

The BIOMESSM Tool in Action

**A Case-Based Approach to
Early Wound Intervention
Using a Novel Silicone
Superabsorbent Polymer**

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Faculty Disclosures

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Disclosures

- The faculty have been informed of their responsibility to disclose to the audience if they will be discussing off-label or investigational use(s) of drugs, products, and/or devices (any use not approved by the U.S. Food and Drug Administration)
 - Applicable CME staff have no relationships to disclose relating to the subject matter of this activity
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Q&A

**Submit questions at any time
via the Question Box**

Learning Objectives

- Identify key biomarkers, clinical indicators, and risk factors associated with stalled or non-healing wounds, and apply structured assessment tools (eg, TIMERS, BIOMESSM) to recognize imbalance in the wound healing trajectory
- Explain the BIOMESSM concept and its role in early identification of barriers to wound healing, enabling timely intervention and appropriate referral for patients at risk of non-healing wounds
- Select appropriate wound dressings based on wound characteristics and healing barriers, with emphasis on the use of a novel silicone superabsorbent polymer (SAP) dressing designed to balance the wound microenvironment, reduce excess protease activity, minimize local inflammation, and support progression from stalled to active wound healing
- Explore, through case-based examples, the application of the BIOMESSM framework to guide appropriate dressing selection and treatment strategies—including the use of novel SAP dressing—to maintain wound balance and support progression toward wound healing

Imbalances in Complex Wounds

Laura Swoboda, DNP, APNP, FNP-C, FNP-BC, CWOCN-AP, WOCNF

Skin Gurus; Mequon, WI

Carthage College; Kenosha, WI

Why are complex wounds split into categories?

Identifying the underlying cause (etiology) is the single most important factor in correcting treatment

Treatment Need Commonalities across Wound Types

- Biofilm
- Inflammation
- Pain
- Risk of infection

Key Biomarkers and Clinical Indicators

Biomarkers: Inflammatory markers that shift during wound phases along the healing trajectory

Inflammatory marker examples

- CRP
- ESR
- Procalcitonin
- Ferritin

Signs of dysfunctional inflammation

- Unhealthy granulation
- Lack of granulation
- Erythema
- Pain
- Increased drainage
- Lack of healing



Polling Question

Which image shows the healthiest granulation tissue?



1



2



3



Bright “beefy” red

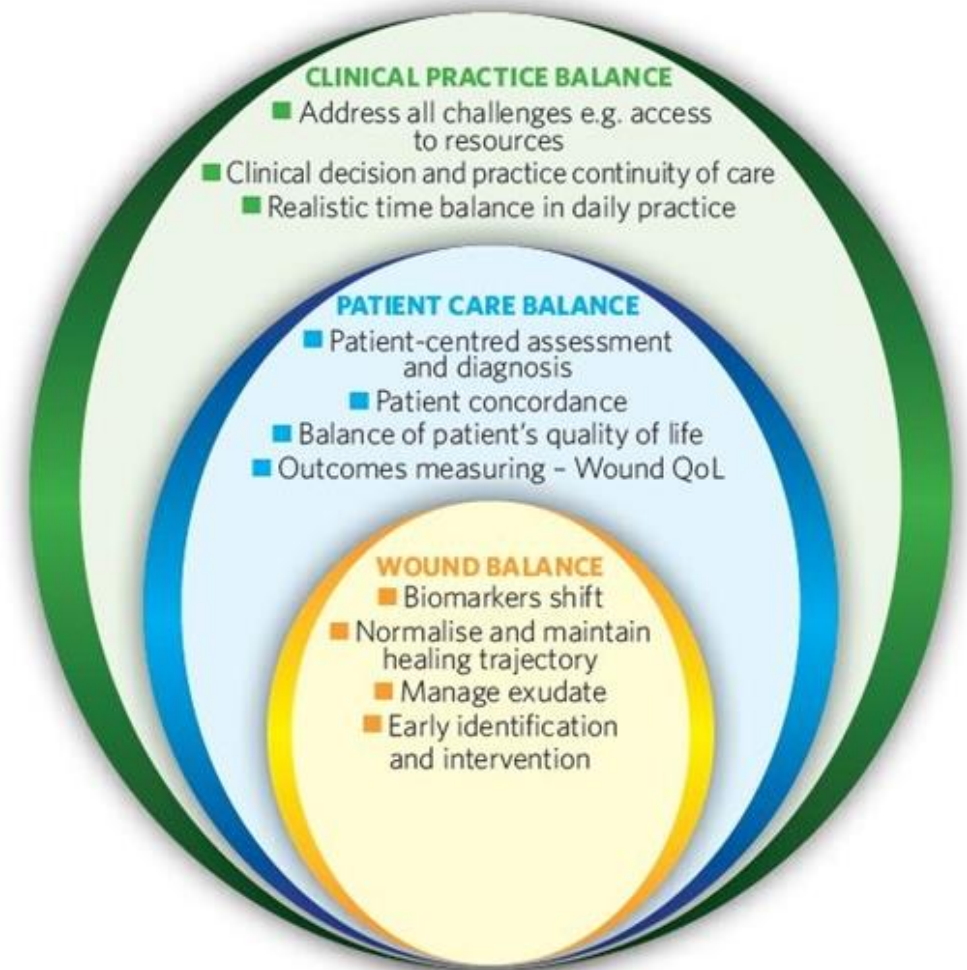
- Appropriate lobe size of granules
- Relatively uniform level and color
- Inter-papillary space filled with healing coagulant



2

Balancing the Wound Environment

- **Wound Balance** includes 3 layers
 - Wound
 - Patient
 - Clinical/Administrative
- **Wound Balance:** A critical principle in wound care that focuses on creating and maintaining an optimal environment for healing



“Red Flags” of Chronicity

Rather than categorizing wounds as *chronic* or *hard-to-heal*, clinicians should proactively identify red flags that may indicate or trigger stalled healing or factors that may cause healing to become stalled.

Address factors which may impede healing

- Patient’s overall health status
- Presence of comorbidities or underlying conditions
- A high risk of infection/bioburden
- Growing wound size/deteriorating wound bed



Structured Wound Screening and Assessment Tools

- Braden Scale (Pressure ulcer risk)
- Norton Scale (Pressure ulcer risk)
- Wagner Classification (Diabetic foot ulcer severity)
- University of Texas (UT) Classification (Diabetic foot depth/infection/ischemia)
- Wifl Classification (Wound, Ischemia, foot Infection - Limb threat)
- PUSH Tool (Pressure Ulcer Scale for Healing)
- Bates-Jensen Wound Assessment Tool (BWAT)
- TIME Acronym (Tissue, Infection, Moisture, Edge - for wound bed prep)
- SINBAD Score (Diabetic foot ulcer assessment)
- NPUAP/EPUAP Staging System (Pressure injury categorization)

Wifl = **W**ound, **I**schemia, **f**oot **I**nfection; PUSH = Pressure Ulcer Scale for Healing; BWAT = Bates-Jensen Wound Assessment Tool; TIME = **T**issue, **I**nfection, **M**oisture, **E**dge; SINBAD = **S**ite, **I**schemia, **N**europathy, **B**acterial infection, **A**rea, and **D**epth; NPUAP = National Pressure Ulcer Advisory Panel (now NPIAP = National Pressure Injury Advisory Panel); EPUAP = European Pressure Ulcer Advisory Board.

Can often still heal!

- Tissue over time with exposure to pressure, poor substrate, poor blood flow, and imbalanced micro-environment



Healthcare Screening & Triage Tools



Screening

- CURB-65 (Pneumonia severity & admission criteria)
- HEART Score (Chest pain risk stratification)
- NIH Stroke Scale (NIHSS)
- Glasgow Coma Scale (GCS)
- PHQ-9 (Depression severity & referral need)
- CIWA-Ar (Alcohol withdrawal severity)
- NEWS2 (National Early Warning Score)
- Wells Criteria (DVT & PE probability)
- Ottawa Rules (Ankle/Knee imaging needs)
- qSOFA (Sepsis screening)
- CHA2DS2-VASc (Atrial fibrillation stroke risk)

CURB-65 = **C**onfusion, **BUN**, **RR**, **BP**; HEART = **H**istory, **E**CG, **A**ge, **R**isk Factors, Troponin; NIHSS = NIH Stroke Scale; GCS = Glasgow Coma Scale; PHQ-9 = Patient Health Questionnaire-9; CIWA-Ar = Clinical Institute Withdrawal Assessment for Alcohol-Revised protocol; NEWS2 = National Early Warning Score 2; DVT = deep vein thrombosis; PE = pulmonary embolism; qSOFA = Quick Sequential Organ Failure Assessment; CHAD2DS2-VASc = **C**ongestive heart failure (or left ventricular systolic dysfunction), **H**ypertension, **A**ge, **D**iabetes mellitus, **S**troke/TIA/Thromboembolism, **V**ascular disease, **A**ge, **S**ex category.



Polling Question

Is there a way to determine which wounds are likely to be *non-healing*?

1. Yes
2. No



Polling Question

Do you currently use a scoring system when first observing a wound on a patient?

