Help! What do I do With this Wound?

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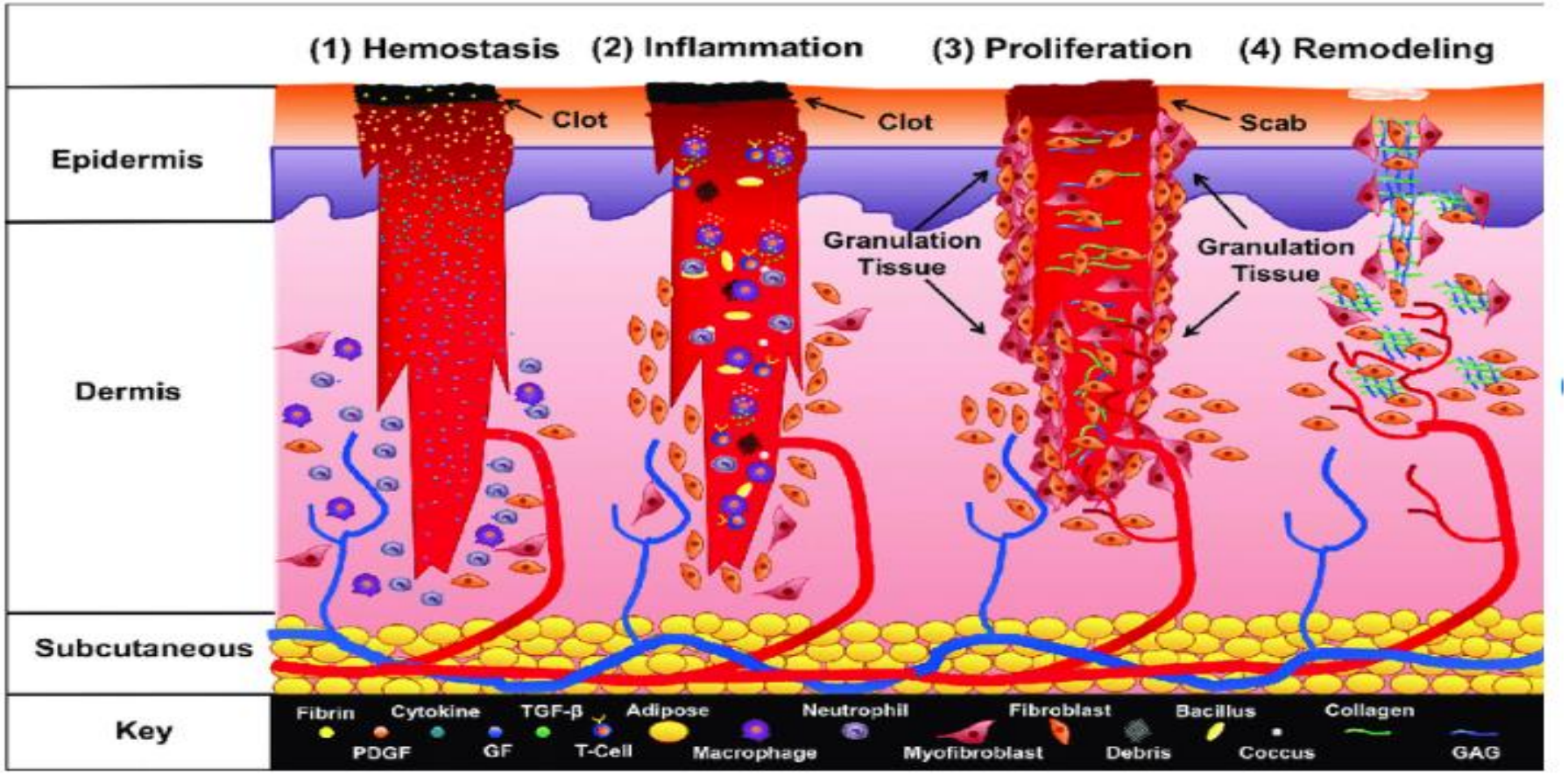
Disclosures

I have no disclosures to report

Objectives

- Become educated on TIME principles of wound healing
- Understand the importance of reducing bioburden in wounds
- Get updated on evidence based wound care products
- Have the tools to start a simple, effective, wound care plan for your patient

