Wound Care Pearls for Practice

DOT WEIR, RN, CWON, CWS
CATHOLIC HEALTH ADVANCED WOUND HEALING CENTERS
BUFFALO, NEW YORK
Disclosures

Consult, Speak or Do Research with:
- Smith & Nephew
- Appulse (formerly Hollister)
- Organogenesis
- Molnlycke
- Lohmann & Rauscher
- Acelity
- Kerecis
- Medline
Goals for Today

Because I couldn’t decide on just one topic, I want to discuss

- The critical evaluation of skin and skin color changes as we assess for pressure injuries and differentiate from “other” problems
- The art of taking a meaningful culture
- How we’re doing on wound cleansing and should we re-think it?
Evaluating Skin and Skin Color Changes

THE IMPORTANCE OF GETTING IT RIGHT THE FIRST TIME
Appearance of many wounds are “close”...
Differential diagnosis can be difficult

- Moisture from incontinence and pressure may both be contributing factors

Inspection of the skin is key

- Location (bony prominence vs. skin fold)
- Color (different from the color of the surrounding skin)
- Depth (partial vs. full thickness)
Moisture-Associated Skin Damage
Deep Tissue Injury: Persistent Non-blanchable Deep Red, Maroon, or Purple Discoloration

Intact or non-intact skin with localized area of persistent non-blanchable deep red, maroon, purple discoloration or epidermal separation revealing a dark wound bed or blood filled blister.

Pain and temperature change often precede skin color changes. Discoloration may appear differently in darkly pigmented skin.

This injury results from intense and/or prolonged pressure and shear forces at the bone-muscle interface. The wound may evolve rapidly to reveal the actual extent of tissue injury, or may resolve without tissue loss.

If necrotic tissue, subcutaneous tissue, granulation tissue, fascia, muscle or other underlying structures are visible, this indicates a full thickness pressure injury (Unstageable, Stage 3 or Stage

Do not use DTPI to describe vascular, traumatic, neuropathic, or dermatologic conditions.
Deep Tissue Pressure Injury
My anecdotal story.....
Same patient, March to October
Same Patient.....

January

May

October
Again, same patient
My Point.....

Not to educate about Deep Tissue Injury per se
To raise awareness that all that is purple is not DTI
  ◦ Another example is the word purulence.....

If unsure, collaborate
If wrong, clarify in the documentation
The Art of Taking a Meaningful Culture
Methods of Wound Culture

- Aspiration
- Biopsy
- Swab
Aspiration

Goal is to obtain fluid from space or below surface of a wound
  ◦ Skin is prepped
  ◦ Needle inserted, aspirated
  ◦ Apply to swab or send fluid

Challenge
  ◦ Painful
  ◦ May be considered invasive
Quantitative Tissue Biopsy

Historically the “gold standard” or at least best practice
Used more in research than clinical practice

$>10^5$ (100,000) colony-forming units (CFU) per gram of tissue considered to be infected
Challenges with Quantitative Tissue Culture

Invasive and skill intensive
◦ Not able to be performed in many setting
◦ Must be done by Provider
◦ Most often not even done in WCC
◦ Painful (may need anesthetic)
◦ Unavailable in many settings
◦ May need to be sent to outside laboratory
When and How to Perform Cultures on Chronic Wounds?

Purpose was to examine current best evidence related to when and how to perform cultures on chronic wounds to guide clinicians in determining the appropriate treatment.

The question: (1) When should cultures be performed on chronic wounds? and (2) What is the best method or technique to perform a culture on a chronic wound?

7 studies

Results: Quantitative culture of wound tissue is the gold standard to obtain a wound culture (4 studies) but the swab method is an acceptable alternative.

Two articles demonstrate the Levine technique is more reliable than the Z-technique to determine microbial load in the wound bed.
Improve Swab Technique

Thoroughly rinse wound surface with non-preserved saline/cleanser
  ◦ Don’t swab through dressing residue, old exudate, necrotic tissue, blood

Choose area that is free of non-viable tissue if possible

Place in carrier, transport ASAP
Methods of Swab Culture

Z Stroke

Levine’s Technique

Deep Tissue Swab Culture
Levine Swab Technique

Wound swab and wound biopsy yield similar culture results

- Haalboom M et al
- 180 wounds of different types; swab and biopsy from same site
  - Skin flora was more frequently cultured from swabs
  - Swabs were able to identify all microorganisms cultured from biopsies in 131 wounds (72.8%) wounds
  - Staphylococcus aureus, Pseudomonas aeruginosa, and beta-haemolytic streptococci species most common organisms
Levine’s Swab Technique

Clean the wound!

