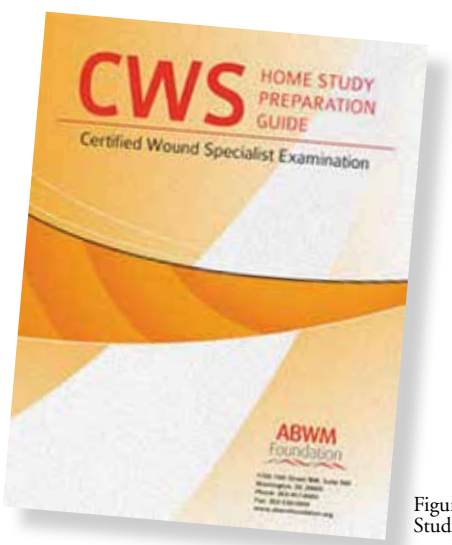


Figure 1 – CWS® Home Study Preparation Guide

Secondly, the ABWM Foundation began development of examination study guides. These several hundred page documents provide a thorough review of content tied directly to the test blueprints, and additionally include annotated practice questions that cover all items of the blueprint. The *CWS® Home Study Preparation Guide* (Figure 1) was released earlier this year. The *CWSP® Home Study Preparation Guide* is set to release in July of 2014, and the *CWCA® Home Study Preparation Guide* is under development.

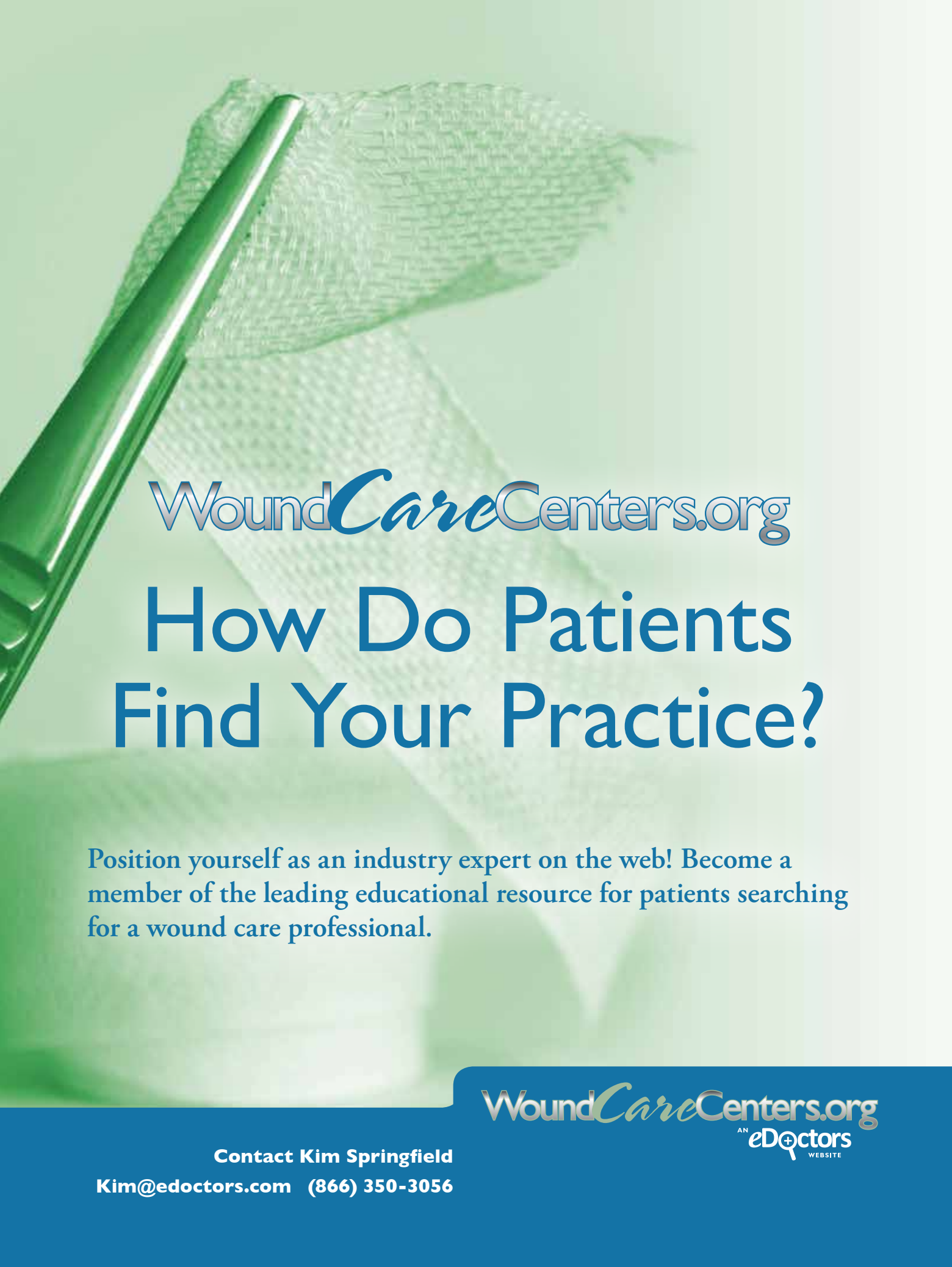
In addition to practice tests and study guides, the ABWM Foundation has teamed up with two outside vendors who offer test preparation coursework. The North American Center for Continuing Medical Education (NACCME) offers an intensive two-day certification preparation course recommended by the ABWM Foundation. The courses are all taught by certified wound specialists who are thought leaders in wound care.

Another option, available to interested applicants, is the online Wound Certification Courses offered by W*oundEducators.com*. These courses allow participants 24 hour/7 day a week access to study materials that can be reviewed at the individual's own pace. Courses are offered at varying levels to aid in preparation for all three ABWM examinations.

Conclusion

With nearly two decades of experience in wound care certification, the ABWM stands today as the longest running, multidisciplinary, not-for-profit wound care certification organization in the country. Collaborating with the ABWM Foundation and its associated education groups (NACCME® and *WoundEducators.com*), great strides are being made in assuring the public has access to a cadre of certified wound specialists. **W**

Individuals interested in pursuing a certification in wound management should contact the ABWM at www.abwmcertified.org. For more information on preparation for certification, contact the ABWM Foundation at *www.abwmfoundation.org.*



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Increase Circulation to Your Practice!

Community Marketing Ideas for Wound Centers

by Emily Marchetta

You know you have an energetic staff, pleasant office and offer the best in patient care. But, do your neighbors in the community know this? What about other local physicians—are they recommending you to their patients? If you haven't made a strong effort to reach out to your local community, chances are your practice isn't in the forefront of their minds.

The good news is that spreading the word about your practice to physicians, influencers and potential patients doesn't have to be difficult or expensive; it just takes a little out-of-the-box thinking and a commitment to building your brand.

Your goal is to make the surrounding community and residents aware that you're here and ready to help. Read on for some fresh ideas to increase local awareness and build profitable relationships within your community.