Stages of wound healing



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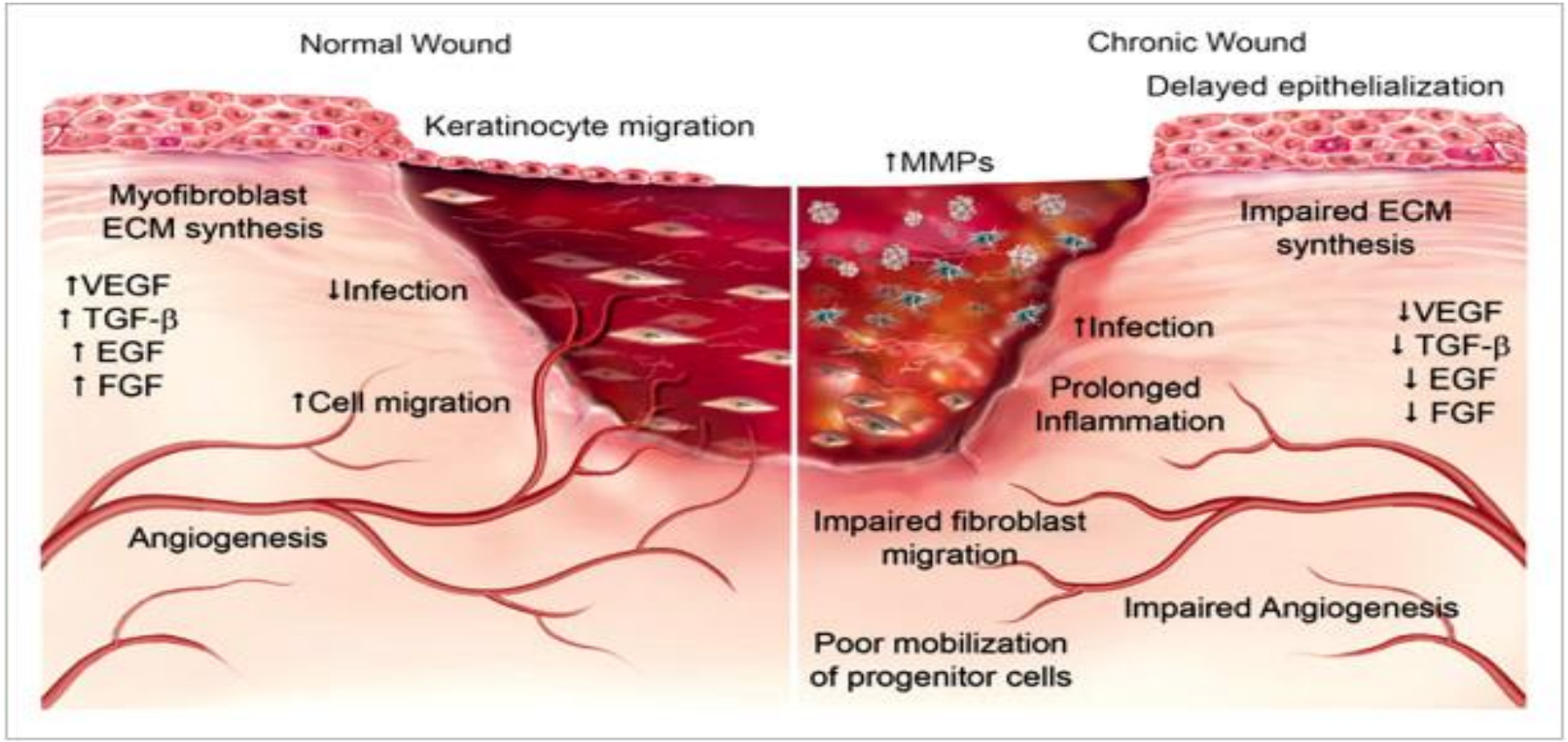
Acute vs Chronic wounds



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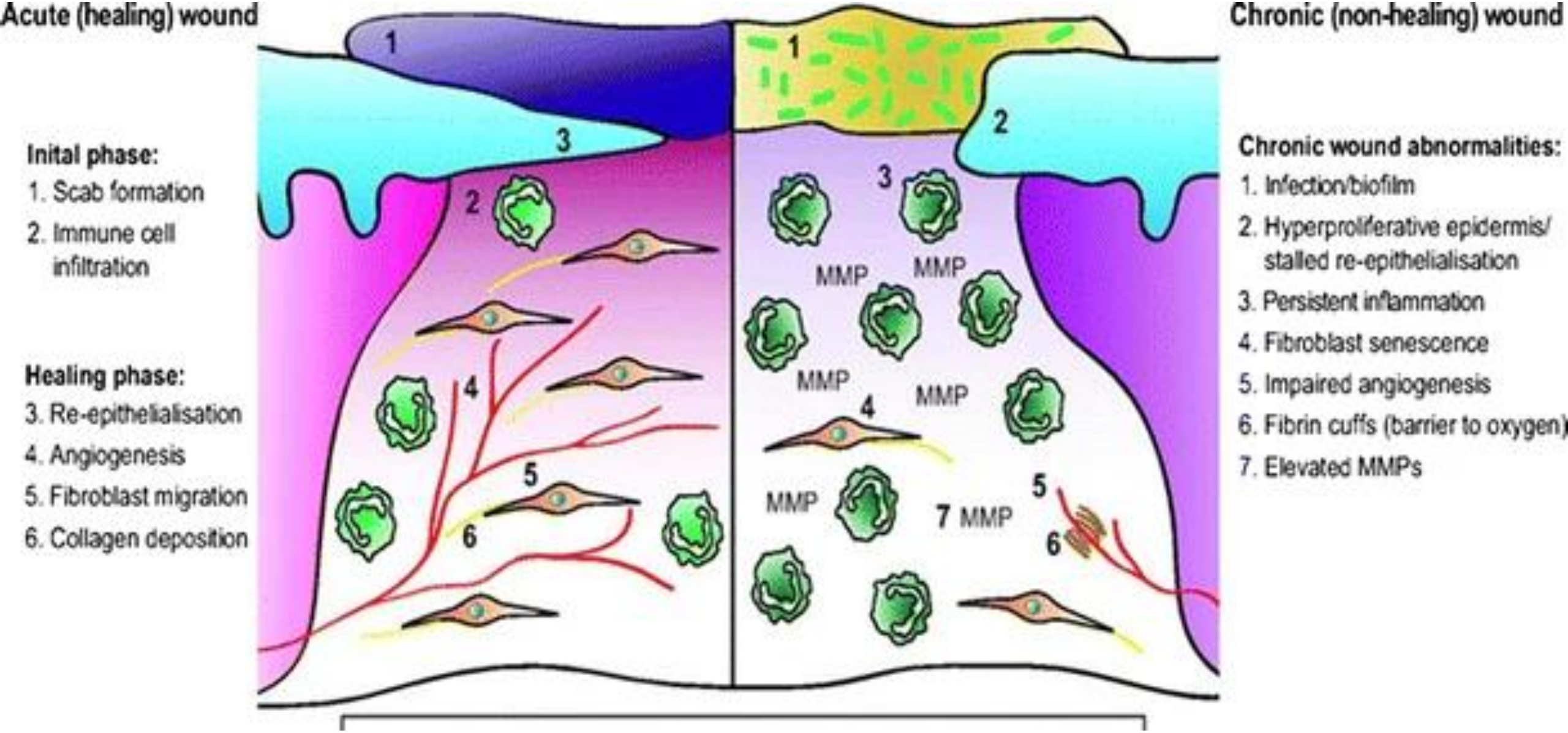