1. Yes
2. No
3. It depends on the type of wound

Increasing Prevalence of Non-Healing Wounds

- The longer a patient has a wound, the higher the chance is for **amputation** or **life-threatening** septic event
- Substantial economic burden
- **16.3%** of Medicare beneficiaries have hard-to-heal wounds
 - Total cost of care exceeds **\$22 billion**



TIMERS



SINBAD

Table 1 The Site, Ischaemia, Neuropathy, Bacterial infection and Depth (SINBAD) system for classifying foot ulcers

Category	Definition	SINBAD score
Site	Forefoot	0
	Midfoot and hindfoot	1
Ischaemia	Pedal blood flow intact: at least one palpable foot pulse	0
	Clinical evidence of reduced pedal blood flow	1
Neuropathy	Protective sensation intact	0
	Protective sensation lost	1
Bacterial infection	None	0
	Present	1
Area	Ulcer <1cm	0
	Ulcer ≥ 1cm	1
Depth	Ulcer confined to skin and subcutaneous tissue	0
	Ulcer reaching muscle, tendon or deeper	1
Total score		/6

This table shows the SINBAD classification system adapted from Ince *et al.*⁵

J.Vasc.Soc.G.B.Irel. 2022;1(3):71-76

Wifi

Table 2 Wound, Ischaemia, foot Infection (Wifi) scoring classification system

Wound			
Ulcer	Gangrene		score
No ulcer	None		0
Small shallow (subcutaneous)	None		1
Deeper (tendon or muscle)	Gangrenous changes to limited digits		2
Extensive (extending to bone)	Extensive gangrene		3
Ischaemia			
ABPI	Toe pressure	Ankle systolic pressure	score
≥0.8	≥60 mmHg	>100 mmHg	0
0.79–0.6	40–50 mmHg	70–100 mmHg	1
0.59–0.4	30–39 mmHg	50–70 mmHg	2
≤0.39	<30 mmHg	<50 mmHg	3
Foot infection			
Ulcer			score
No signs or symptoms of infection			0
Local infection involving skin and subcutaneous tissue only (<2 cm erythema)			1
Local infection involving deeper structures or with >2 cm erythema (ie, osteomyelitis)			2
As above with SIRS response			3

This table shows the Wifi classification scoring system derived from Mills *et al.*⁴

J.Vasc.Soc.G.B.Irel. 2022;1(3):71-76

Why See a Wound Specialist?



- Studies show better healing with a multidisciplinary wound care service/specialist
- A study (Takahara, et al.) found that patients with critical limb threatening ischemia (CLTI) often had wounds 1-3 mos before referral to vascular specialist
- Lack of resources
 - Cellular tissue-based products (CTPs)
 - Advanced dressings, wound vacs
 - Vaporous hyperoxia therapy (VHT), debridement tools
 - Vascular intervention
 - In-office ABI, A1c
 - In-office imaging (fluoroscopy, ultrasound, x-ray, etc.)



CLTI = critical limb-threatening ischemia; CTP = cellular tissue-based product; VHT = vaporous hyperoxia therapy; ABI = ankle-brachial index.

Rivolo M, Staines K. *J Wound Care*. 2021;30(9):685-692. Takahara M, et al. *Ann Vasc Dis*. 25 2020;13(1):56-62. Akiki RK, Mehrzad R. *J Am Board Fam Med*. 2020;33(5):799-808.

Risk Assessment and the Science and Healing Trajectory

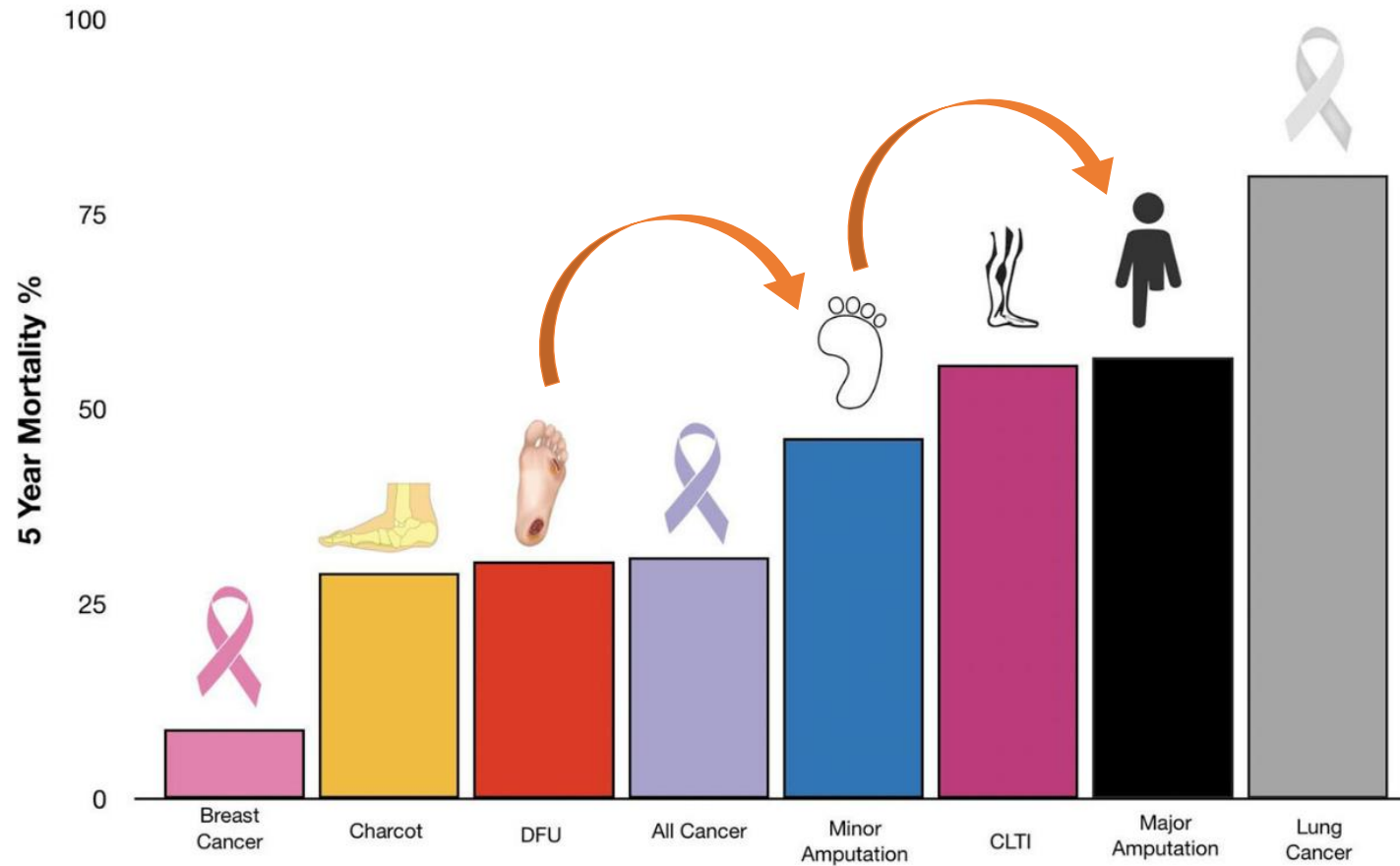
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Limb Salvage: Important Implications for Patients



Prognosis of Patients with Diabetic Foot Ulcers

- Diabetic foot infection management is challenging
- Requires a multidisciplinary approach
- Current surgical treatment, aside from amputation, includes multiple debridements

Patients in a prospective, multicentre study with 12-months follow-up*

45
%

Healing rate of ulcers

10
%

Ulcer recurrence

17
%

Amputation rate

15
%

Mortality rate

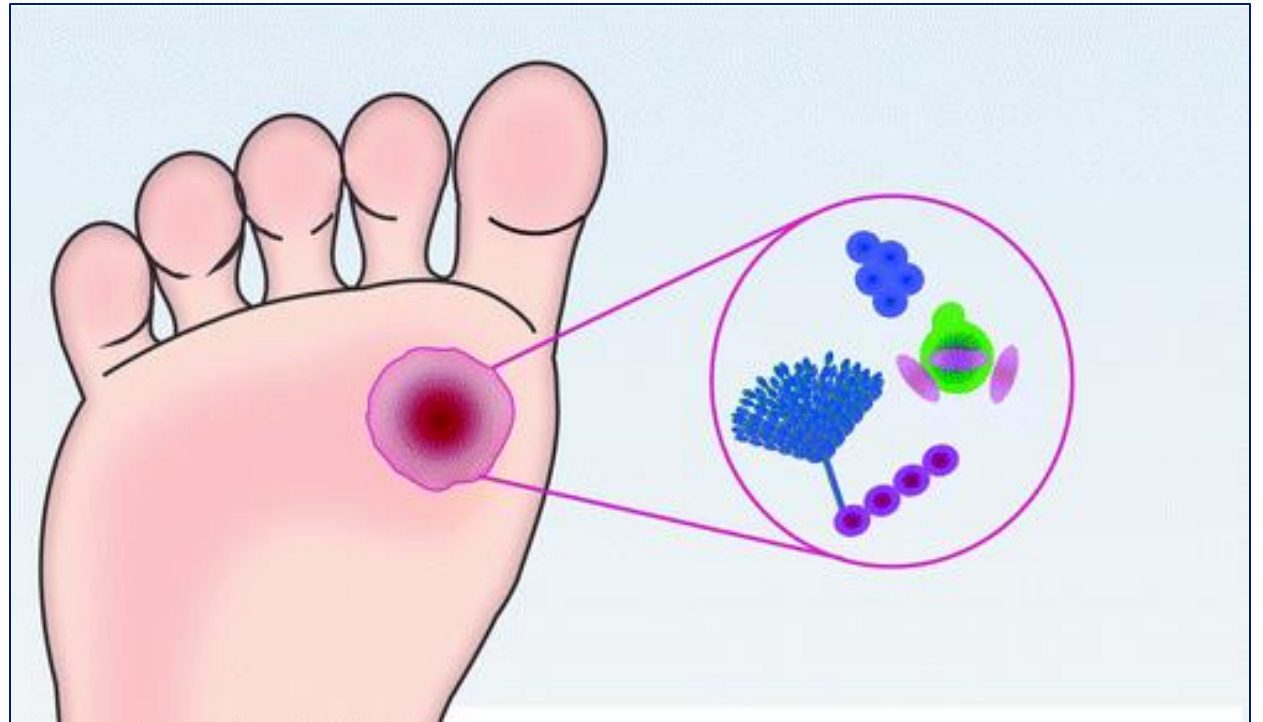
What I am trying to avoid...

Why am I just now getting a wound consult for this patient?