Influencers—Who They Are and Why They Matter

Grassroots marketing involves developing relationships and communicating with influencers to encourage enthusiasm about your business, so that they become advocates who share and introduce you to a broader audience. Connecting to influencers is a great way to minimize marketing cost and see significant results.

For wound treatment centers, referring physicians should be the main targets of grassroots marketing efforts, since they have a large audience of potential patients who may need wound care services.

You probably already have physicians referring their patients to you based on your hospital and group affiliations, but creating relationships with referring physicians outside your familiar network can produce great results. Here are some ideas for how to get started:

- Rather than networking one-on-one, put together a social event for physicians and hospitals in your surrounding area. This approach allows you to focus the majority of your time on a single outreach event, while creating an environment for all in attendance to network and learn more about your expertise, abilities and when to refer a wound patient to your facility.
- Consider offering incentives to the referring physicians for helping you build your practice. Gift cards or movie tickets are always appreciated. Offering a round of golf with you provides an additional opportunity to build the relationship.
- Participate in physician-to-physician communities online. This provides an opportunity for you to enrich your knowledge and "talk shop" with other physicians, building your brand on a national level.
- Join local physician groups and associations within your county or state. These can vary widely based on your area, but many local physician groups provide benefits that include being listed on their distribution lists, alerted to local physician networking opportunities, and more.
- Communicate via social media. Connecting with other physicians who are active on sites like Facebook, Twitter, LinkedIn, etc., creates opportunities to share not only with those individuals but with their followings as they syndicate your posts.

Caring Encourages Sharing – The Value of Cause Marketing

Cause marketing represents businesses and non-profit organizations working together in a mutually beneficial way. In addition to targeting physicians, you should consider marketing to non-profits as well as providing charitable services that benefit the community. Studies show people respond significantly to these efforts—it was recently found that 91% of global consumers are likely to switch brands to one associated with a good cause, given comparable price

and quality. Try the following avenues for making a difference and making an impact on your community:

- Get involved with local diabetes support or awareness groups. Make contacts within the organization, advertise with them, and participate in walks and community activities. This kind of activity provides double the exposure—you gain visibility with both the support group influencers and potential patients in the community.
- Retirement or assisted living facilities and nursing homes can provide great opportunities for exposure. Consider sponsoring one of their events, advertise in their newsletters, or offer to give an educational talk about wound care, diabetes or another topic. Keep in mind: If the facility has a resident physician who is referring wound patients elsewhere, tell him you'll provide a free consultation to any referrals he sends—it's worth it to get in the door and establish a new relationship with a significant influencer.
- Partner with a local drugstore or other entity to offer free diabetes testing, sponsored by you. Having one of your nurses there to talk with patients about the severity of the disease and importance of care can build powerful relationships.

Connecting with Patients via Digital Marketing

When it comes to reaching out directly to the broader community of potential patients, knowing your audience is key. A recent Nielsen study found that Americans are increasingly connected—65% of all Americans owned a smartphone in 2013, and we have an average of four digital devices per person.

If you haven't done so already, now is the time to start using digital marketing methods that will grab the attention of potential patients where they spend their time. Here are some ideas to think about:

- Create your own website, independent of your affiliations or hospital. This will help your potential patients quickly find information about you and your practice without having to navigate through often complex hospital websites, and provides great exposure on search engines like Google and Bing.
- Participate in the Wound Q&A service, coming soon to *WoundCareCenters.org*. Your responses to questions from potential patients about wound care issues are published online, building your brand and credibility with consumers on a national scale.
- Send one or a series of email marketing campaigns. Email marketing is one of the most affordable ways to communicate to a large audience, and can be very effective. Plan your messaging in advance, and consider offering educational information or healthcare tips in addition to promotional features like a free consultation. Sending emails to your current database can help you retain patients by keeping you top-of-mind, and you can take it a step further by purchasing a list of local residents to market to as well.

Is It Working for You? Ensuring ROI by Measuring Results

One of the most important and often overlooked aspects of marketing is tracking and evaluating results. In some cases, this can be challenging. The benefits of building brand recognition don't always include a concrete number of patients coming in the door. However, there are two easy ways you can track how successful your marketing efforts are:

- Ask your patients how they found you. This sounds simple, but is often forgotten in the haste of onboarding a new patient. Make sure you have processes in place with your staff to collect information about where the lead or patient came from, including a field on new patient forms and making sure staff ask and record the answer when taking a phone call.
- Use trackable phone numbers in your advertising. Tracking numbers allow you to get concrete evidence of how many phone calls were generated by a particular marketing campaign. Any time you place an ad, send an email or circulate marketing collateral, you should think about using a tracking number in place of your regular local line. When potential patients dial the number, they are connected to your front desk as usual, but you have the benefit of knowing exactly which one of your campaigns successfully reached that individual.

Tracking your marketing campaigns provides valuable information that can improve your ROI by helping you make decisions about how to market effectively in the future. Each practice is unique and results can vary, but remember that getting the word out about your practice has to start with you. **W**

NEWS&NEW PRODUCTS

InvisiDerm Announces Zero Adverse Effects Two Years after Successful D`OXYVA® Landmark Human Clinical Study - New Randomized Human Clinical Study at Penn State University

InvisiDerm Healthcare Announces Zero Adverse Effects have been reported two years after its groundbreaking transdermal delivery study in diabetic and non-diabetic people and one year after results were presented to scientific community at international medical conference; potential seen for a wide range of direct health and beauty applications for widespread conditions.

InvisiDerm, LLC d/b/a/ InvisiDerm Healthcare ("InvisiDerm" or the "Company"), an emerging world-leading developer and manufacturer of proprietary pain-free, non-invasive circulatory health and transdermal delivery methods under ISO13485 QMS implementation and certification, recently announced it has not received any adverse effect report by the study subjects who participated in its successful landmark IRB-approved human clinical study completed in mid-2012 using its patent pending D`OXYVA® transdermal delivery system. Furthermore, InvisiDerm has never received any adverse health effect report from its customer users in the past three years who have been reporting significant and fast benefits with a wide range of mild to severe health and cosmetic conditions such as numb hands and feet, the appearance of dry skin, acne breakouts, acne and stretch mark scars, varicose and spider veins, and difficult to heal chronic, trauma and burn wounds. This advanced microvascular solution works by bolstering the body's natural healing foundation: microcirculation. Restrictions in this form of circulation impede the flow of antibodies, white blood cells and platelets, and rob the body of oxygen.

The overwhelmingly positive results of this study led by Dr. Lee Rogers, DPM, were presented at the Diabetic Foot Global Conference (DFCon) in Hollywood, California, March 21-23, 2013. The overwhelmingly positive study results with no adverse events have far-reaching implications for D`OXYVA® becoming an approved, effective, and complete Wound Care and Cardiovascular Solution, especially when combined with other beneficial therapies. The study manuscript was co-authored by Associate Professor at the Department of Physiology and Functional Genomics at the University of Florida, Judy M. Delp, PhD, and is intended for publication in an international peer-reviewed medical journal.