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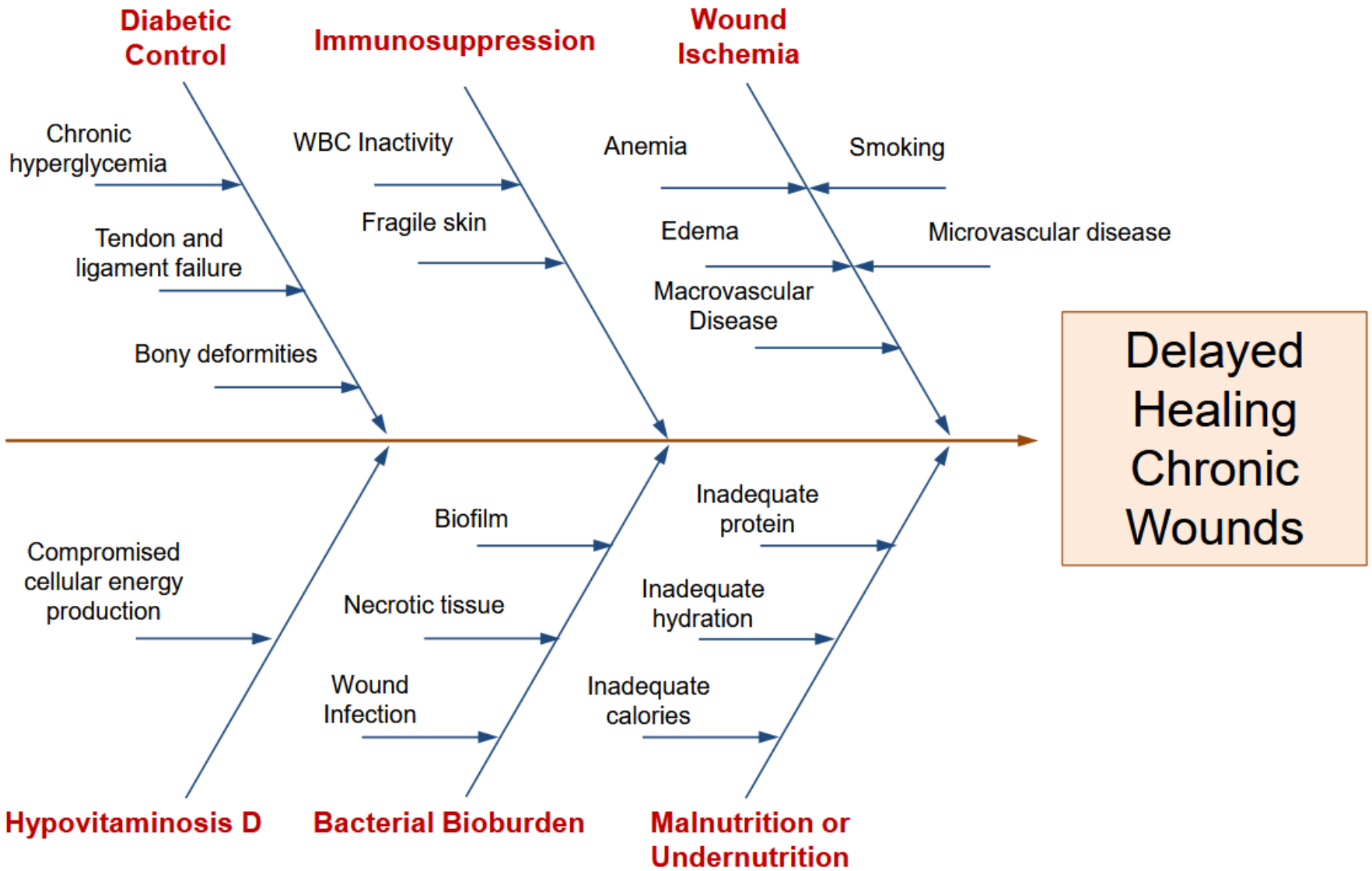
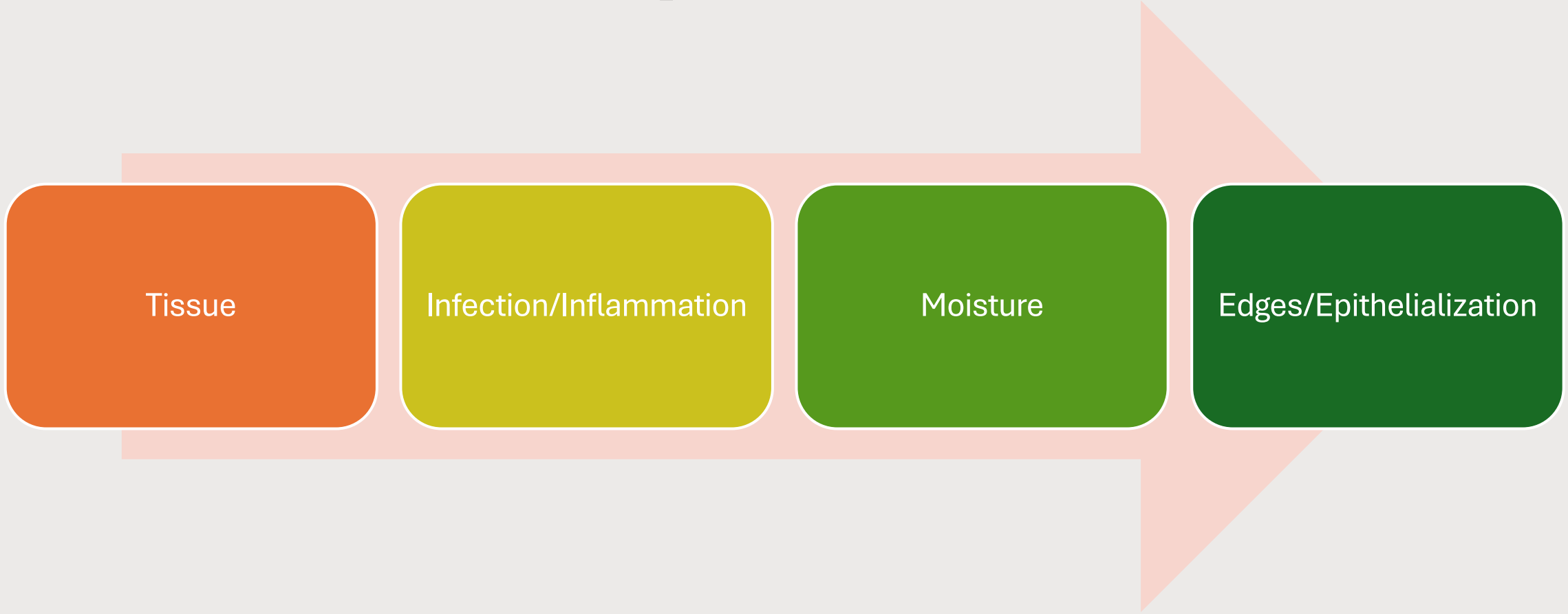
Causes of Delayed Healing in Chronic Wounds