Surface swab of a 1 cm$^2$ area of healthy tissue in the wound

Press into wound to obtain fluid (5 minutes?)
Levine’s Technique
Levine’s Technique
Levine’s Technique
Levine’s Technique
Location, Location, Location....
Tissue Swab Culture
While wound assessment drives decision to culture, a non-healing wound is a reasonable reason to culture.

- Potential chronic wound infection should be considered early using clinical signs such as pain, necrotic tissue, delayed healing, and wound deterioration (in addition to classic signs of infection) to determine the need for collecting a culture.

Levine swab technique is a validated method for obtaining the culture but like anything else, must be done using the correct technique.

Bad cultures = bad culture results

- A word about types of reporting
  - Quantitative, semi-quantitative, qualitative
Wound Cleansing

HOW ARE WE DOING? IS IT TIME TO RE-THINK IT?
Wound Bed Preparation

“chance favors the prepared mind”  wound”

Louis Pasteur

- Wound Cleansing
- Wound Debridement
- Bacterial Control

Adequate Wound Cleansing
Challenges of Obtaining a Clean Wound

Pain and Trauma
- History of need to avoid; avoidance of pain prevails

Availability of adequate solutions
- Avoidance of toxicity
- Home vs facility vs clinic setting

Historical vs modern threats to wound healing
Wound Cleansing
Wound Cleansing

“Removal of surface contaminants, loose debris, slough, softened necrosis, microbes and/or remnants of previous dressings from the wound surface and surrounding skin”

Wound Cleansing

Integral part of wound bed preparation
- Removes surface debris
- Reduces bacterial load
- Mitigates biofilm activity

Challenge is the right balance
- How to clean
- What to clean with

Wolcott R, Fletcher J. The role of wound cleansing in the management of wounds. Wounds International 2014. 1(1)
How to Clean

Debridement
- Clearly a fail-safe way to get a wound clean
- But we should clean again after debridement!

Cleansing
- Irrigation
  - Streaming
  - Continuous pulsed irrigation
  - Pulsatile lavage
- Monofilament cleansing
- Gauze cleansing
How to Clean

Debridement
- Clearly a fail-safe way to get a wound clean
- But we should clean again after debridement!

Cleansing
- Irrigation
  - Streaming
  - Irrigation devices
  - Pulsatile lavage
  - Ultrasound
- Monofilament cleansing
- Gauze cleansing
Irrigation - Streaming

Choice of solution: We’ll get to that

Method of Delivery – patient and setting dependent
  ◦ Pouring
  ◦ Syringes
  ◦ Commercial devices

Volume of Solution
  ◦ 50-100 ml recommended

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35 cc - 19 gauge?
What about the 35 ml syringe, 19 gauge angiocath recommendation?


- 35 ml and 19 G angiocath delivered 8 psi, 20 ml syringe and 18 gauge angiocath delivered 12 psi
- Larger syringe, lower pressures. Larger angiocath, higher pressures.

Figure 1: Experimental assessment of pressure generated
Irrigation Devices
Pulsed Irrigation/Lavage With and Without Suction (PLWS)

Pulsed irrigation/lavage provides cleansing and debridement with pulsed irrigation combined with suction

Pulsed lavage with suction provides negative pressure to remove irrigant and debris

Helps reduce bioburden and to enhance granulation tissue formation

Does not disrupt biofilm

PPE required
Pulsatile Lavage

Good for large or multiple wound sites

Variable pressure that is controllable

4-8 psi recommended, >15 psi avoid

Return suction assists with debridement

Selective application tips

Pulsed lavage with suction requires private room – aerosolization issues

Courtesy of Harriett Loehne, DPT, CWS
Types of Low-Frequency Ultrasounds

- Non-Contact
- Contact
A Word About Personal Protective Equipment

Should be worn with any procedure which may result in aerosolization of bacteria

Joint Commission requirement
Monofilament Pad

Polyester monofilaments trap exudate and debris

Thoroughly moisten and clean in circular motion

Ideal for less experienced providers

Necrosis, debris, bacteria, etc. is lifted from wound bed and trapped in fibers of device relatively painlessly
Gauze Scrubbing

Likely more painful
Less effective on bacterial load than monofilament
Less expensive
Consider topical analgesia

Yang Q, et al. Microfilament pad debridement of biofilms on pig skin explants and clinical cases.
Wound Cleansing – Solutions

Commercial cleansers

- Enhanced wound cleaning due to surface active agents, which break the bonds of foreign bodies on wound surface

Strength of their chemical reactivity directly proportional to their cleansing capacity and toxicity to cells

- Skin cleansers (those for incontinence) should not be used to cleanse an open wound
What to clean with?