The overwhelmingly positive study results with no adverse events have far-reaching implications for D`OXYVA® becoming an approved, effective, and complete Wound Care and Cardiovascular Solution, especially when combined with other beneficial therapies.

The study explored and demonstrated D`OXYVA®'s successful transdermal delivery of GMP-compliant, purified Carbon Dioxide (CO2) directly to the body tissues via a skin absorption process unique only to InvisiDerm's patent pending process, achieved by its Supersaturated CO2 + H2O Vapor™. The study has recorded unmatched oxygen-rich capillary blood flow volume or Skin Perfusion Pressure (SPP) in every subject, indicating powerful increase in the activation of vasodilation, tissue perfusion, cell respiration and metabolism as the Bohr effect is widely known to facilitate oxygen unloading when the red blood cells' hemoglobin exchange CO2 and H2O, in turn signaling the body to increase endothelial function, oxygen and blood levels. The study protocol included the use of SPP readings taken for four hours after a single 5-minute D`OXYVA® application on the thumb by the FDA-cleared Vasamed Sensilase® 3000 microvascular assessment system as an indicator of CO2 delivery.

The clinical trial results reflected outstanding transdermal CO2 delivery in both diabetic (Type 1 and 2) and non-diabetic subjects, as recorded by significant and unmatched sustained increases in blood flow volume in the microcirculation in all study subjects for four hours. Not only was the response rate remarkably high, but the efficacy observed was beyond what has been reported in previous trials employing different transdermal delivery systems.

D`OXYVA®'s superior performance is due to its novel flow regulation mechanism for controlling the injection of medical gases into liquids, gels, and other substances for mixture into a supersaturated solution. The proprietary regulator system is groundbreaking in its design, manufacturability, and capabilities in high-pressure gas regulation.

Poor circulation is a gateway for a litany of ailments: slow healing, depression, poor complexion, sores, slow metabolism, and more. Optimizing and even improving the blood flow for the microvascular system is increasingly and widely being reported by independent experimental and clinical research to have direct applications to a wide variety of different conditions for people of all ages and backgrounds, including hypertension, diabetes, wound healing, sexual dysfunction, respiratory illness, skin health and appearance, and brain function.

D`OXYVA®'s introduction to the field is timely, because the role of microcirculation deficiency as a critical factor in these and other disease states affecting large percentages of the population has been made clear only in the past several years.

InvisiDerm's findings were presented at DFCon 2013 to an international audience of vascular surgeons, podiatrists, wound care specialists, and other medical professionals who also work with diabetic foot ulcer patients. As the rate of diabetes has skyrocketed, so has the need for a solution to improve blood flow and prevent amputation for these patients. The primary cause of diabetic foot ulcers is impaired microcirculatory blood flow to the affected areas, and D`OXYVA® is thus seen as a major opportunity for this community.

The principal investigator of the D`OXYVA® study was Dr. Lee Rogers, DPM, Co-Medical Director of the Amputation Prevention Center at Valley Presbyterian Hospital in Van Nuys, CA. Dr. Rogers is highly visible for his work on conditions such as diabetic ulcers and non-healing wounds caused by microcirculation and tissue oxygenation deficiencies.

InvisiDerm has been sponsoring an IRB-approved, double-blind, placebo-controlled, and randomized study with D`OXYVA® in dozens of subjects at Penn State University since early 2014 for measuring skeletal muscle tissue perfusion, skin receptor signaling, neurological signaling, heart rate and other vital mechanisms of action throughout the entire body. The results are intended for publication in an international peer-reviewed medical journal and for regulatory clearance submissions.

About InvisiDerm Healthcare

InvisiDerm, LLC d/b/a InvisiDerm Healthcare, headquartered in the U.S., is an emerging world leader in proprietary circulatory health and non-invasive transdermal technologies, committed to helping improve lives by developing, manufacturing, and marketing proprietary consumer health, dermatology, and beauty products. InvisiDerm specializes in groundbreaking non-invasive technologies for highly portable medical gas-powered transdermal delivery systems and is pursuing regulatory approvals in dozens of countries for device usage as treatment of disease states related to cardiovascular blood flow.

ABWH Introduces Epidermal Grafting Certification

The American Board of Wound Healing announces training and certification for Epidermal Grafting. Successful completion of this training will provide a certificate of competency that can be used for hospital credentialing services. This program and training is endorsed by the ACHM & APWCA. Future training dates will be announced on the ABWH website.

Epidermal Grafting Certification consists of three components:

1. Didactic educational lectures providing physiology mechanisms and an understanding of clinical indications and utilization
2. Hands on training and demonstration of proper techniques
3. Clinical practicum and skill verification. Following the LIVE training, candidates will be instructed in the procedure for case submission.

Five cases of Epidermal Grafting must be submitted to the ABWH for review and approval, prior to certification.

Physicians who are not credentialed to perform skin grafting procedures (e.g. general, vascular, and plastic surgeons) may require training and proof of competency to submit to their hospital credentialing committees to be allowed privileges to perform and bill for this procedure. W

FUTURE WOUND CARE

Mobile Health Telemedicine for Wound Management

by David L. Brock, Ph.D.
Cornelius M. Donohue, DPM, FACFAS

Introduction

The astonishing growth of computing technology, ubiquity of mobile devices, and power of the Internet—combined with growing healthcare costs and need for improved treatments—lay the foundation for a revolution in medicine. Realizing this visual, we propose a new system for intelligent management of chronic wounds: the WoundTool™. This device integrates smartphone applications, cloud computing, web technologies, and advanced visualization to provide physicians and caregivers with a more effective means to monitor, diagnose, and treat chronic wounds. In this article, we describe the enabling technologies, evolution of telemedicine and wound telemedicine, the impact of chronic wounds, and our proposed solutions.

Accelerating Technology

Technology has proceeded so rapidly and consistently that few of us consider its full implications. We recall IBM's Deep Blue defeating chess grandmaster Gary Kasparov in 1997, but may not realize Sony's PlayStation game console is 150 times more powerful. Furthermore, the smartphones that many of us carry in our pockets can outperform most supercomputers from the 1990s. To put it simply, processing power, memory, storage, and communications are growing apace, each following a similar exponential trend. In the world of medicine, the question then becomes: What are the implications for healthcare and wound care, in particular?

Smartphones have computational power, image processing, 3D graphics, and data communications that were once available only on high-end medical devices. Full high-resolution displays are now common, and 2K 2560 x 1600 QHD – and even 4K 3480 x 2160 UHD displays – are on the horizon.

In addition to processing and display, most smartphones have high-resolution cameras, high-intensity light sources, accelerometers, touch surfaces, global position systems, and microphones. Many also have proximity sensors, magnetometers, barometers, and humidity and light sensors. Future mobile devices are now planned with health sensors, such as single-lead ECG, body temperature, blood glucose, oximetry, and blood pressure.