Wound Bed Preparation and 'TIME'



Dowett, C., & Ayello, E. (2004). TIME principles of chronic wound bed preparation and treatment. British Journal of Nursing, 13(Sup3), S16–S23

TIME Principles

What is getting in the way of healing?

- Non viable tissue
- Infection
- Moisture imbalance
- Closed edges

Systemic Support for Healing

- Tissue perfusion/ oxygenation
- Glycemic control <140
- Smoking cessation
- Nutritional support
- Corticosteroids (dose/time dependent)

Tissue

Debridement is the mainstay of treatment for wound care…

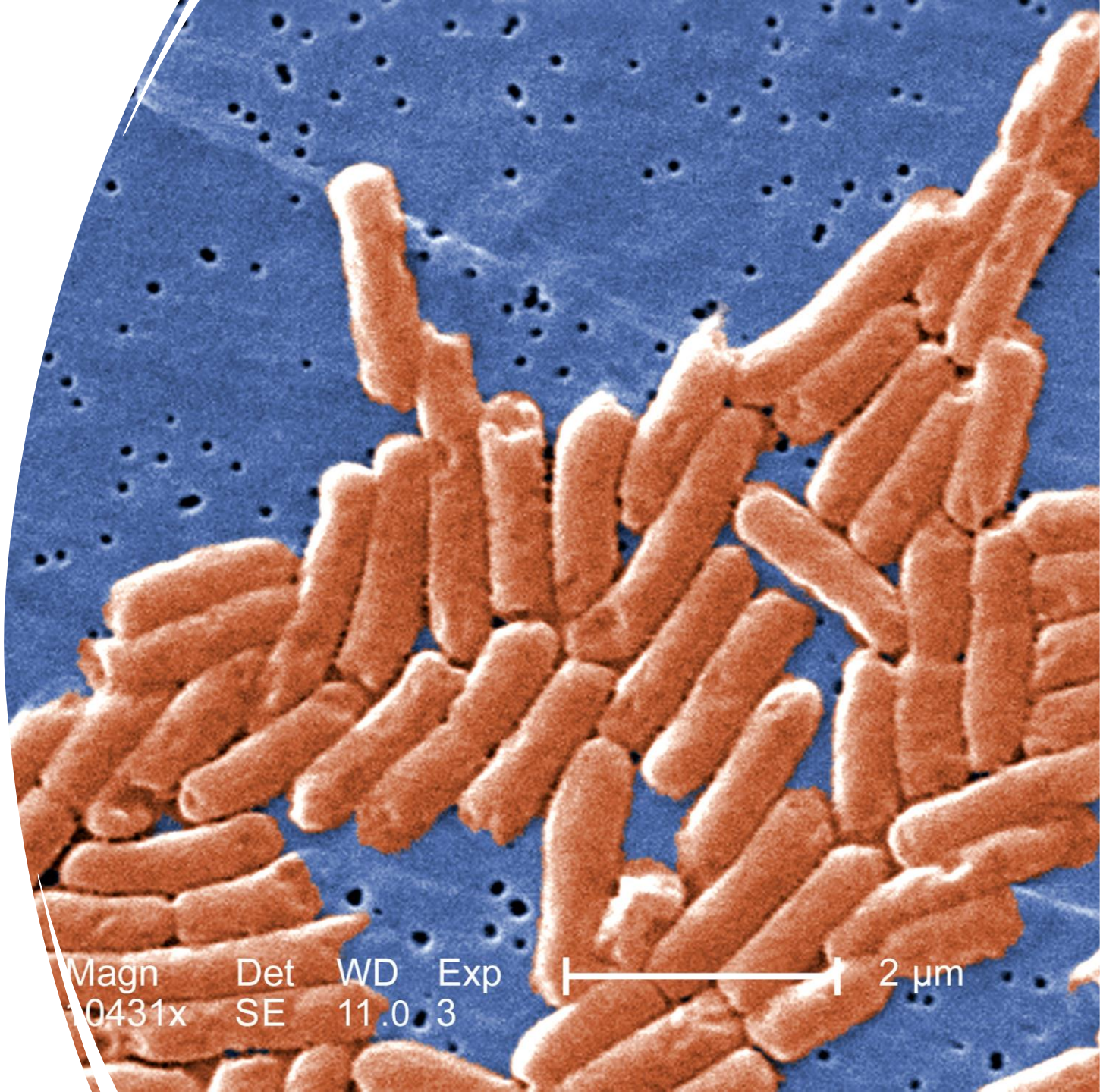
- **Autolytic**- providing moisture for necrotic tissue, allow host enzymes to work
- **Enzymatic** – collegenase $$$
- **Mechanical**- non specific/fast/painful
- **Larval (maggot)**- selective, not available
- **Chemical**- silver nitrate, sodium hypochlorite, PHMB, iodine
- **Ultrasonic-** great for painful wounds, time consuming, $$
- **Sharp/Surgical**- removes non viable tissue and surface biofilm
  - Making underlying bacteria more susceptible to targeted therapy