Wounds Are Really Just Microbiomes

- Microorganisms
 - Bacteria, fungi, viruses, etc.
- Our skin is our best defense
- Address these micro**biomes**, and identify the **red flags** to wound healing



The **BIOMES**SM Tool: A New Tool for Screening

Barriers to Wound Healing

- B** Blood Flow
- I** Infection/Bioburden
- O** Offloading/Overloading
- M** Metabolic/Morbidities
- E** Exudate/Edema
- S** Social/Economic

Total BIOMESSM Score:

How to Use the BIOMESSM Tool

1. Assess each component of BIOMES
2. Check each component present
3. Add up the number of barriers present
4. Follow recommendations based on BIOMES risk

The **BIOMES** Tool: A New Tool for Screening

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Total BIOMESSM Score:

- 62y Male
- PMH: CVA, HTN, HLD, partial blindness, T2DM
- Presented with a large right leg and right foot wound, non-palpable pedal pulses
- Originally seen in July 2022 for nonhealing foot wound...
- **NOT referred to a wound specialist;** sent to vascular



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Total BIOMESSM Score:

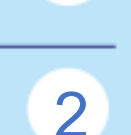
- 6 months later; referral to podiatry for “wound care” and management prior to a potential BKA
- Could this have been avoided?



The **BIOMES** Tool: A New Tool for Screening

Barriers to Wound Healing

- B** Blood Flow
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- O** Offloading/Overloading
- M** Metabolic/Morbidities
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- S** Social/Economic



Total BIOMESSM Score:

2

- Lack of pulses/appearance of the wound is enough for a check mark by “B” ... and obvious point if referring to vascular
- Multiple comorbidities such as T2DM, etc... point for “M”

Initial BIOMES Score: 2+

Urgent referral to wound specialist



How to use the
BIOMESSM Tool

Risk Assessment Guidance

0 BIOMES

Low Risk

Continue to
assess

1 BIOMES

Moderate Risk

Consider referral
to wound specialist

≥2 BIOMES

High Risk

Do not delay,
refer to wound
specialist now

2 weeks without improvement: refer to wound specialist

Follow Wound Balance recommendations for early intervention

The **BIOMES**SM Tool: A New Checklist for Wound Healing

Barriers to Wound Healing

B Blood Flow

I Infection/Bioburden

O Offloading/Overloading

M Metabolic/Morbidities

E Exudate/Edema

S Social/Economic

Total BIOMESSM Score:

How to Use the BIOMESSM Tool

1. Assess each component of BIOMES
2. Check each component present
3. Add up the number of barriers present
4. Follow recommendations based on BIOMES risk

B = Blood Flow

- No flow = no healing
- Check: Pulses, capillary refill, skin appearance, **ABI**, rubor dependency, etc.
- Cause: PAD (most common), thrombus, cysts, trauma, vasospasms
- Lifestyle: **Sedentary, smoking**, vaping
- Potential interventions: **Lifestyle changes**, medication, compression, elevation, HBOT, **vascular procedures/referral**, SURGERY



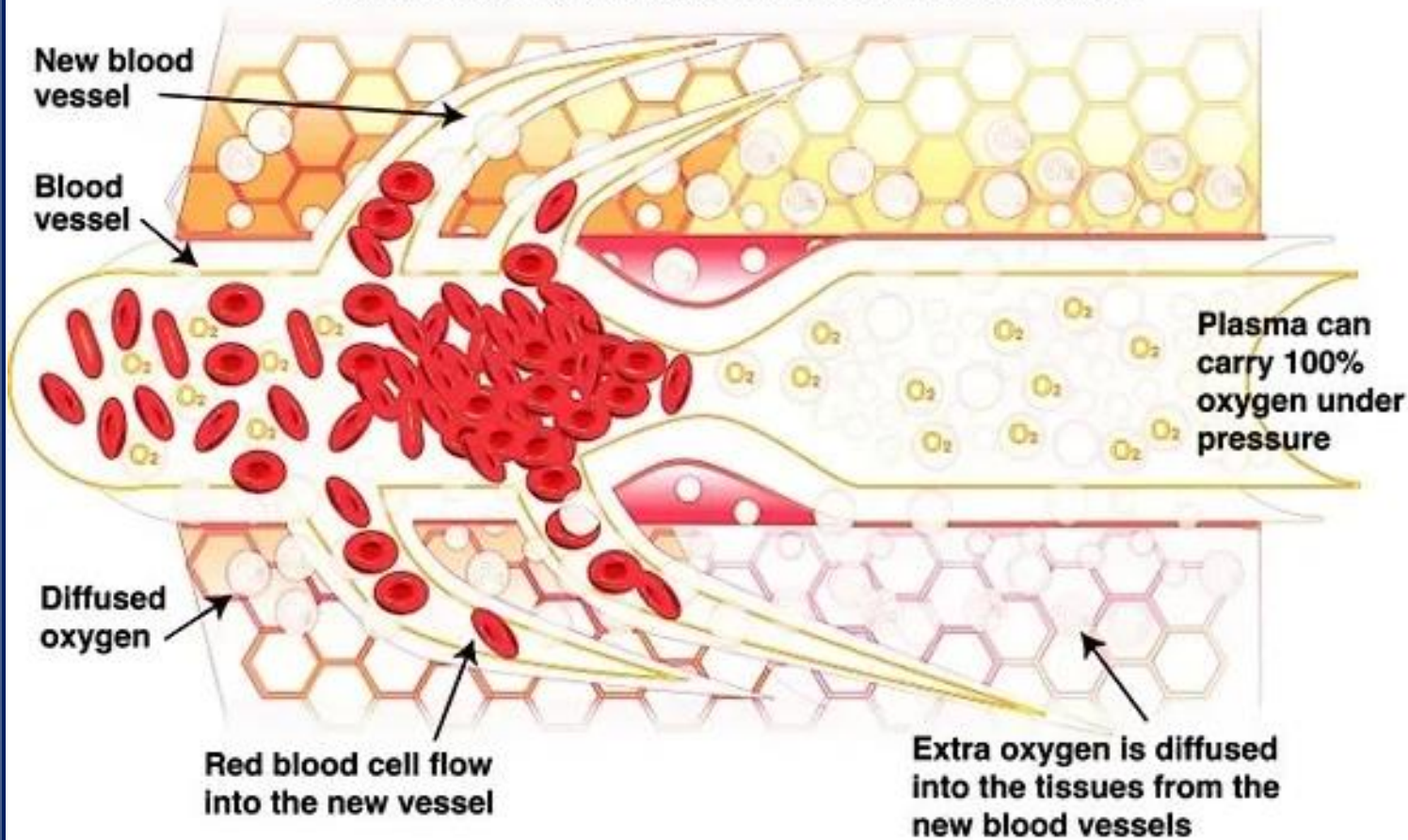
B = Blood Flow



NO 
SMOKING

B = Blood Flow; Hyperbaric Oxygen Treatment

Oxygen under pressure forces more oxygen into the tissue and encourages new blood vessels to grow

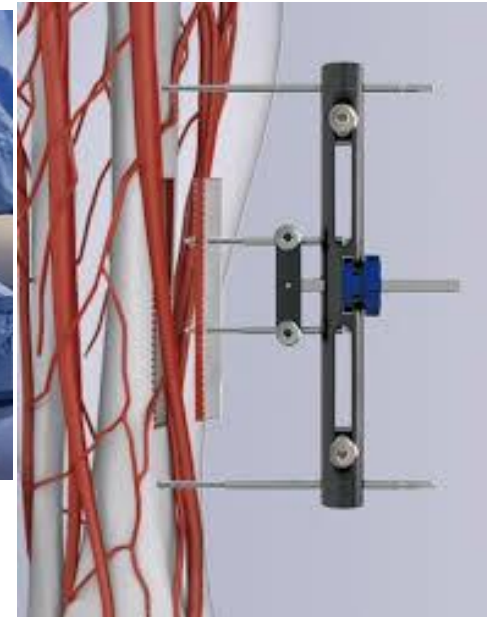
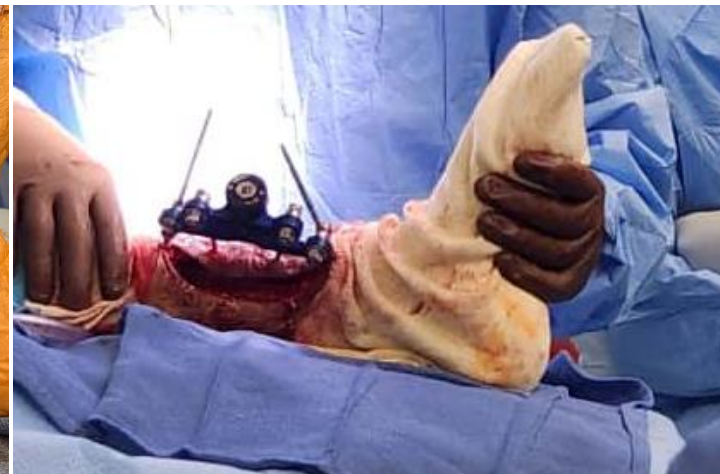
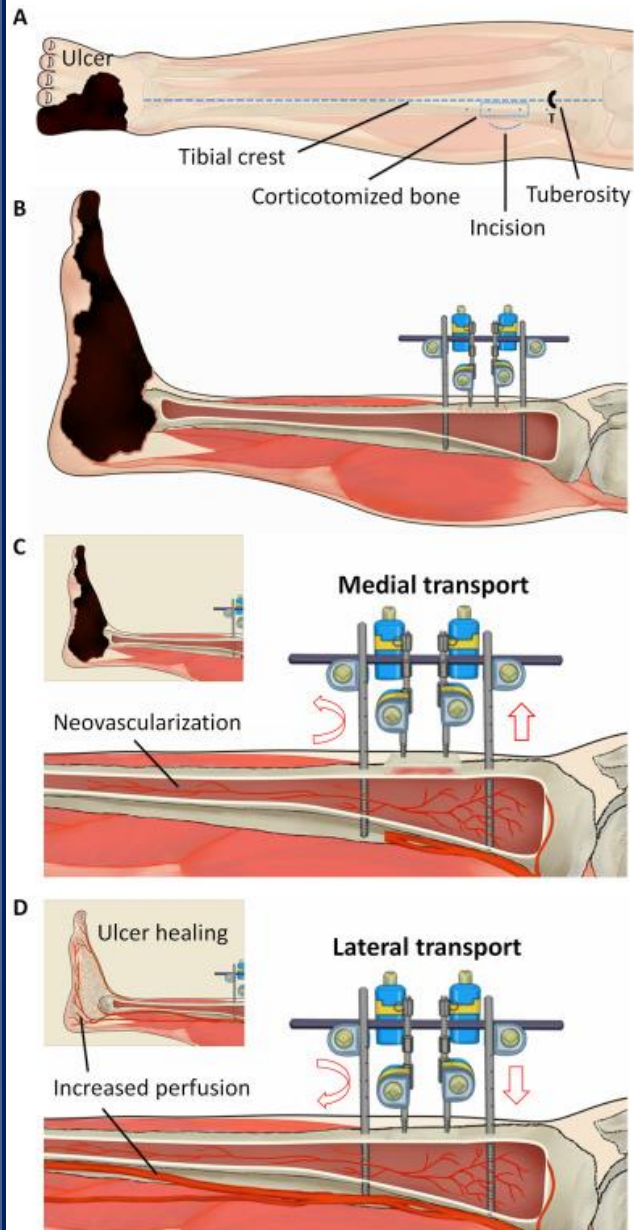