Isotonic Saline (0.9%)
- On clean uncomplicated wound usually the right answer on test 😊
- Must be used with enough psi to make a difference
- No impact on microbes and biofilm
- Best used with monofilament or gauze

Potable water
- 2012 Cochrane Review concluded no difference in healing or infection rates in using saline vs tap water
- Concern of water borne pathogens such as pseudomonas, and known growth of biofilm in pipes

What to clean with?

Commercial Cleansers
- Remove bacteria with less required force due to surfactant content
- May be best suited for wounds with adherent cellular debris and biofilm
- Typically contain preservatives to extend effective shelf life
- Can be highly cytotoxic to healthy cells and granulating tissue (skin cleansers)

What to clean with?

Povidone Iodine

◦ Broad-spectrum antimicrobial activity
◦ Cytotoxic to healthy cells and granulating tissue in higher-percentage concentrations
◦ May irritate periwound skin
◦ Consider cadexomer or PVA delivery dressings
What to clean with?

Hydrogen peroxide

◦ One time cleansing for dirty acute injury may be appropriate
◦ May be cytotoxic to healthy cells and granulating tissue
◦ Ineffective in reducing bacterial counts in vivo; in vitro evidence of effectiveness
◦ Effervescence visually changes wound surface
What to clean with?

Polyhexamethylene biguanide (PHMB) 0.1%
- Also contains betaine, a surfactant, to lift microbes and debris and suspend them in solution to prevent wound recontamination
- Has an increased ability to penetrate difficult-to-remove coatings, lifting debris, bacteria and biofilm from the wound
- Broad spectrum of activity against bacteria, viruses and fungi
- No evidence of toxicity or resistance
- Commonly used with NPWT
What to clean with?

Hypochlorous Acid

- Broad-spectrum antimicrobial activity
- Non-irritating, non-sensitizing, non-toxic
- Can be used to loosen encrusted dressings in addition to irrigating loose debris and bacteria from the wound bed
- Has rapid antimicrobial activity at concentrations safe for human cells
- In vitro evidence of effect on biofilm

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What to clean with?

Acetic Acid (Vinegar Solution)

- Shown effectiveness against many Gram-positive and Gram-negative organisms, especially Pseudomonas aeruginosa.
- Does not kill bacteria, creates an acidic environment unfavorable for bacterial growth.
- Acetic acid in 1% and 5% concentrations has been widely used in an attempt to reduce pH.
- Effective against odor
- In vivo studies have shown safety for short periods (4-7 days) to control bacterial levels without compromising the healing process
What to clean with?

Dakin’s Solution 0.125 %
- Dilute hypochlorite (bleach) solution that shows effectiveness against Gram-positive bacteria such as strep and staph, as well as a broad spectrum of anaerobic organisms and fungi.
- Kills microorganisms, but also harms healthy cells in all concentrations
- It can be sprayed on the wound, poured as a wound irrigant, or used in a wet compress.
What to clean with?

Concentrated Surfactant Technology

- Non-ionic (no charge)
- Does not disrupt lipid bilayer of cells
Surfactantcy Effect

- At a certain concentration level, molecules form a Micelle Matrix.
- Matrix is surface active, constantly expanding and contracting creating a “rinsing” action on a molecular level.
- Disrupts non covalent bonds. Softens, loosens and traps the wound debris.
Surfactant cleansing

- Stable gel maintains intimate contact with the wound and prolonged exposure to bacteria/debris.
- 100% water soluble. Minimizes pain at application and removal
24 Weeks: **PluroGel®** applied patient to apply daily

6 days Later: Patient returned to collagenase

16 days later, reformation of slough
Before And After: 7 Weeks of surfactant gel

BEFORE: 1/19: 15.75 cm²

AFTER: 3/24: 0.65 cm²
And lastly......Does this look familiar?
Remove scales, reduce bacteria

Photos courtesy Lohmann & Rauscher
Descaling Hyperkeratotic Skin
Skin or Scales?
Closing out on cleansing......

Begin with the end in mind

Base cleansing on wound appearance and presumption of bioburden – Clean or disinfect?

Base decisions on risk-benefit analysis