Even with their somewhat limited telemetry, current smartphones can measure heart rate, test vision, measure hearing, track activity levels, and determine gait, as well as capture and transmit images. Smartphones, of course, also have the ability to send and receive all manner of multi-media medical information.

Given this current and emerging technology, we propose a wholly new platform for wound telemedicine that combines the full power of available computation, sensor arrays, data communication, immersive graphics, networking, cloud computing, remote storage and distributed collaboration. We are currently developing a prototype mobile intelligent wound care management system that exploits these capabilities and provides new levels of remote monitoring and diagnostic aids.

History of Telemedicine

A simple definition of telemedicine was offered by Dr. Joseph Kvedar of Harvard Medical School, a pioneer telemedicine practitioner and advocate. His opinion is that "telemedicine is the delivery of medical care independent of time and location." Despite its simplicity, this description provides what may be the most meaningful definition of telemedicine, because it emphasizes the value to the patient, who is ultimately the direct beneficiary of all medical services.

Telemedicine definitions range from the technical to the strategic. The most detailed in regards to specification of technology may be the definition used by the United States Center for Medicare and Medicaid Services (CMS). This definition states, along with a basic concept of telemedicine, that at the bare minimum, "telemedicine as defined by CMS must function to provide two-way, real-time communication between the patient and provider."

A frequent confusion exists between the terms telemedicine and telehealth:

- Telemedicine is most frequently applied to programs that supply clinical care through remote technologies, and is focused on the doctor-patient or other provider-patient interaction. Telemedicine programs of this type most frequently provide evaluations, diagnoses or prescriptive services for patients.
- Telehealth, on the other hand, more broadly applies to both clinical and non-clinical settings. Telehealth, as a term, is intended to include the areas of health related to education, research, administrative services, and clinical care. Under this taxonomy, telemedicine is a subset of the broader term telehealth.

The integration of telecommunications into clinical medicine was the defining element of telemedicine, and its roots carry back to the earliest days of diagnostic technology. Most individuals are surprised to learn that Willem Einthoven, the discoverer of the original electrocardiogram or EKG, also inadvertently created what is identified as the world's first telemedicine link. When he was denied the ability to see his patients directly in the hospital as he developed the EKG, he devised a method to transmit the early EKG over newly installed telephone lines. This communications connection between the hospital and his research clinic functioned perfectly. His apparatus and its performance were published in a notable article in 1906.

As telecommunications technology developed and radio use became commonplace, the popular press began to visualize new applications for the fledgling technology of radio. In 1924, a radio enthusiast magazine titled *Radio News* described and illustrated what it termed "The Radio Doctor" —a complete bedside unit that allowed a physician to remotely examine, diagnose, and treat a patient.

This whimsical system has surprising parallels to actual telemedicine units in use today—having two way sound and video, an electronic remote stethoscope, and monitors for vital signs.

Telemedicine by radio persisted until the mid-20th century, and was most frequently applied by doctors providing advice to ships at sea using maritime radio. As television emerged nationally—beginning in the 1950's—telemedicine applications were attempted using TV. In 1955, a Nebraska psychiatric institute created and operated a successful closed-circuit television system in a hospital over 100 miles away. The video was black and white, which was the best standard of electronic visualization for the time.

Television projects became the mainstay of telemedicine through the mid-20th century. An additional, but notable project once again used black-and-white closed circuit TV to link the medical clinic at Boston's Logan International Airport to Massachusetts General Hospital, just across the bay. Concerns over Logan Airport's limited road and train access led to the project, and a paper published after doctors had seen 1,000 patients over the link was the first positive evaluation of the diagnostic equivalency and validation of a telemedicine link versus in-person care.

Television remained the primary medium for telemedicine throughout the 1970s. Many pilot projects were undertaken across the United States, and most of these were funded by the United States government through agencies such as the Department of Health, Education, and Welfare (HEW), the Health Care Financing Administration (HCFA), or the Federal Communications Commission (FCC).

During this time, interest in telemedicine began to decrease as the high costs of the involved television systems limited development. As measured by Medline citations, a premier online source for medical research, there was a 44% decrease in research literature activity related to telemedicine when one compares the like periods 1975-1982 versus 1982-1990.

With the 1990s came the advent and popularity of the personal computer. This stimulated renewed interest and developments in many forms of telemedicine that were based upon personal computer software development. These applications ranged widely in use across many medical specialties, but few found sustainable success. Upon the millennium celebration in the year 2000, two factors began to drive a fast expansion and exploration of new telemedicine applications.

First of these was the development of low-cost solid state devices with high performance levels for both black-and-white and color imaging. Driven by the broad-based consumer video camera industry, the capabilities of what once were high-cost imagers were now widely available at affordable costs.

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Ultimately, this new generation of devices outperformed their predecessors in many ways, and at a significantly lower cost.

Second was the widespread growth in the availability and popularity of the Internet, which offered new ways for computers to communicate and send digital files. With these two elements, a new generation of telemedicine systems and methods was born, developed and began widespread application.

The 1997 Telemedicine Report to Congress was a comprehensive review of the federal projects, but it resulted in no clear conclusions and made no specific recommendations, further muddying the already unclear waters regarding the value of telemedicine to national healthcare. Through the persistent efforts of telemedicine advocates, the Telemedicine Report to Congress was updated in 2001, under new governance that included many telemedicine organizations and practitioners from the private sector. This new level of advocacy resulted in a deeper analysis and focus on policy needs from a governmental level.

The 2001 report identified five key focus areas for policy development. These were lack of reimbursement, legal issues, safety and related standards, patient privacy and confidentiality, and telecommunications infrastructure.

Even as recently as 2010, the following key areas were of greatest concern for development that the medical community and government were focusing on:

- Technologies used to obtain and securely share biometric data reliably have led to applications in remote Intensive Care Unit bed management (referred to as Tele-ICU), as well as home monitoring of chronic care conditions for post-discharge management and patient care improvement.
- Advanced development of digital image processing has led to successful applications in radiology (referred to as Tele-radiology), as well as pathology and dermatology (referred to as Tele-pathology and Tele-dermatology, respectively). In each of these disciplines, patient images are obtained and transmitted to remotely located physicians for interpretation and diagnosis, with diagnosis and treatment plans returned to the point of care.
- Advances in live two-way video has led to telemedicine applications in remote stroke patient management during emergency room presentations (referred to as Tele-Stroke), as well as many programs providing ambulatory care visits in both primary care and specialist care, such as wound diagnosis and treatment decision making.[1]

Cost of Chronic Wounds

Chronic wounds are a significant burden to patients, healthcare professionals, and the global healthcare system. Within the United States, chronic wounds affect 5.7 million patients and cost an estimated $20 billion per year.[2] Globally, non-healing wounds affect more than 60 million people, and most of these without adequate medical treatment.