Original Article

Effect of tibial cortex transverse transport in patients with recalcitrant diabetic foot ulcers: A prospective multicenter cohort study

Yan Chen^a, Xiaofang Ding^b, Yueliang Zhu^c, Zhongwei Jia^d, Yong Qi^e, Mingyong Chen^f, Jili Lu^g, Xiaocong Kuang^h, Jia Zhouⁱ, Yongfeng Su^a, Yongxin Zhao^a, William Lu^j, Jinmin Zhao^{a,**}, Qikai Hua^{a,*}



I = Infection/Bioburden

- All wounds have flora; the need for antimicrobial intervention depends on the number and type of microbe (biopsy/culture)
- Local vs systemic infection
- Chronic vs acute emergency
- Biofilm
- Debridement

Punjataewakupt A, et al. *Eur J Clin Microbiol Infect Dis*. 2019;38(1):39-54. Nusbaum AG, et al. *Skin Therapy Lett*. 2012;17(7):1-5. Høiby N, et al. *Clin Microbiol Infect*. 2015;21 Suppl 1:S1-25. Mori Y, et al. *Wound Repair Regen*. 2019;27(5):540-547.



O = Offloading/Overloading

- Pressure injuries; bed sores
- Repeated trauma, tissue necrosis
- DFUs and neuropathy
 - Motor neuropathy
 - Sensory
 - Vascular component
- Biomechanics of stance vs gait



DFU = diabetic foot ulcer.

Firnhaber JM, Powell CS. *Am Fam Physician*. 2019;99(6):362-369. Bandyk DF. *Semin Vasc Surg*. 2018;31(2-4):43-48. Faglia E. *Int J Low Extrem Wounds*. 2011;10(3):152-166.

O = Offloading/Overloading

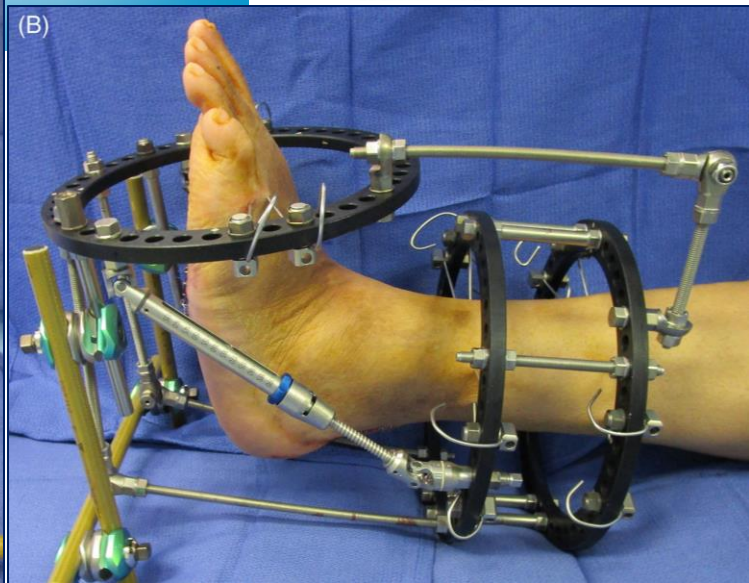
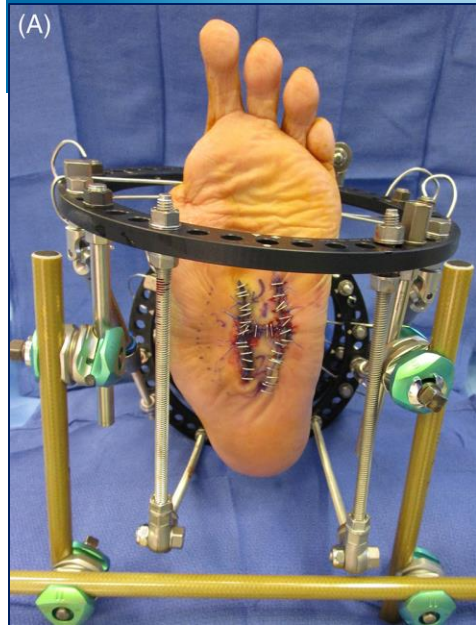
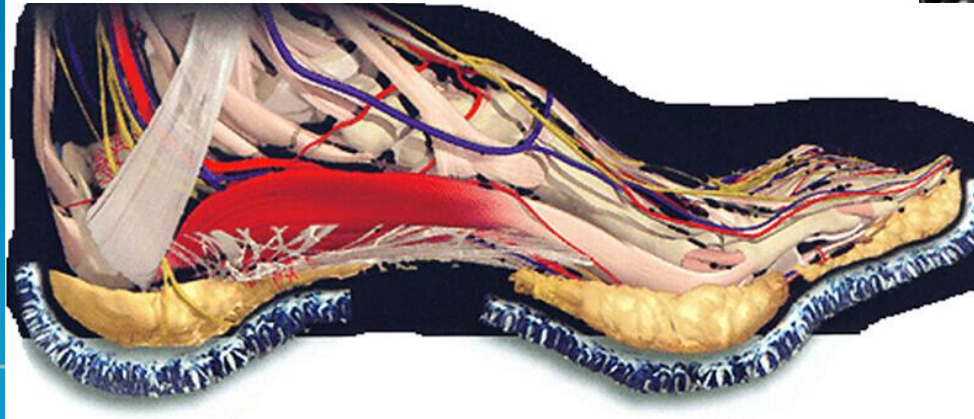
Potential Treatment Options

- Diabetic shoes
- Custom orthotics
- Total contact cast
- External fixation
- Surgery



O = Offloading/Overloading

Potential Surgical Treatment Options



M = Metabolic/Morbidities

REMEMBER:
Treat the **WHOLE** patient...
not just the hole in the patient

- T2DM (most common)
- ESRD, CKD, PVD
- A1c less than 7%
- Glycosuria above 180 mg/dL
- Blood glucose needs to be
 - **Below 200 mg/dL** for protein synthesis
 - **Below 150-180 mg/dL** for neutrophil function



ESRD = end-stage renal disease; CKD = chronic kidney disease.

Dasari N, et al. *Semin Plast Surg.* 2021;35(3):153-158. Hu SC, Lan CE. *J Dermatol Sci.* 2016;84(2):121-127. Rosenberg CS. *Nurs Clin North Am.* 1990;25(1):247-261.

M = Metabolic/Morbidities

- Adequate protein vs malnutrition
- Obesity
 - Exercise/NEAT
 - Diet
 - Intermittent fasting
- Autoimmune
 - Lupus
 - Pyoderma gangrenosum
 - Pemphigoid
 - Drug-induced hypersensitivity syndrome



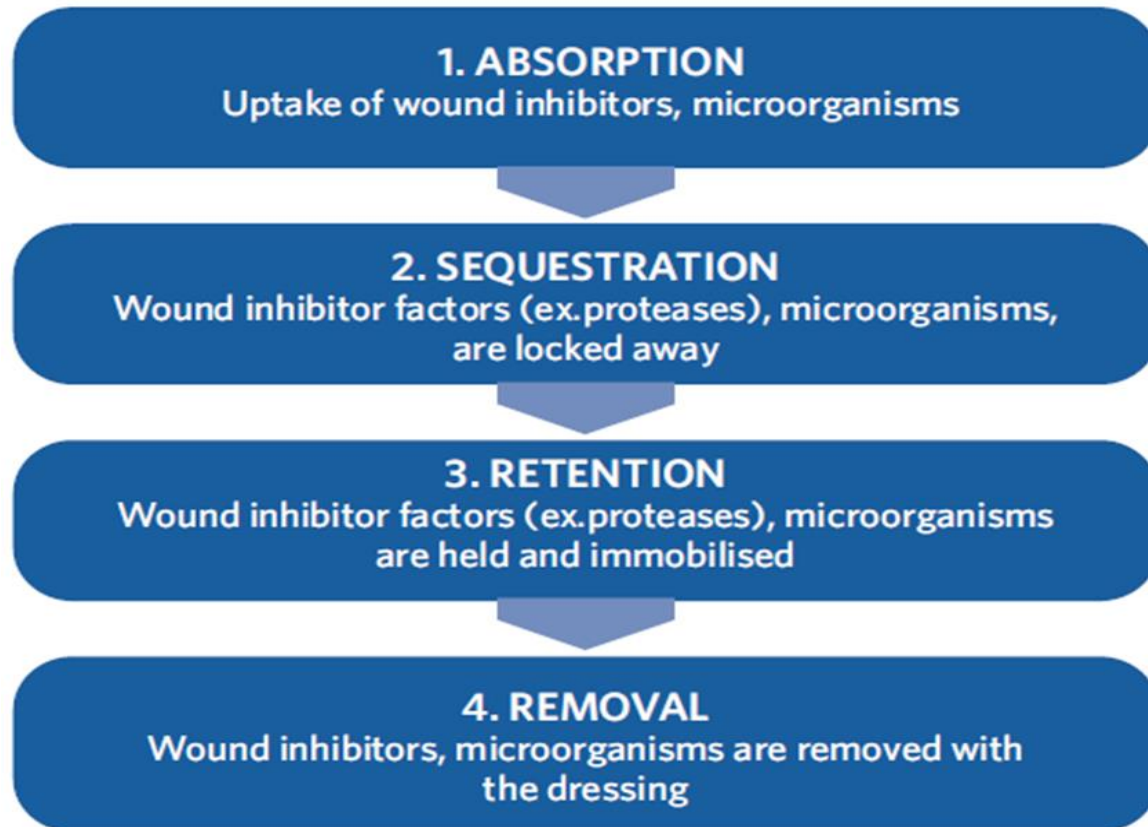
E = Exudate/Edema

- Wound exudate
 - Serous
 - Sanguineous
 - Purulent
- Contains MMPs, which contribute to delayed healing
- Some treatment options include
 - SAP dressings
 - Compressive dressings



The Science and Healing Trajectory

How can dressing selection improve MMPs?