When is debridement contraindicated?

- Stable eschar
- Noninfected wound on an ischemic extremity or pressure ulcer on the heel until vascular status is confirmed
- Untreated calciphylaxis, pyoderma gangrenosum

Infection/ bioburden management

- *Biofilm*- occurs when bacteria attach to surface and create structure called extracellular polymeric substances (EPS)
  - Protective shield for bacteria
  - Significant obstacle to healing
  - Can grow on variety of surfaces
  - Resistant to antimicrobials



Spectrum of Bioburden

ALL wounds have bacteria
No disruption to healing

Inflammation triggered
Healing stalled

Odor, exudate, damaged tissue, "slough"

Bacteria replicated triggering systemic response

Strong odor, erythema, pain, drainage

Surrounding tissues involved

McNichol, L.L., Ratliff, C.R., Yates, S.S. (2022) *WOCN: core curriculum wound management.* 2nd edition. Wolters Kluwer.

Infection Control

Prioritize Biofilm focused wound care!

Hypochlorous Acid (Vashe, Puracyn Plus, Anasept)

- -Effective against bacillus anthracis, Clostridium difficile MRSA, P aeruginosa
- **-Non cytotoxic!** Vs chlorhexidine, iodine, hydrogen peroxide or sodium hypochlorite

Dilute sodium hypochlorite 0.125%

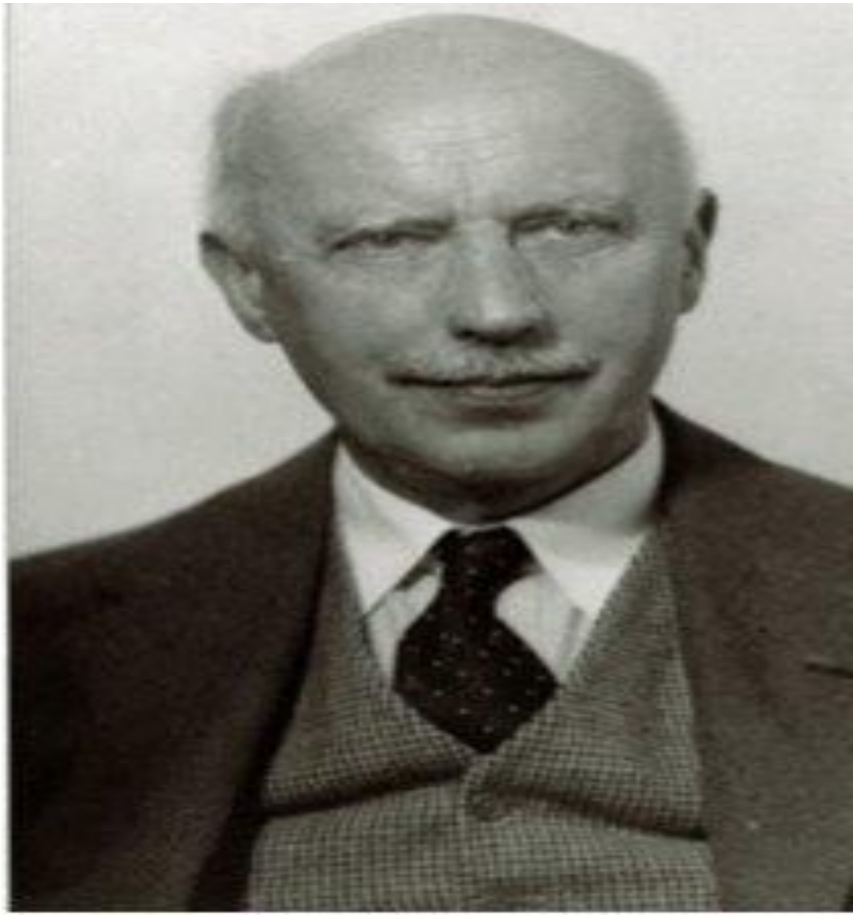
Use for heavily necrotic wounds, or infection