The rapid increase in obesity, coupled with sedentary lifestyles, has resulted in a sharp rise in diabetes in the United States, where as many as 26 million people have the disease—a number expected to quadruple by 2050.[3]. Medical costs associated with the disease rose from $174 billion in 2007 to $245 billion in 2012—an increase of 41% over five years.[3] As a result, the major factors inhibiting wound healing—diabetes and obesity—will result in an ever-increasing incidence and severity of chronic wounds in the United States and throughout the world.[4]. Globally, 382 million patients suffer from type 2 diabetes; by 2035 this will rise to 592 million, and of these, approximately 15% will develop a diabetic foot ulcer, and 50% of these will become infected, representing an estimated 44.4 million patients, the latter group being at highest risk of death from sepsis or amputation.[5,6]

The number of people with type 2 diabetes is increasing in every country. Eighty percent of people with diabetes live in low- and middle-income countries. The greatest number of people with diabetes is between 40 and 59 years of age.[6]

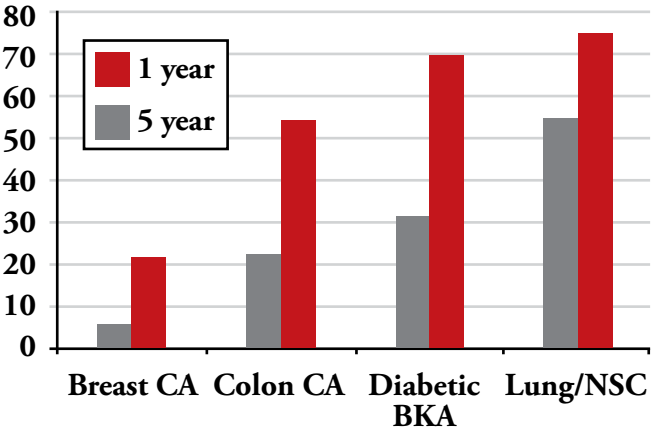
In the U.S., more than 60% of non-traumatic, lower-limb amputations occur in people with diabetes. In 2006, about 65,700 non-traumatic, lower-limb amputations were performed in people with diabetes. Diabetic foot infections (most are infected foot ulcers) represent the most common cause of hospitalizations for diabetic patients in the U.S. Considering that most amputations occur in diabetic patients who first develop a diabetic foot ulcer (DFU), the human and fiscal implications of the role of prevention, early diagnosis, and treatment of diabetic foot ulcers, both domestically and internationally, are worth considering.[7]

The physical and emotional impact of diabetic amputations includes:

- Higher risk of amputation of the other leg
- Increased risk of death (See Chart A1)
- Negative self-image / Depression
- Loss of ambulatory independence if the below-knee amputation (BKA) patient is not able to be rehabilitated

- Risk of pressure sores and death from blood poisoning (sepsis)
- Loss of ability to work
- Cost to patient, family, insurance companies, both public and private

One and Five Year Mortality Rates



Source: Serena, TE, Rassiga A. Penn North Centers for Advanced Wound Care
This data was compiled by the Penn North Centers for Advanced Wound Care from the National Cancer Data Bank (NCDB) and a large retrospective series of patients undergoing amputation at a major teaching hospital.

Aulivola, B., Hile, CN, et. al. Major Lower Extremity Amputation: Outcome of a Modern Series. ARCH SRG/VOL 139. APR 2004. 395-399

Chart A1: A diabetic amputee has a 70% chance of dying within five years of the amputation, with breast and colon cancer patients having a higher survival rate five years after diagnosis and treatment of their cancer.

Early Wound Telemedicine

On the horizon at the time of the Telemedicine Report to Congress in 2001, and certainly being discussed among many visionary wound caregivers and administrators for some number of years before that, was the accelerating problem of chronic wounds in the U.S., which facilitated a new era of investigations of telemedicine applications to wound management. It became clear, early on, that telemedicine flexibility and virtual encounter capabilities could assist wound prevention education for caregivers, as well as early and proper wound diagnosis and best wound practice treatment applications as the pressure continued to emerge from the U.S. health system for high levels of cost-effective healthcare outcomes, reduction in limb, and life-threatening chronic wounds and infections, as well as rising patient expectations of access and convenience.[8]

Development of Wound Telemedicine Models and Systems

In 2012, in the *Indian Journal of Plastic Surgery*, RK Chittoria described the need and model development of wound telemedicine systems:

"The escalating physiological, psychological, social, and financial burdens of wounds and wound care on patients, families and society demand the immediate attention of the health care sector. Many forces are affecting the changes in healthcare provision for patients with chronic wounds, including managed care, the limited number of wound care therapists, an increasingly aging and disabled population, regulatory and malpractice issues, and compromised care.

The physician is also faced with a number of difficult issues when caring for chronic wound patients because their conditions are time-consuming and high-risk, represent an unprofitable part of care practice, and raise issues of liability. Telemedicine enhances communication with the surgical wound care specialist. Digital image for skin lesions is a safe, accurate and cost-effective referral pathway.

The two basic modes of telemedicine applications—store and forward (asynchronous transfer) and real-time transmission (synchronous transfer, e.g. video conference) —are utilized in the wound care setting. Telemedicine technology in the hands of an experienced physician can streamline management of a problem wound. Although there is always an element of anxiety related to technical change, the evolution of wound care telemedicine technology has demonstrated a predictable maturation process."[9]

Modern Models for Wound Telemedicine[9]

RK Chittoria categorizes wound telemedicine systems as follows:

- Store and forward (SAF) or pre-recorded (asynchronous) telemedicine wound management (TMWM)
- Real-time or video conference (VC) (synchronous) TMWM
- Hybrid TMWM
- Mobile or cellular TMWM
- Integration model

One modern model of wound telemedicine involves wound experts in an office setting who receive live (synchronous) transmissions from remote wound caregivers, transmitting from the office or wound clinic, discuss the cases with the caregiver, who then return suggested diagnostic and treatment plans to the point of care (VC TMWM, above). This synchronous model is limited by the need for the wound caregiver to have the wound patient in front of a video camera. Fixed systems having these inherent limitations can be

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compared and contrasted with more portable, wireless systems available through mobile cellular and other similar technology, which give more geographic versatility and flexibility of patient and caregiver access to remote wound experts.

The synchronous nature of the above model also limits wound expert access since the expert must be available in real-time to accept the live transmission from the wound caregiver. Ideally, hybrid systems, reserving synchronous communication for a more detailed review of a case sent asynchronously, seem to be worth more investigation, particularly for the more severe or infected wounds, or patients approaching a septic or limb-threatening state.