- **Excessive protease levels are the most significant factors inhibiting healing that have been identified**
- Dressings can be selected that address factors associated with stalled healing through protease modulation



S = Social/Economic Burdens

- Stress, smoking, vaping, alcohol
- Living situation
 - Family support
 - Skilled nursing facility
 - Living alone
 - Stairs
- Access to care, transportation



Case 1

- 70y Male
- PMH: T2DM
- Physical exam
 - Bilateral foot wounds and 2+ pitting edema
 - **Chronic wound x8 mos**
 - Previous treatment:
Regular debridements with dry dressings at SNF



The right foot is not very impressive looking, which is why they let it sit chronically for 8 months!

Barriers to Wound Healing

B Blood Flow	★
I Infection/Bioburden	○
O Offloading/Overloading	○
M Metabolic/Morbidities	★
E Exudate/Edema	★
S Social/Economic	○

Total BIOMESSM Score: 2

- 70y Male
- **PMH: T2DM**
- Physical Exam
 - Bilateral foot wounds and **2+ pitting edema**
 - Chronic wound x8 mos
 - Previous treatment: Regular debridements with dry dressings at SNF

Initial BIOMES Score: 2+

Should have been immediate referral to wound specialist



Using BIOMES

B Checked ABI in office; Found to have blockage; referral to vascular

I Debride weekly for Infection/Bioburden

O Patients who are more sedentary often overload various areas, including lateral ankles... use padded dressings

M A1c in office to closely monitor control of T2DM

E Once cleared by vascular, used multilayer SAP dressing and 2-press compression dressing to address Exudate/Edema

S Assessed living situation – family, caregivers – to make sure they were aware of instructions

The image displays a medical data screen for Ankle/Brachial Indices (ABI) and blood pressure readings. The screen is titled "ANKLE / BRACHIAL INDICES" and includes a note "NC = NON-COMPRESSIBLE".

RIGHT ANKLE BRACHIAL INDEX: 1.47

LEFT ANKLE BRACHIAL INDEX: 1.38

RIGHT ARM

SYSTOLIC	117	mmHg
DIASTOLIC	59	mmHg

LEFT ARM

SYSTOLIC	115	mmHg
DIASTOLIC	59	mmHg

RIGHT ANKLE

LEFT ANKLE

LEFT POSTERIOR TIBIAL ARTERY	7	mmHg
ERY	2	mmHg

0.46

mmHg
%
%

mV/min

The image also shows a patient's leg in a white cast with a yellow dressing on the foot, and a hand in a blue glove applying a dressing to the leg.

Used BIOMES every visit; applied skin graft when ready;
Both feet fully healed in less than 8 wks after implementing BIOMES



Clinical Pearl: For lateral ankle/foot ulcers, soft silicone SAP dressing adds padding and protection



Case 2

- 71y Female, 2+ yr chronic wound
- NON-diabetic, Charcot neuroarthropathy with loss of protective sensation
- Obese (BMI \approx 40) with bilateral non-pitting edema
- Patient had difficulty with insurance and getting to the office for wound checks

3+

- Offloading
- Metabolic (neuropathy/ obesity)
- Social (access to care)





Using BIOMES

B Adequate

I No current infection (local/systemic)

O Main problem! Offered Charcot Recon, patient refused; refused TCC; nonadherent with the offloading CAM boot

M (Obesity) diet, exercise, weight loss

E Compressive dressings for the b/l edema

S Arranged for home health/supplies at home since she had difficulty making it to appointments



Ulcerated, infected, admission: Still refused recon but allowed me to shave down the plantar bony prominence during the I&D



Continued to use BIOMES: Much easier now that “O” was better addressed.
Fully healed in less than 1 month and has stayed healed for more than 2 years!



Plantar and heel wounds; the soft silicone SAP dressing heel works great!



Case 3: Emergency Department Starts Using BIOMES



- 59y Male presented to the ED following an episode of syncope
- PMH: T2DM, CHF, anemia, and renal failure
- Even though the wound does not look alarming, it has been present for more than 3 months; concerns of deeper infection
- **BIOMES: 2+ (Infection/Morbidities)**

Why a Specialist Is Important

- Debridement of the metatarsal canals and backfilling using the “SiloTechnique” for intramedullary retrograde filling in the forefoot using ceramic bone filler mixed with gentamycin
- Then placed a graft over the wound bed
- V to Y advancement to primarily close



Continue Weekly BIOMES



Following a TMA or other partial foot amputations, try oval for other ways to offload the forefoot



Case 5: Gas Gangrene and Charcot Foot

- X-rays in the ED showed soft tissue swelling and gas along the plantar aspect of the mid and forefoot, concerning for infection
- Charcot collapse:
Chronic degenerative, erosive changes of the talar head



- BIOMES: 5+
Need to address all issues
- Medical/surgical emergency;
patient refuses any/all types
of amputation
- Clear out gas gangrene
infection
- Multiple trips to the operating
room to flush out and
debride the necrotic tissue



“WOLF” Frame: Wound Offloading Frame



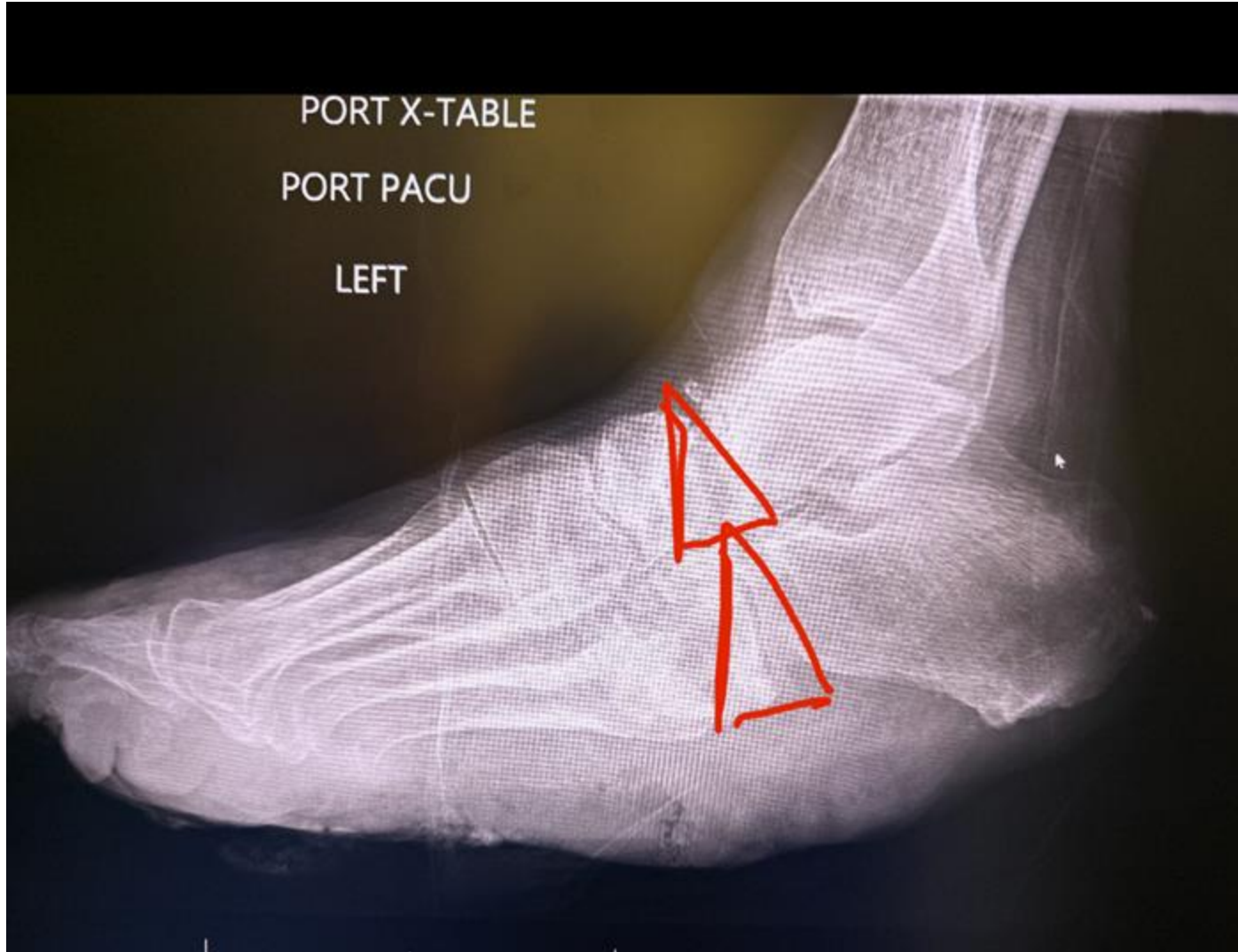
When the Goal Goes beyond “Healing the Wound”



- Primary goal: Clear infection, heal the wound
- Removed the ex-fix after 5 wks
- Then, we think about how to prevent recurrence