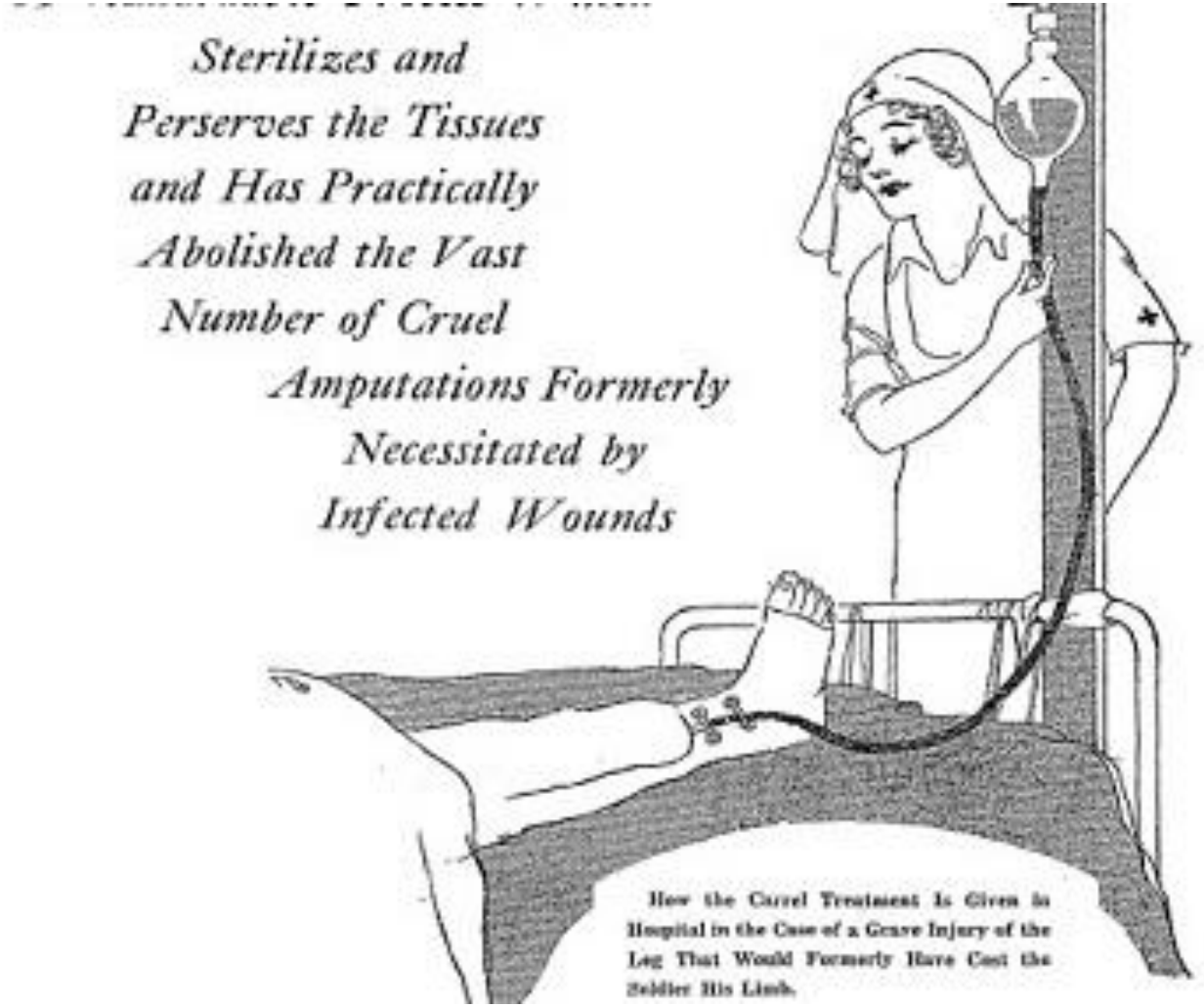
Saline is not the solution!!!

< 4 pounds pressure per sq inch (psi) ineffective and >15 psi risk of driving bacteria deeper

Day, A., Alkhalol, A., Carney, B.C., Hoffman, H.N., Moffatt, L.T., Shupp, J.W.. Disruption of Biofilms and Neutralization of Bacteria using Hypochlorous Acid Solution: An in Vivo and In Vitro Evaluation. Wound Care Journal, Advances in Skin and Wound Care, December 2017

Dr. Dakin





Dr. Dakin, an innovator for asepsis, studied over 200 substances, monitoring effects on tissues and bacteria

Sodium Hypochlorite Solution

Stock bottle concentrations:

-0.125% (Quarter strength)
-0.25% (Half strength)
-0.5% (Full strength)

Some toxicity at 0.0125% (1/40)
Complete toxicity at higher concentrations

- *Killing fibroblasts, osteoblasts, keratinocytes*

Short acting

Barsoumian, A., Sanchez, C. J., Mende, K., Tully, C. C., Beckius, M. L., Akers, K. S., ... Murray, C. K. (2013). In vitro toxicity and activity of Dakin's solution, mafenide acetate, and Amphotericin B on filamentous fungiand human cells. Journal of Orthopaedic Trauma, 27(8), 428–436. doi:10.1097/bot.0b013e3182830bf9

Infection Control

- **Silver dressings or gels**
  - donated to wound = bactericidal
  - destroyed within the dressing itself.
- **DACC- Dialkylcarbamoyl chloride**
  - works by physically wicking and binding bacteria in dressing.
  - good choice for sensitive skin, children
- **Methylene Blue and Gentian Violet in PVA foam**- holds 12x its weight, can be left in place for up to 7 days.

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Gels and Dressings that Fight Biofilm Reformation

- **Cadexomer iodine**
  - Delivery system which allows sustained release of iodine "steady state"
  - Can last on avg 72 hrs
- **Surfactant Based Gel**
- **Hypochlorous Acid Gel**

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"But...It's INFECTED! Don't they need an antibiotic?"

Classic signs of infection/cellulitis:

- Increased pain
- Increasing drainage, "pus"
- Erythema, warmth, and or induration >2 cm
- Above + systemic sign(s)

Chronic wounds may present differently:

- Increased serous drainage
- "stalling"
- Discoloration, friable tissue
- Pocketing at base of wound
- Foul odor

Topical antibiotics are of little benefit, systemic antibiotics should only be used for signs and symptoms of invasive infection

- ***Mupirocin, bacitracin- (for gram +, but resistance developing, dermatitis)***
- ***Neomycin- (for gram –, 10-12% hypersensitivities, dermatitis)***

Punjataewakupt, A., Napavichayanun, S. & Aramwit, P. The downside of antimicrobial agents for wound healing. Eur J Clin Microbiol Infect Dis 38, 39–54 (2019). https://doi.org/10.1007/s10096-018-3393-5

Cross Sectional Study of 260 Patients admitted through ED

30% misdiagnosed with cellulitis

85% did not require hospitalization

92% received unnecessary antibiotics

est $515 million in healthcare costs annually in US

SPREAD THE WORD!!!