Systems designed with the integration model create new levels of possibilities of data management, both incoming from the wound caregiver and outgoing back to the point of wound expert care. The uniqueness of this model is defined by RK Chittoria as one that "capture[s], transfer[s], store[s], measure[s], and deliver[s] follow up wound care."[9]

In simplest form, a wound telemedicine system can be clinical photo or live video sharing between the wound caregiver and the wound expert, with a phone conversation to discuss the case, including recommended further diagnostics and a treatment plan. The limitations of this "two-way video" are as follows:

- Lack of a standardized and efficient data entry template from the wound caregiver
- Lack of a standardized and efficient "e-management" plan, returned to the wound caregiver from the wound expert
- Lack of server-level data storage and analysis
- Lack of fundamental data management elements in the systems, such as healing trajectories, cost-effectiveness of wound products and devices, quality of life measurements, and the lack of an efficient and flexible infrastructure in the system to add additional elements in response to feedback from the end-user wound caregiver

WoundTool™ – An Intelligent Wound Management System

Given the revolutionary capability of mobile and web technologies—together with the growing need for effective management of chronic wounds—we are developing a next-generation platform – the WoundTool™ – that combines a mobile application, cloud services, and web-user interface. The system allows images taken from a smartphone to be securely and automatically uploaded onto a private cloud for review and analysis by an attending physician using any standard web browser, as shown in Figure 1.

Figure 1. The WoundTool™ consists of a mobile application for image capture, a browser element for review and analysis, and a server system for data management.

Using the mobile application, a caregiver simply selects the patient's name from the database, snaps a picture (or selects one already taken), enters note and other applicable patient data, and clicks 'save' on their mobile device. The application then automatically uploads the information to the server, which is immediately available to remote consulting physicians or care teams.

The web-based component of the WoundTool™ allows the physician to review patient history, analyze images, and manage notes. All changes – both in the images and comments – are recorded, stored, and tracked. The WoundTool™ thus provides a complete history of all changes to patient record and archives these changes along with user information and timestamp.

The WoundTool™ allows users to trace outlines around one or more wounds and automatically calculate wound area, shown in Figure 2. Multiple contours may be applied to a single wound to distinguish various healing regions.

The cloud-based record management system provides for a secure cloud on which all information is securely archived. The WoundTool™ uses a secure, scalable database technology that employs multiple, redundant servers for reliability and efficiency.

Finally, the WoundTool™ provides a platform for an array of advanced features and capabilities. These include educational elements, advanced visualization, volumetric measurement, diagnostic assistance, research, and third-party anonymized access.

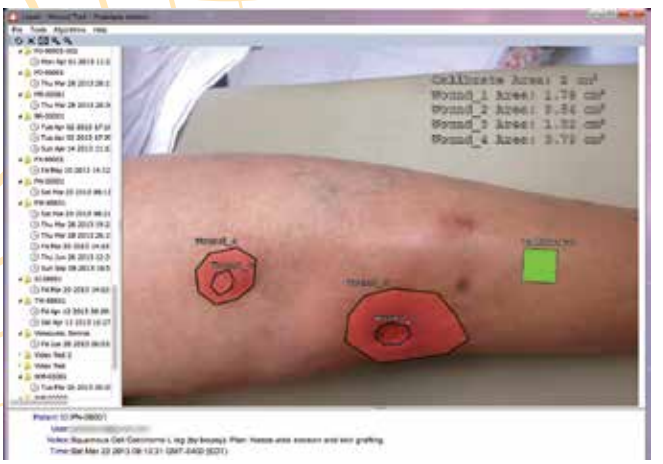

Figure 2. The WoundTool™ allows users to outline multiple regions on one or more wounds within a single image. Wound region areas are automatically computed and stored on the server.

Benefits of the WoundTool™

In addition to the impact of wound healthcare and the direct costs of treatment, transportation – particularly from the nursing home and assisted living facilities to the wound center and hospital – represents significant additional cost. Given the average price of an ambulance ride of $1,000 and the over 1 million transports per year for evaluation of chronic wounds, the WoundTool™ becomes even more attractive.[10,11]

There are 15,700 nursing homes in the United States, with a total population of 1.4 million.[12] Among residents over the age of 65, between 17% and 35% have chronic wounds – that is between 238,000 and 490,000 individuals.[13] Residents are typically transported via ambulance for outpatient wound evaluation and treatment, with an average cost of $1,000 per trip.[11,14] Given an average 10 trips per wound for wound treatment, transportation costs per year are over $10,000 per patient, with a total cost from $2.4 billion to over $4 billion annually.

The WoundTool™ could replace at least half of these transports, producing an annual savings of $5,000 per patient – or a total of over $1.2 billion per year. Given the proposed $600 per patient per year license, the WoundTool™ represents a small fraction of the ambulance costs and an even smaller fraction of the total cost of care, which is about $90,000 annually or about $250 per a day.[15]

Beyond the nursing home venues (skilled nursing facilities (SNF), long-term care and assisted living facilities), WoundTool™ may have applications in hospitals, home wound care agencies, and among primary care physicians (PCP). The goal is to have the WoundTool™ in the hands of every long-term care facility, SNF, home care agency, and hospital wound caregiver in the U.S., as well as in the hands of primary care physicians, the largest medical specialty and source of wound patient referrals in the world.

A sobering number is the approximately 5-8% of chronic wound patients in the United States that ever see a wound care specialist. We are now identifying the reasons for this phenomenon and determining whether the WoundTool™ could provide wound educational and screening materials directly to the primary care physician and his nursing staff. These materials would facilitate early and accurate wound diagnosis and staging/grading of wound severity and timely best practice (evidence-based) treatments. The WoundTool™ could help determine which patients could be treated in the PCP's office and which require a wound center or hospital level of care, contributing to avoidance of wound chronicity, minimizing cases of wound infections and sepsis, reduction of cases of limb-threatening acute Critical Limb Ischemia (CLI), decrease in unnecessary pain and suffering, and generally improving quality of life.

The WoundTool™ can potentially become a universal system for early and appropriate identification of wound diagnoses, severity, and the determination of proper venue of care, i.e., nursing home, home, wound center or in-patient hospital, as well as determining which patients would benefit from HBO Therapy to facilitate the healing of their wounds.

A new paradigm of care is emerging in the nursing home world, considering the substantial expense incurred by nursing homes for transportation to wound centers and to ERs, with more and more wound physician experts making nursing home wound rounds, in collaboration with their wound nurse practitioners, who act as wound center "extenders," who can, now as a team, use the WoundTool™ in the following ways:

- Fee-generating remote consultation between wound center expert physician and a nursing home or home wound caregiver
- Educates the nursing home wound caregiver in proper wound diagnosis, wound assessment, and wound staging, allowing early proper diagnosis and treatment, as well as early identification of those nursing home patients who need wound center or even hospital level care, thereby not only reducing the deterioration of many patients' wound into chronicity, but also reducing the cumulative number of hospital days for nursing home patients due to early and proper surgical care before patients reach the point of sepsis-prone, limb- and life-threatening infections

The benefits of telemedicine service also are seen on the financial side, in that it fuels economic development within many rural areas where it has been used. Business prospects consider healthcare a key factor when deciding on location, and the opportunity to be seen by specialists, whether integumentary (dermatology, wounds) or otherwise, is significant.[8]