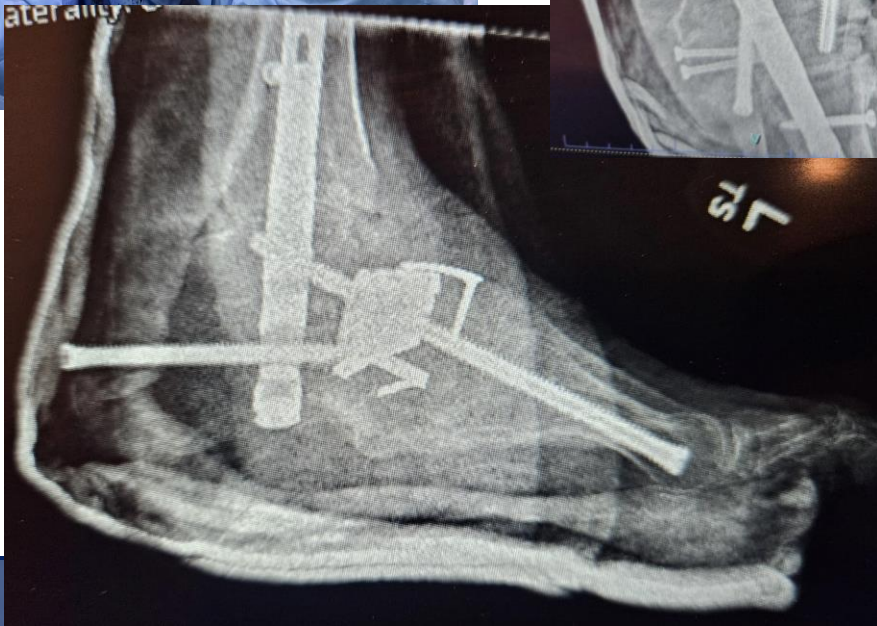


When the Goal Goes beyond “Healing the Wound”



- During the initial ex-fix application, we performed midfoot wedges with a dorsal apex to bring the arch back up; offloading the area plantarly where he was getting increased pressure and wounds
- Took bilateral CT scans to compare the non-collapsed “normal” foot to the Charcot-ed foot
- Using these CT scans, decided on a 3D printed implant and a reconstruction plan

When the Goal Goes beyond “Healing the Wound”



- 3D printed navicular due to bone destruction
- TAL
- Medial column fusion (1st TMTJ, NC joint, and TN joint)
- CC joint arthrodesis and calcaneal beam for a TTC joint fusion

TAL = tendo Achilles lengthening; TMTJ = tarsometatarsal joint; NC = naviculocuneiform; TN = talonavicular; CC = calcaneocuboid; TTC = tibiotarsal calcaneal.

10 wks postop Charcot recon:

- Still has his toes, foot, and leg after he was referred for BKA!
- Patient now walking in a boot and doing well



Clinical Pearls

- Use the new **BIOMESSM** tool to identify if a wound should be sent to a wound specialist or dedicated wound team
 - **Don't delay! Refer today!**
- If you are a specialist in wound healing, use this tool to **double-check** your work and to remind you of what could be utilized to keep healing wounds for each patient, each day

Download the
BIOMESSM
Tool



Don't Delay, Refer Today!



The BIOMESSM Tool helps to identify barriers to wound healing, wounds at risk for complications, and when to refer to a wound specialist.

Barriers to Wound Healing

- B** Blood Flow
- I** Infection/Bioburden
- O** Offloading/Overloading
- M** Metabolic/Morbidities
- E** Exudate/Edema
- S** Social/Economic



Total BIOMESSM Score:

How to use the BIOMESSM Tool

1. Assess each component of BIOMES.
2. Check each component present.
3. Add up the number of barriers present.
4. Follow recommendations based on BIOMES Risk score.

Risk Assessment Guidance



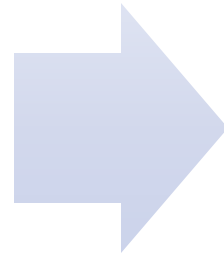
BIOMES and Balancing the Wound Environment

Laura Swoboda, DNP, APNP, FNP-C, FNP-BC, CWOCN-AP, WOCNF

Skin Gurus; Mequon, WI

Carthage College; Kenosha, WI

BIOMES screens for many factors that inhibit that environment



Wound balance creates an optimum healing environment

The **BIOMES** tool is among the spectrum of tools balancing the environments that impact wound healing

BIOMES Screening

- Screen –
- Identify condition appropriately –
- Identify patients who need further treatment/referral –
- Outline/conceptual framework for treatment



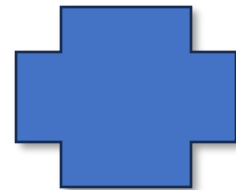
Image source Dr. Trent Brookshier

Goals of Balancing the Wound Microenvironment

Prevent infection

Promote tissue
regeneration

Facilitate faster
recovery



BIOMES
represents
common
factors in
chronicity



Polling Question

Gauze dysregulates the wound microenvironment through which pathway?

1. Promotion of local hypothermia
2. Fomentation of inflammation
3. Bioburden remaining against the wound bed
4. All of the above





Polling Question

Gauze dysregulates the wound microenvironment through which pathway?

1. Promotion of local hypothermia
2. Fomentation of inflammation
3. Bioburden remaining against the wound bed
4. **All of the above**



Use BIOMES to Create Wound Balance

Select appropriate wound dressings
based on wound characteristics and healing barriers

Emphasize use of dressings designed to

- Balance the wound microenvironment
- Reduce excess protease activity
- Minimize local inflammation
- Support progression from stalled to active wound healing

SAP Category Qualities



- SAP = superabsorbent polymer
- A novel silicone superabsorbent polymer (SAP) dressing



A dressing does that???



B

- Protect fragile bony prominences
- Maintain micro-environment even in fragile skin (VLUs)
- Support tissue



I

- Sequestration of wound fluid
- Limited reflux
- Periwound protection
- Closed environment – protection from outside contamination



O

- Support tissue
- Protect bony prominences
- Prophylaxis
- Newly healed tissue



M

- Protect against disruptions to the environment
- SDOH
- Hyperglycemia
- Edema fluctuations
- Control metabolism of the local wound microenvironment

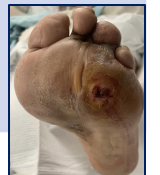


E

- Wound exudate
 - Serous
 - Sanguineous
 - Purulent
- Contains matrix metalloproteinases (MMPs), which contribute to delayed healing
- Some treatment options include
 - Superabsorbent polymer (SAP) dressings
 - Compressive dressings

S

- Easy use
- Exudate flexibility = dressing change flexibility
- Use living situation
 - Family support
 - Skilled nursing facility (SNF)
 - Living alone
 - Stairs
- Access to care, transportation



BIOMES and Balancing the Wound Environment

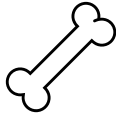
Patient-clinician
partnership
in achieving
healing outcomes,
which includes
improving quality
of life



61y Female, Sacral PI Stage 4, Paraplegia from MVA >25 yrs

- Failed outpatient NPWT, concerns for unskilled applications leading to dressing failure
- Smoking status
- Currently on bleach solution wet to dry



- B – Blood Flow
- I – Infection Control 
- O – Overloading
- M – Metabolic/Comorbidities
- E – Exudate/Moisture/Bioburden
- S – Social/Economic Barriers



85y Female; Traumatic scalp wound w/hematoma



- 3.3x2.3x0.2cm; undermines 0.1cm at 9 o'clock
- PMHx significant for HLD, A-fib, CAD, PE, morbid obesity, COVID myopathy, peripheral polyneuropathy
- Wound is >4wks old; fell at home and developed hematoma, which ulcerated

Wound Clinic Referral, Improvement with Wound Balance



- Blood flow is too good!
- Infection control
- Offloading
- Metabolic/Comorbidities
- Exudate
- S (Cannot reach, wants to shower)

Wound Clinic Referral: Improvement with Wound Balance



PLAN

Wound Treatment Recommendations

- Cleanse wounds, periwound, and entire extremity with soap and water
- Apply hypochlorous acid (HOCl), soak for 2-3 min
- Ensure periwound is completely dry; apply skin protectant to periwound
- Apply antimicrobial collagen to wound bed
- Apply super absorber PRN for drainage
- Secure with hydrocolloid
- Assess wound and provide care weekly and PRN
- Recommend adhesive remover to remove bandage due to hair
- Home health

Wound Clinic Referral, Improvement with Wound Balance



Wound Balance

- Wound
- Patient
- Systemic

2-wk follow-up

1.5x1.0.1cm 1.5cm² 90%

Clinical Pearls

Clinical Pearls

- **BIOMES** screens for factors associated with delayed wound healing to quickly identify patients who must be referred to a wound center
 - **Wound Balance** addresses the factors within **BIOMES**
 - All wounds benefit from evidence-based wound bed preparation
- If you are a specialist in wound healing, use this tool to double-check your work and to remind you of what could be utilized to keep healing wounds for each patient, each day

Case Review

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BIOMES™ Tool : A Screening Tool to Recognize Wound Severity for Early Intervention and Referral to a Specialist

Authors: Laura Swoboda, DNP¹, Trent Brookshier, DPM², Christabelle Rogers, MD³
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Introduction

Current best practices of wound care focus on healing as early as possible which includes making a correct diagnosis, recognizing the red flags that impede wound healing, and initiating early intervention acknowledging that chronicity is not time dependent. Initial wound evaluations are often performed first by urgent care, emergency responders, or primary care professionals who are skilled in their field but are not chronic wound specialists. These medical providers are often unfamiliar with current wound care scoring systems that aid in determining wound severity, guiding early interventions, and identifying the need for specialized care based on patients' overall medical condition and the wound status. A referral to a wound specialist has the potential to expedite healing, reduce overall cost of care, alleviate patient suffering, and ultimately save a limb or life.

Methods

The BIOMES™ scoring scale is a tool that serves as a method to quickly assess wounds as moderate to high risk for being hard-to-heal. The BIOMES™ acronym provides the front-line clinicians who perform initial patient assessments with succinct direction in the early identification of barriers to healing of moderate to high-risk wounds. Each letter guides the clinician to evaluate a part of the patient's medical history or wound presentation that may affect the healing trajectory.

BIOMES™ Tool

HARTMANN
Wound Care Products

Don't Delay. Refer Today!