- Necrotic tissue and drainage produces odor
- Yellow/tan drainage does not = infection
- Start with CLEANSING the limb/wound with soap/water, followed by non cytotoxic cleanser such as hypochlorous acid solution

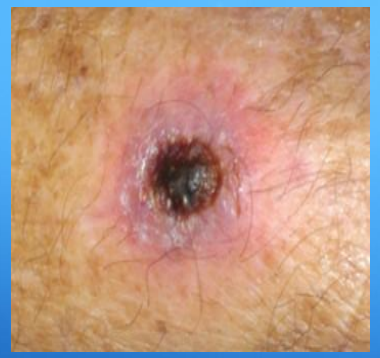
Weng QY, Raff AB, Cohen JM, et al. Costs and Consequences Associated With Misdiagnosed Lower Extremity Cellulitis. JAMA Dermatol. 2017;153(2):141–146. doi:10.1001/jamadermatol.2016.3816

Moisture

BALANCE IS KEY

Too wet

- Peri wound maceration or dermatitis
- Increased biofilm
- Negative effects on QOL, soaking through clothing, footwear, etc.



Too dry

- Inhibits cellular activity->tissue death-> eschar

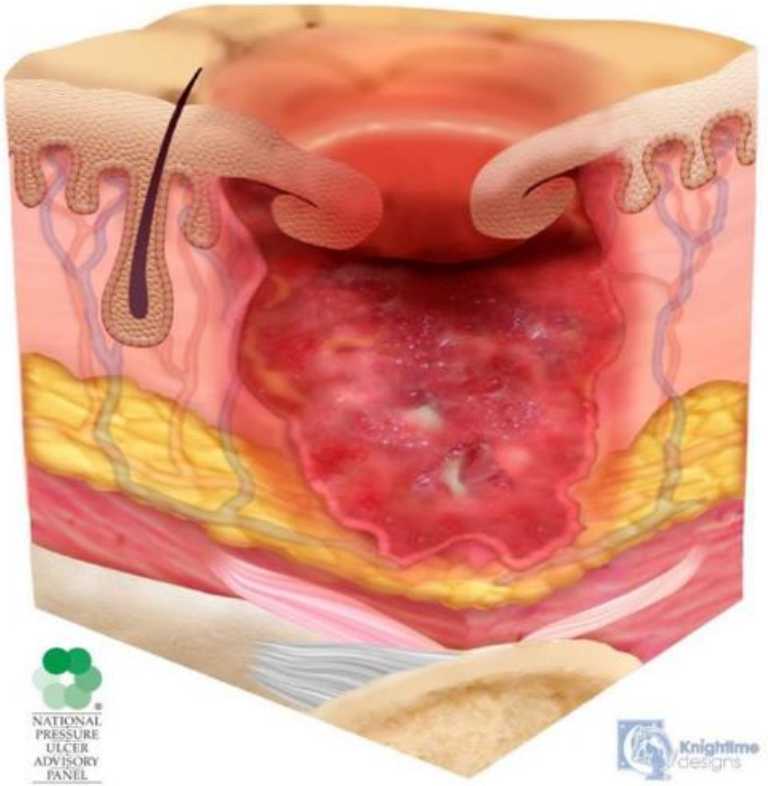
Edge/Epithelialization

After adequate wound bed preparation, comes epithelialization and contraction of wound.

20-40% reduction of surface area within 2-4 weeks is the most reliable indicator of healing

Leaper, D.J., Shultz, G., Carville., Fletcher., Swanson., T. Drake, R. *Extending the TIME concept: what have we learned in the past 10 years?* International Wound Journal, 2014; 9:1-19.

Area of Focus



Epibole

- Slow or absent epithelial migration
- Rolled or hyperkeratotic appearance

When TIME doesn't heal the wound...

TIME doesn't heal all wounds…

- **Malignancy**
- **Wound ischemia**
  - **Arterial vs venous**
- **Non compliance/ non adherence**
- **Inability to optimize host factors**
- **Osteomyelitis**
- **Soft tissue necrosis**
  - Hyradenitis suppurativa
  - Pyoderma gangernosum
  - Calcyphylaxis
  - Radiation necrosis

Per US Wound Registry real-world data, only about 66% of chronic wounds achieve healing

US Wound Registry,. https://doi.org/10.1089%2Fwound.2017.0743

Palliative vs Maintenance

Inability to heal
-End stage chronic disease
-Cancer/Tumor invasion
-Ischemia
-Hydradenitis supperativa, Pyoderma gangrenosum, Calciphylaxis
-Radiation necrosis

Symptom management, pain, odor, drainage control

Wound *unlikely* to heal
due to intrinsic or extrinsic factors

-Unwilling to stop smoking, offload,
-Poor surgical risk
-Uncontrolled A1C

Prevent infection and manage drainage

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Palliative Wound Care: Pain Control

- Premedication prior to dressing changes
- Contact layer to reduce trauma upon removal
  - Oil emersion gauze
- Reduce frequency of changes
- NO wet to dry
- Allow periods for "time out"

- Protect the peri wound using skin barrier prep or zinc oxide + lidocaine, +menthol
- Consulting with pain management or palliative specialist
- Topical compounded solutions, opioid formulations
- Pain blocks?

Shah, J.B., Sheffield, P.J., Fife, C.E., *(2018). Textbook of Chronic Wound Care: An evidence-based approach to diagnosis and treatment.* Best Publishing Compay.