Reimbursement is covered by insurance in Georgia through the Rural Health Initiative for a number of wound patient living venues, which states if insurance covers being seen in person, it must cover telemedicine if conducted in one of several sites. The originating sites covered by Medicare include the office of the physician or practitioner, hospital, critical-access hospital, rural health clinic, federally-qualified health center, skilled nursing facility, hospital-based dialysis center, and community mental health center.[15]

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With this program, there is a 5% bonus if the patient resides in a federally-designated "physician shortage area." The originating site also receives a site fee. As of Jan. 1, 2010, a skilled nursing facility can use the codes C0406-G0408, which previously were just for the inpatient hospital setting. Modifiers GT and GQ may be used.[16]

Only real-time telemedicine consults are reimbursable under Medicare, at least, at this time. Store-and-forward does not meet the Centers for Medicare and Medicaid Services' definition of telemedicine. However, it is reimbursable by Medicaid under section 1905 of the Social Security Act in 27 states.[17] Considering the annual net cost savings to Medicare is estimated to be $2 billion-$4 billion, it would seem that the future looks bright for telemedicine and our rural communities, and also for consideration and advocacy for a change in Medicare policy to include reimbursement for store-and-forward (asynchronous) wound consultations. The American Recovery and Reinvestment Act of 2009 calls for $2.5 billion to invest in infrastructure and tools for promotion of telemedicine in real-time.[18]

A 2003 small pilot study published by Halstead et al compared wound assessment of spinal cord injured patients via telemedicine and live examinations of patients by the wound caregivers. A plastic surgeon reviewed laptop images of 20 wounds among 17 individuals, then assessed the patient and wound live. The percent of agreement was:

- 95% need to change the management of the wound
- 95% need for referral
- 85% satisfaction for making treatment decisions
- 80% need to obtain additional information[19]

A study by Dobke et al indicated that telemedicine consultations provide remarkably accurate chronic wound assessments. Between 2003 and 2005, 120 patients in a variety of living settings were seen by a surgical wound specialist via telemedicine, and subsequently via direct consultation. Settings included long-term care, skilled nursing, and home care. Store-and-forward was used, with only photos and the plan of care being emailed. Upon physical examination, only two cases (1.67 %) showed a surgeon change the previously established diagnosis and management plan, demonstrating validity of telemedicine consultation.[20]

In 2000, a study by Kobza et al. discussed telemedicine and chronic wounds in the home care setting. Outcomes showed improved healing rates (trajectories), decreased healing times, decreased number of home health visits, and decreased number of hospitalizations related to wound complications. The latter is an important factor in current reimbursement and regulatory issues. Kobza concluded that telemedicine systems are a viable option for delivering quality, cost-effective care to chronic wound patients in the home care setting.[21]

A study published in 2006 by Hofmann-Wellenhof et al. addressed the feasibility and acceptance of telemedicine for wound care in patients with chronic leg ulcers. Forty-one ulcers of different origin in 14 patients were included. During the initial in-person visit, the leg ulcers were assessed and classified, and underlying diseases were noted. Follow up visits were done by home health nurses. Digital images of the wound, periwound tissue, and relevant clinical information were transmitted weekly via a secure website to an expert at the wound care center. These experts provided assessment of the wound status and therapeutic recommendations. In 89% of 492 teleconsultations, the quality of the images was sufficient or excellent. The experts reported being confident giving recommendations based on using the telemedicine technology available to them. Treatment modalities were changed or adapted in one-third of the consultations. A significant decrease in visits to the physician or the wound center was noted.[22]

Advantages of telemedicine for patients are many:

- They can stay with their local physician, which also is to a physician's advantage
- Travel to see a specialist is not always necessary
- Cost savings are seen in not having to call an ambulance and/or go to an emergency department (ED)
- Major hospitals see a decrease in ED visits, which can result in an increase in the hospital direct-admission patient census, in areas where telemedicine is utilized[8]

Even the lay public is learning more about the value of telemedicine and wound management. In 2009, *Parade* magazine published an article about Rafael Grossmann, MD, at Eastern Maine Medical Center, that featured the use of telemedicine in his work as an expert in burn injuries. Grossmann compared 59 emergency telemedicine consults with telephone consults. With telemedicine, unnecessary transfers were almost completely eliminated and medical errors were reduced by 75%. This also saves unnecessary transfers to other hospitals and saves the family the expense of multiple journeys.[19]

In a study to determine the factors that influence the use of telemedicine consultation by primary care physi-

cians (PCPs) in the management of patients with problem wounds, a short questionnaire was administered to thirty-six PCPs who referred to an out-patient wound care program within one year. Participant PCPs were asked to rate the importance of specific concerns and benefits regarding the role of wound care surgical specialist and the use of telemedicine consults prior to possible face-to-face consultation. Sixty percent of respondents felt comfortable with telemedicine consultation based on recommendations alone. The total number of patients referred for telemedicine consultations was 230, and face-to-face consultations with a wound care surgical specialist was offered and arranged for 30% of patients. The perception of shared decision making, streamlining patient care, and an opportunity for follow-up were all highly ranked benefits. The majority of PCPs (93%) agreed that telemedicine wound care consultations are a useful tool in their practice and would continue to use the telemedicine consultation service [23].

In the long run, the savings in unnecessary transports facilitated by the partner hospital wound center, the increased and ongoing education of the nursing home and home care wound nurses, and the more systematic and early identification of patients with a need for wound center and hospital level of wound care, will build strong bridges between the wound center and the nursing homes and home care agencies, as well as the primary care physicians (PCP) of those patients.

Planned features of the WoundTool™

The WoundTool™ is a platform designed to be easily extended and enhanced. Current features under development include:

- **Plug-ins –** Optional components for the WoundTool™ may 'plug into' the existing framework, providing algorithms, analytics, diagnostics, visualizations, pattern analysis, healing prognostics, and treatment recommendations. Plug-ins currently in development include:
  - **Chronicity Algorithm –** A chronicity algorithm analyzes patient records and estimates current and future healing rate
  - **Intelligent Registry –** An intelligent registry that automatically filters and anonymizes records
  - **Graphics -** Wound overlay graphics to visualize wound elements
- **Video -** Video wound clips to augment still wound photos sent with the case history
- **Volume Measurement -** True volumetric measure of wound size (cubic volume) using panned video clips and processing. This will provide a new level of quantitative data on true rate of healing (healing trajectory), both for clinical and research applications for new and established wound products and treatments. A prototype three-dimensional acquisition and presentation system is currently being sampled as shown in Figure 3.

Figure 3. Multiple image analysis estimates the three-dimensional geometry of the wound. A dynamic, 3D visual presentation of the geometry is shown in the web browser application. The software automatically calculates wound area and volume, as well as maximum and average depths.