BIOMES

The BIOMES™ Tool helps to identify barriers to wound healing, wounds at high risk for complications, and when to refer to a wound specialist.

Barriers to Wound Healing

- Blood Flow
- Infection/Bioburden
- Offloading/Overloading
- Metabolic/Morbidities
- Exudate/Edema
- Social/Economic

How to use the BIOMES™ Tool

1. Assess each component of BIOMES.
2. Check each component present.
3. Add up the number of barriers present.
4. Follow recommendations based on BIOMES™ risk score.

Total BIOMES™ Score:

Risk Assessment Guidance

- 0 BIOMES™ (Low Risk):** Continue to observe.
- 1 BIOMES™ (Moderate Risk):** Consider referral for expert approach.
- 2 BIOMES™ (High Risk):** Do not delay, refer to wound specialist.

Follow Wound Balance recommendations for early intervention.

CASE STUDY 1: Left Ankle Wound



The patient is a 70-year-old female who developed wound dehiscence on a surgical incision following left total hip replacement. The wound measured 3cm x 0.2cm and had neither and non-viable fibrous tissue in the wound base. Once seen by a specialist the assessment using the BIOMES™ screening tool revealed the following barriers to healing: infection and social concerns, as the patient would be returning to Mexico for the next 2 weeks with no access to wound care. This gave the patient a score of 2, with high risk for not healing. The wound was cultured, and the patient was started on appropriate antibiotics. A transparent wound matrix was applied as a primary dressing, and a multilayer silicone border (SAP dressing (Durauf® Plus Silicone Border) was applied as a secondary dressing. The patient was wound sufficient secondary dressings to change to weekly while on her trip. Through verbal and written instructions were given to the patient to help address the lack of care she would receive over the next 2 weeks. The wound reached full closure after 8 weeks of treatment.

CASE STUDY 2: Dehisced Abdominal Incision



The patient is a 67-year-old female seen for dehisced abdominal incision status post perforated sigmoid colon, small bowel resection, and Hartmann's procedure, measuring 6.5cm x 7.8cm x 1.4cm. Using the BIOMES™ screening tool, the following barriers to healing were noted: Infection/Bioburden, Metabolic/Morbidities, giving the patient a BIOMES™ risk score of 2. After negative pressure wound therapy, the patient was transitioned to a collagen matrix dressing with silver and EDTA (Confecta® Plus Ag), a multilayer silicone border (SAP dressing (Durauf® Plus Silicone Border), and diet and lifestyle modification. The wound was fully closed in 6 weeks.

Results

BIOMES™ is a coined acronym that can be used by any provider to quickly identify if a patient should be referred to a specialist by classifying the wound as low, moderate, or high risk for delayed healing. Blood Flow, Infection/Bioburden, Offloading/Overloading, Metabolic/Morbidities, Exudate/Edema, and Social/Economic barriers are assessed, and one point is assigned to each barrier that can be identified as a red flag with the potential to affect the healing trajectory of a patient's wound. Wounds are classified as follows: Low risk: No BIOMES™. Moderate risk: 1 of the BIOMES™. High risk: 2 or more BIOMES™. Any patient identified as moderate or high risk should be referred to a wound specialist for earlier, more aggressive management resulting in wound healing rather than traditional wound management.

Discussion

The proposed BIOMES™ approach introduces a novel, simplified acronym that emphasizes early identification of wound risk factors, thus becoming an early intervention strategy that creates a bridge between non-specialist medical teams and wound specialists. The subsequent phase in BIOMES™ expansion, implementation of the pilot study, is underway to test the reliability and validity in the field.

Citations

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3. Mikami J, Katsugawa K, Kawaguchi T, et al. Longitudinal Evaluation of Biomarkers in Wound Healing from Venous Leg Ulcers and High Healed Skin Graft. *Superficial Wounds Treated with a Protein-Releasing Wound Dressing*. *Acta Derm Venereol*. Dec 1 2022;102(12):2083-2088. doi:10.2340/acta.v102.i12.2083

Scan here for the latest version of the BIOMES™ Tool



NWJ 3108 May 2 2025

Cureus
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Open Access Technical Report

The BIOMES™ Tool: An Approach to Recognizing Wound Severity for Early Intervention and Referral to a Specialist

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Abstract

The escalating prevalence and incidence of individuals with chronic, non-healing, or hard-to-heal wounds is staggering and poses significant financial burdens on the healthcare system. Initial wound evaluations and assessments are often performed first by urgent care, emergency responders, or even general medical professionals who are skilled practitioners but are not chronic wound specialists and may have only received a limited amount of education or training specific to wound care. As a result, these medical providers may not be familiar with current wound care scoring systems that aid in determining wound severity, guiding early interventions, and identifying the need for specialized care based on patients' overall medical condition and wound status. A referral to a wound care specialist has the potential to expedite healing, reduce the overall cost of care, alleviate patient suffering, and ultimately, save a limb or a life.

The blood flow, infection, offloading, metabolic burden, and exudate, social (BIOMES™) tool is a coined acronym that can be used by any healthcare provider to quickly identify whether a patient should be referred to a specialist by classifying a wound as low, moderate, or high risk for delayed healing. Blood flow, infection/bioburden, offloading/overloading, metabolic/morbidities, exudate/edema, and social/economic barriers are assessed, and 1 point is assigned to each barrier that can be identified as a red flag with the potential to affect the healing trajectory of a patient's wound. Wounds are classified as follows: low risk: no barriers; moderate risk: 1 BIOMES™ barrier; high risk: 2 or more BIOMES™ barriers. Any patient identified as moderate or high risk should be referred to a wound care specialist in hopes that earlier, more aggressive wound care and medical management will result in improved wound healing versus traditional wound management. Addressing these barriers is essential for wound management and improved outcomes, especially in lower extremity care.

Categories: Podiatry, Dermatology

Keywords: diabetes, peripheral arterial disease, referral criteria, screening tool, wound healing

Introduction

Significant shifts in chronic wound care prevalence and cost of care have been reported over recent years, including increased costs incurred in the physician's office and decreased costs in hospital-based outpatient wound care clinics [1]. An estimated 14.3% of Medicare beneficiaries have a chronic or hard-to-heal wound with a total cost of care exceeding \$3 billion. Between 2014 and 2019, fees for wound care provided in physicians' offices increased from \$3.0 billion to \$4.1 billion [1]. Numerous studies have shown that early intervention, including proper diagnosis, adequate wound bed preparation, and use of advanced strategies to facilitate wound healing, leads to faster wound healing and reduced cost of care [2-6]. A retrospective study of patients with hard-to-heal lower extremity wounds who were referred to a multidisciplinary wound care service found that the patients had faster healing rates with reduced costs and improved patient quality of life as compared to when they were treated in non-specialized settings [7]. A study by Tabakian et al. found that patients with critical limb-threatening ischemia often had their wounds present for an average of one to three months before referral to a vascular specialist [8]. A review of guidelines for primary caregivers treating wounds revealed delayed referrals and, in some cases, treatments that led to worsening outcomes, including elevation for an arterial wound that is not making progress [9]. In addition, officers of primary care practices often do not check the available, advanced, evidence-based treatment options for best practice.

Case 1

- 73y Male
- Mixed etiology: Venous insufficiency, PVD
- Vascular imaging
 - Reflux: +
 - Non-surgical candidate
 - ABIs: Stable
- BIOMES Score: 3
 - Blood flow
 - Metabolic
 - Social



Case 1

- Tx
 - Increase patient autonomy
 - Glucose control
 - Decongestion of limb
 - Fish-derived collagen with alginate/CMC and EDTA, bordered silicone SAP dressing, tubular compression garment; change daily



Case 2

- 85y Male
- Significant comorbidities
- Nonadherent with medication, plan of care
- BIOMES: 4
 - Infection/Bioburden
 - Metabolic/Morbidities
 - Exudate/Edema
 - Social/Economic



Case 2

- Tx
 - Focus on medication management
 - Serial debridements
 - Fish-derived collagen with alginate/CMC and EDTA, superabsorbent dressing, gauze roll, tubular compression; daily
- Transition to multilayer wrap; reduce to 3x/wk

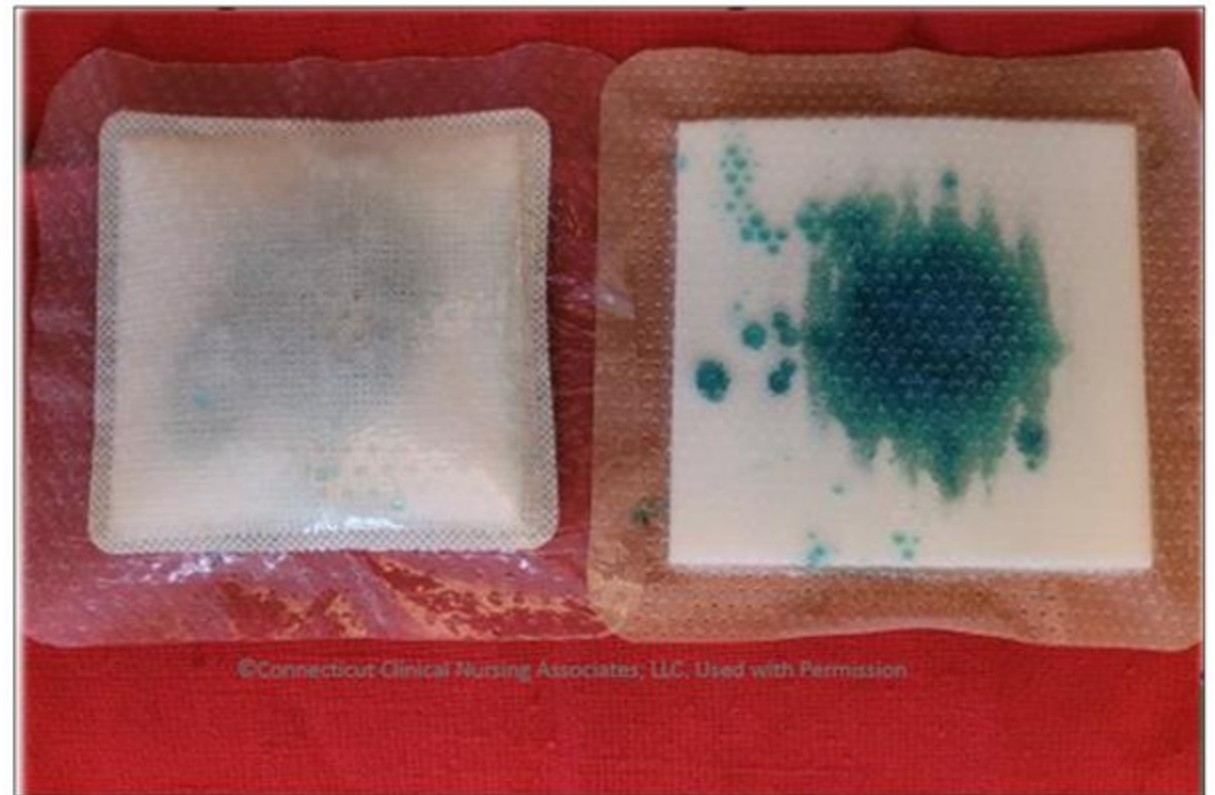




Polling Question

In these dressings, the drainage should be described as _____.