Odor Control

START with reducing bacterial burden

- **Shower**
- **Good wound cleanser, hypochlorous acid solution**
- **Irrigations: sodium hypochlorite, acetic acid (inexpensive, but irritating, require BID-TID changes)**
- **Cadexomere iodine, gentian violet, silver dressings**

Rx Metronidazole 500 mg tablet 1-2x daily PRN

Can be used in Irrigation, gauze soak, mixed in gel, or sprinkled

!*MASK when crushing! Can be harmful to pleura*

Drainage Management

- Reduce bacterial loads and necrotic tissue
- Heavily draining – 2 layers (alginate + absorbent cover)
- ABD pads, super absorbent dressings, sanitary pads/ baby diapers
- Protect the peri wound with Zinc Oxide paste

Bleeding can be frightening, distressing to patient and family

- Pressure + calcium alginate, or silver foams
- Epinephrine soaked gauze
- Hemostatic foams/dressings (oxidized cellulose polymer) $$$
- Dark towels

Skin Failure in the Critically Ill

SKIN FAILURE

- Failure occurs during multiple organ dysfunction, blood shunts away from skin and to vital organs
- Can occur in areas under stress, or distal body parts
- NO FORMAL DIAGNOSIS CRITERIA

Dressing Selection

DEEP DRY wounds	DEEP WET wounds
Gel impregnated gauze Cover Dressing- Transparent film or ABD pad	Hydrofiber with Ag AMD roll gauze Polyvinyl alcohol foam with methane blue and gentian violet Cover Dressing – ABD, foam border, super absorbent pad
SHALLOW DRY wounds	**SHALLOW WET wounds**
Hypochlorous acid gel Cadexomere iodine gel Hydrocolloid Cover with Gauze/bordered gauze	Polyurythane foam with methane blue and gentian violet Hydropolymer mesh gauze Cover with super absorbent dressing, foam border, or ABD pad

Alternatives to Adhesives

PREVENT MEDICAL ADHESIVE-RELATED INJURY (MARSI)!

- Open weave gauze and stretch bandages commonly used, these are **NOT** ideal due to slippage
- **INSTEAD, USE THESE:**
  - Tubular elastic net dressing
  - Elastic tubular bandage (tubigrip, medigrip elasticated tubular bandage)
  - Self adherent elastic bandage (coban, coflex, medi-Rip, Co-Lastic)
  - Conforming bandages (curity stretch bandage, conform stretch, Duflex)
  - Abdominal dressing holders/ binders

  - Rotate your dressings/tape


CASE STUDIES

Case 1 Ms. S

78 y F PMHx HTN, HLD, melanoma (opposite leg, s/p Mohs), ex-smoker.
-Treated by 3 different providers for cellulitis.
-Wound consult Oct, 2023. Wound RLE- dry, adherent slough, minimal drainage, radiating pain. minimal edema.
-Unable to palpate distal DP/PT pulses, but good doppler flow.
-Nov, 2023 ABIs: RIGHT 0.6, toe pressure 39

Case 1 Ms. S

- Examine the wound
  - How would you classify or describe this wound?
  - How would you dress this wound?

*Collaboration with vascular surgery, IR, dermatology
- IR angioplasty on 1/17/23

Shallow/ dry
Painful

Contact layer, gauze
OR gel + gauze cover

Case 2 Ms. C

77 y F PMHx CKD II, osteoarthritis, , PE on anticoagulation, anemia, BLE venous ulcers present since 2022

Case 2 Ms. C

- Examine the wound
  - How would you classify or describe this wound?
  - How would you dress this wound?

- Collaboration: PT, home health, ACS, palliative care, pain management

Moderate depth & Wet

Antimicrobial contact layer
And super absorbent

Case 3 Mr. S

- 66 y AA Male, PMHx DM2, CKD3, PVD, HTN, Gangrenous L foot 2019
- Social Hx: Married, daughter and grandchild in GA. Strong faith, active church and community member.
- Strongly opposed amputation. Quality of life dependent on ability to walk, travel, stay involved in church.

How it started...

Nov 2019

May 2020

Aug 2020

How its going...

Dec 2022

July 2023

Case 3 Mr. S

- **Examine the wound**
- How would you classify or describe this wound?
- How would you dress this wound?

- Ongoing communication
  - Goal setting and Managing expectations

Shallow & Dry

Cadexomere iodine
And wrap gauze

Case 4
Skin breakdown + infection

- 75 y F with multiple sclerosis, quadriplegia
- Recently hospitalized with cellulitis of thigh, on IV abx, which resulted in increased stooling.
- Red/angry/satellite lesions -> miconazole 2% cream vs powder dusting.
- "Crusting" technique with barrier spray
- Finish with zinc oxide paste in frosting like consistency
    - Contact layer (oil emersion gauze) over zinc oxide if needed
    - Do not wipe away zinc oxide barrier with every soiling! This is what is providing a shield from moisture

Wound Care Plan

1. Gently cleanse skin with mild soap and water.
2. Apply Acetic acid moistened paper towel on skin 15 min.
3. Allow skin to fully dry.
4. Dust miconazole 2% powder over rash.
5. Apply frosting thick layer of zinc oxide paste over open areas.

-Counseled on reducing layers/friction,

-Rx Flluconazole x 1

2 weeks later

Wrap it Up!

What NOT to do

- Leave the wound covered and refer to your nearest wound care center
- Give more antibiotics
- Saline wet to dry dressings
  - Outdated
  - Non selective debridement, healthy granulation damage
  - Painful
  - NO biofilm control, risk for infection

Pearls

- Remove the dressing and LOOK
- Focus on TIME
- Prioritize decreasing bioburden
- Save saline, use hypochlorous acid!
- Remember your wound dressing grid and think of alternatives to adhesives
- Get familiar with your formulary
- No more "wet to dry"
- Antimicrobial stewardship

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