- **Search –** Advanced semantic search, including keywords, concepts, image correlation, and case matching, provides access to similar files, pathologies, treatments, and outcomes
- **Continuing Medical Education -** Wound prevention, diagnosis and treatment courses for continuing medical education credits (CME)
  - **Webinars -** Video input from caregivers and video educational output by experts embedded in the e-management (diagnosis and treatment) plan is sent back to the submitting caregiver
  - **Curriculum -** Development of a multimedia virtual wound academy, including "best practice," evidence-based, diagnosis-specific, clinical practice guidelines with access to narrated PowerPoint lectures, videos and a library of current medical and surgical journal articles on wound prevention, diagnosis and treatment
  - **Nursing -** CME and CEU for nurses are available through presentations provided by WoundTool™
- **Communication –** Multi-media synchronous and asynchronous communications may be included
- **Referrals -** Home (wound) care agency and skilled nursing facility access (by contract with CuraNexus) for physician and institutional referrals, including agency and facility contact information, respectively

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- **Conferences -** Access to live and archived lectures and conferences on wound healing, potentially sponsored by the international wound product and device industry
- **Research -** Accessible, anonymized database for clinical research may be used for data management in wound clinical trials
- **Third-Parties -** Vendor access (by contract with CuraNexus) for caregivers and institutions through the WoundTool™, including wound industry products, dressings, devices and services, as well as local sales representative contact information.
- **Additional Educational, Communication and Administrative Capabilities -** The natural "ordering" of photographic and medical data chronologically, by the WoundTool™, allows for easy access by nursing home staff to review cases, healing trajectories, and differential response to treatments, particularly in assessment of patients' wounds at milestone weeks for signs and symptoms of chronicity, which then will trigger a wound surveillance evaluation for diagnostic and therapeutic interventions. This ordering also allows for easy preparation of educational lectures, e.g., in PowerPoint, with each patient's case data ordered chronologically.

Similarly, hospital physicians, residents medical students and inpatient wound nurses can use the WoundTool™ for cataloging surgical inpatient wounds for easy access to photos and patient data for both research and educational presentation preparation, e.g., in PowerPoint. This same access to patient wound data can serve the primary care physician and the home care nurse for practice-specific wound patient data access.

The WoundTool™ can be used to facilitate communication among wound surgeons, hospital wound nurse navigators, case managers and nursing facilities to coordinate seamless and efficient transfer of the wound patient to a nursing facility with detailed wound and rehabilitation orders, including follow up appointments.

Conclusion

The rapid and continuing growth of computing power, mobile devices, and web technology—coupled with the rising costs of healthcare and increasing needs of an aging population ensure applications such as the WoundTool™—will become ever more important and prevalent in the future. While the initial focus is on the relatively narrow domain of wound management in nursing homes, the core technology and software framework provides the basis for a wide array of applications and technologies. We envision the tool used across the whole spectrum of wound management, from the wound care specialist to primary care physician to the homes of patients and their wound caregivers as well as for inpatient hospital wound management. W

References

1. History of Telemedicine in the U.S. http://www.philblock.info/hitkb/h/history_of_telemedicine.html
2. Branski L.K., Gauglitz G.G., Herndon D.N., et al. "A review of gene and stem cell therapy in cutaneous wound healing," Burns. Jul 4 2008.
3. "Economic Costs of Diabetes in the U.S. in 2012"; Scientific Statement from American Diabetes Association; Diabetes Care, 6 March 2013; 10.2337/dc12-2625.
4. Guo, S. and DiPietro, L.A., "Factors Affecting Wound Healing," Journal of Dental Research, 2010 March; 89(3): 219–229.
5. "Wound Management, Forecast to 2021: Established and Emerging Products, Technologies and Markets in the Americas, Europe, Asia/Pacific and Rest of World," Wound Management, March 2013.
6. International Diabetes Federation (IDF), http://www.idf.org.
7. U.S. Department of Health and Human Services, National Diabetes Information Clearinghouse (NDIC), National Diabetes Statistics, 2011,http://www.diabetes.niddk.nih.gov/dm/pubs/statistics/#Amputations.
8. Loehne HB. Telemedicine: The key to opening the door to wound closure in rural communities. Today's Wound Clinic (http://www.todayswoundclinic.com/articles/telemedicine-key-opening-door-wound-closure-rural-communities), September, 2012.
9. Chittoria RK. Telemedicine for wound management. Indian J Plast Surg., 45(2): 412-417, 2012 May-Aug.
10. Rosenthal, Elisabeth, "Think the E.R. Is Expensive? Look at How Much It Costs to Get There," New York Times, Health, Dec 5 2013. http://www.nytimes.com/2013/12/05/health/think-the-er-was-expensive-look-at-the-ambulance-bill.html
11. "Ambulance Providers," U.S. Government Accountability Office, 2012. http://www.gao.gov/products/GAO-13-6.
12. United States Census Bureau, "Nursing Homes, Beds, Residents, and Occupancy Rate by State," Table 194, 2009. http://www.census.gov/compendia/statab/2012/tables/12s0194.pdf.
13. "Prevalence of Wounds among the Frail Elderly: A Look at its Value," WOUNDS, 2005.
14. "The 2012 MetLife Market Survey of Nursing Home, Assisted Living, Adult Day Services, and Home Care Costs," MetLife, November 2012.
15. American Telemedicine Association. Medicare payment of telemedicine and telehealth services.
16. Centers for Medicare & Medicaid Services. Expansion of Medicare telehealth services for calendar year 2010. MLN Matters MM6705. 2009.
17. PT in Motion. February 2010.
18. Carlson T, Collins L. A long distance relationship that works: exploring telemedicine in wound care. Today's Wound Clinic. 2009;3(3):25-26.
19. Halstead LS, Dang T, et al. Teleassessment compared with live assessment of pressure ulcers in a wound clinic: a pilot study. Adv in Skin Wound Care. 2003;91-96.
20. Dobke M, Renkielska A, De Neve J, Chao J, Bhavsar D. Telemedicine for problematic wound management: enhancing communication between long-term care, skilled nursing, and home caregivers and a surgical wound specialist. WOUNDS. 2006;18(9):256-261.
21. Kobza L, Scheurich A. The impact of telemedicine on outcomes of chronic wounds in the home care setting. OSM. 2000;46(10):48-53.
22. Hofmann-Wellenhof R, Salmhofer W, Binder B, et al. Feasibility and acceptance of telemedicine for wound care in patients with chronic leg ulcers. J Telemed Telecare. 2006;12 Suppl 1:15-7.
23. Dobke M, Bhavsar D, Herrera F. Do Telemedicine Wound Care Specialist Consults Meet the Needs of the Referring Physician? A Survey of Primary Care Providers. Int J Telemed Appl. August 11, 2011.

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1. Comerota AJ. Intermittent pneumatic compression: physiologic and clinical basis to improve management of venous leg ulcers. J Vasc Surg. 2011;53(4):1121–1129.
2. Smith PC, Sarin S, Hasty J, Scurr J. Sequential gradient pneumatic compression enhances venous ulcer healing: a randomized trial. Surgery. 1990;108(5):871–875.
3. Alpagut U, Dayioglu E. Importance and advantages of intermittent external pneumatic compression therapy in venous stasis ulceration. Angiology. 2005;56(1):19–23.

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