1. Mild
2. Moderate
3. Large
4. Copious



Case 3

- 65y Female
- Smoker
- Traumatic injury: Left lateral lower leg
- BIOMES: 5
 - Blood flow
 - Infection/Bioburden
 - Metabolic/Morbidities
 - Exudate/Edema
 - Social/Economic
- Cellulitis present: Day 0



Case 3

- Tx
 - Oral antibiotics
 - Smoking cessation
 - Vascular referral
 - Initial: Enzymatic debriding agent, bordered silicone SAP dressing, tubular compression garment; daily dressing changes
 - Transition to fish-derived collagen with alginate/CMC and EDTA and bordered silicone SAP dressing, as integrity improved



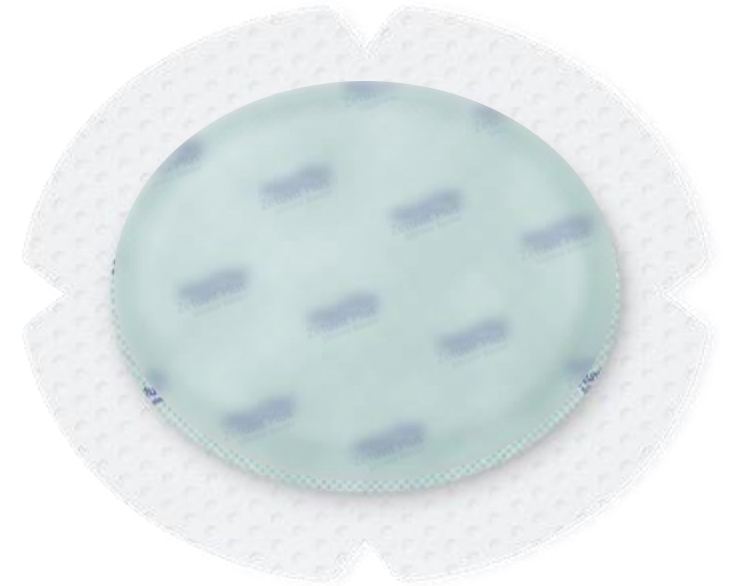
Case 4

- 52y Female
- DM, smoker
- PMH: Non-healing TMA, stopped going to HBOT, severe PAD – unsalvageable limb; underwent right BKA
- Poor healing postop, dehiscence, admitted with cellulitis – IV abx, multiple OR debridements, use of NPWT
- BIOMES: 5



Case 4

- Tx
 - Establish home care
 - RN, PT, OT
 - Smoking cessation
 - Edema management
 - Fish-derived collagen with alginate/CMC and EDTA and bordered silicone SAP dressing, tubular compression garment; change daily
 - Referral for prosthesis



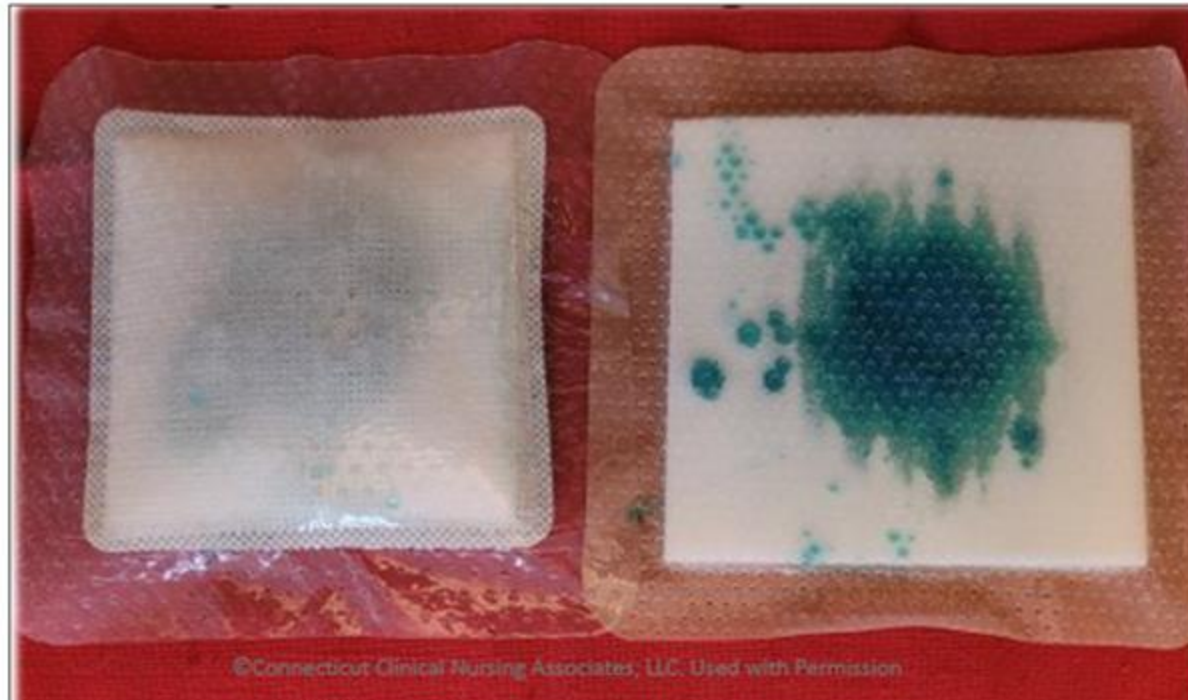
Case 5

- 70y Female
- Adverse reaction to DTAP injection
- BIOMES Score: 4
 - Infection/Bioburden
 - Metabolic/Morbidities
 - Exudate/Edema
 - Social/Economic
- Tx: Antibiotic ointment, bordered silicone SAP dressing, tubular compression, daily change



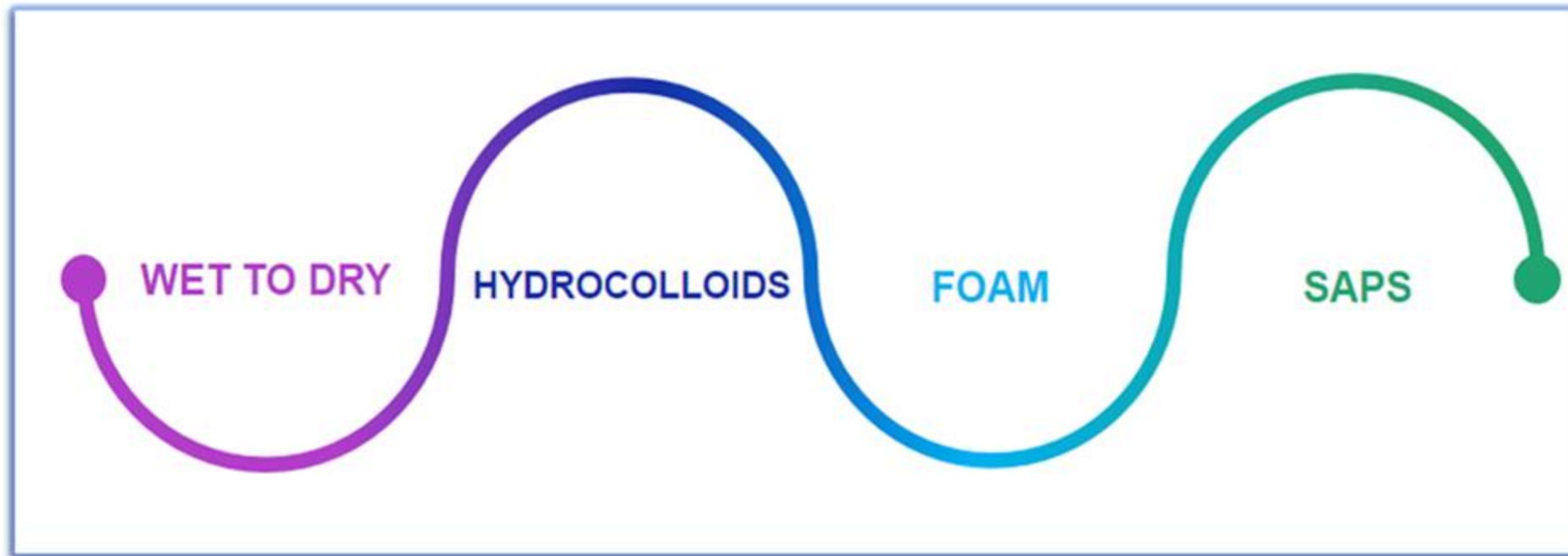
The Difference between a Foam Dressing and a Superabsorbent (SAP) Dressing

60cc



30cc

Revolutionizing the “Gold Standard”



Clinical Pearls

- Wound Balance
 - Regulate biomarkers: MMPs
 - Early intervention, proactive, healing-first mindset
- Patient Balance
 - Patient-centered assessment, QoL
- Clinical Practice
 - Address barriers
 - Cost-effectiveness when using SAP dressing
 - Reduced dressing use and visits while improving healing outcomes

Thank You

**Submit your questions
via the Question Box**