How are we doing? Do we need to re-think?
WOUND BED PREPARATION

“chance favors the prepared mind”

Louis Pasteur

• Wound Cleansing
• Wound Debridement
• Bacterial Control
WOUND CLEANSING

Hey! That's good scotch!

It's good for cleaning wounds!

I have a tongue wound!

Me too!
ADEQUATE WOUND CLEANSING
CHALLENGES OF OBTAINING A CLEAN WOUND

- Historical vs modern threats to wound healing
- Availability of adequate solutions
  - Avoidance of toxicity
    - Risk / Benefit
    - Clean vs. Disinfect
  - Home vs facility vs clinic setting
- Pain and Trauma
  - History of need to avoid; avoidance of pain prevails
INTERNATIONAL WOUND CARE SURVEY

- Conducted in eleven countries in Europe and North America
- Identify practitioners primary consideration in their approach to pain and tissue trauma at dressing changes
- 14,657 questionnaires distributed
  - 3,918 responded (27%)

Moffatt CJ, Franks PJ And Hollinworth H. Understanding wound pain and trauma: an international Perspective. EWMA position document on “Pain at wound dressing changes 2002.”
13% Preventing surrounding skin damages
34% Preventing trauma to the wound bed
22% Preventing the spread of infection
25% Preventing pain to the patient
6% Other / missing
THE TOP TWO ISSUES IN WOUND HEALING

- Preventing trauma to the wound surface and surrounding skin
- Preventing pain to the patient during dressing change(s)
PLAN FOR THE PAIN

- Inpatient pre-medicate patient
- Provide medication to patient
  - Take pain medication prior to leaving home if not driving
- Topical anesthetics can help
  - Know the mechanism of action
  - Prescriptions for patients and community care/long term care nurses
WOUND CLEANSING
So.....

We have to decide......
OR BETTER....
WOUND CLEANSING

- Wound cleansing is the use of fluids to gently remove loosely adherent contaminants and devitalized material from the wound surface.

WOUND CLEANSING

- Integral part of wound bed preparation
  - Removes surface debris
  - Reduces bacterial load
  - Mitigates biofilm activity
- Challenge is finding the right balance
  - How to clean
  - What to clean with
HOW TO CLEAN

- Debridement
  - Clearly a fail-safe way to get a wound clean
    - Clean again after debridement

- Cleansing
  - Irrigation
    - Streaming
    - Continuous pulsed irrigation
    - Pulsatile lavage
  - Monofilament/microfiber cleansing
  - Gauze cleansing
HOW TO CLEAN

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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
PRESSURIZED CLEANSING

35 cc- 19 gauge?
WHAT ABOUT THE 35 ML SYRINGE, 19 GAUGE ANGIOCATH RECOMMENDATION?

- Ideal pressures for irrigating trauma wounds
## ADJUSTING FOR THE PSI


- 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.

<table>
<thead>
<tr>
<th>Syringe MLs</th>
<th>Needle/Angio Gauge</th>
<th>PSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>25</td>
<td>4</td>
</tr>
<tr>
<td>35</td>
<td>21</td>
<td>6</td>
</tr>
<tr>
<td>35</td>
<td>19</td>
<td>8</td>
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<tr>
<td>20</td>
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<td>13</td>
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<tr>
<td>12</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>6</td>
<td>19</td>
<td>30</td>
</tr>
</tbody>
</table>

*Figure 1: Experimental assessment of pressure generated*
IRRIGATION DEVICES
POWERED DEVICES

Pulsatile lavage

Non-contact low frequency ultrasound

Contact low frequency ultrasound
A WORD ABOUT PERSONAL PROTECTIVE EQUIPMENT

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

- Likely more painful
- Less effective on bacterial
- Less expensive
- Consider topical analgesia
MICROFIBER DEBRIDEMENT PAD

- Debridement Pad consists of microfibres that debride and an absorbent backing layer
- Pad is moistened and used in a circular motion
- Debridement Pad frees the wound from coatings and dead cell residues (debris) and absorbs excess exudates. Intact tissue is spared.
- Works well with scaly and necrotic wound surfaces

Photo used with permission, B. Braun
MICROFIBER DEBRIDEMENT PAD

Photos used with permission, B. Braun
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
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
  - 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)

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

## Cleansing Solutions

<table>
<thead>
<tr>
<th>Solution</th>
<th>Type</th>
<th>Cytotoxicity</th>
<th>Effect on biofilm</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sterile normal saline</td>
<td>Isotonic</td>
<td>None</td>
<td>None</td>
<td>Sterile, non-antiseptic solution[23]</td>
</tr>
<tr>
<td>Sterile water</td>
<td>Hypotonic</td>
<td>None</td>
<td>None</td>
<td>Sterile, non-antiseptic solution[23]</td>
</tr>
<tr>
<td>Potable tap water</td>
<td>Varies in content</td>
<td>Unknown/variable</td>
<td>None</td>
<td>Not sterile[23]</td>
</tr>
<tr>
<td>Polyhexamethylene biguanide (PHMB)</td>
<td>Surfactant</td>
<td>Low to none[23]</td>
<td>Surfactant qualities disrupt biofilm attachments[21, 106]</td>
<td>Available in gel and irrigation preparations that can be used together or separately</td>
</tr>
<tr>
<td>Octenidine dihydrochloride (OCT)</td>
<td>Surfactant</td>
<td>In vitro tests show high toxicity[107]</td>
<td>Prevents formation of new biofilm for at least 3 hours[108]</td>
<td>Available in gel and irrigation preparations that can be used together or separately</td>
</tr>
<tr>
<td>Super-oxidised with hypochlorous acid (HOCL) and sodium hypochlorite (NaOCl)</td>
<td>Antiseptic</td>
<td>May vary depending on concentrations</td>
<td>Penetrates biofilm rapidly, killing formations from within[103]</td>
<td>Purported to provide desloughing and antimicrobial activity</td>
</tr>
<tr>
<td>Povidone iodine</td>
<td>Antiseptic</td>
<td>Varies depending on concentrations[108]</td>
<td>Inhibits development of new biofilm[110]</td>
<td>Modulates redox potentials and enhances angiogenesis, thereby promoting healing[73]</td>
</tr>
</tbody>
</table>

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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.

- 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
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
Surfactant Dressings and Gels

- Dressings containing non-ionic surfactants that cleanse wound at microscopic level
- New evidence of anti-biofilm properties
- Local cleansing – “scrubbing bubbles”
SURFACTANTNCY EFFECT

- Monomers line up along an aqueous environment with hydrophilic head / hydrophobic tail
- In higher concentrations form a micelle matrix which 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.
- Solubilizes debris at cellular level
SURFACTANT ENHANCED AUTOLYTIC DEBRIDEMENT

12/04/18
Concentrated surfactant + ABX

12/14/18
AND LASTLY... SCALES
WHO THINKS THAT THERE IS BACTERIA UNDER THESE DRIED SCALES?
REMOVE SCALES, REDUCE BACTERIA

Photos courtesy Kevin Woo, RN, PhD
Descaling Hyperkeratotic Skin
CLOSING OUT ON CLEANSING......

- Begin with the end in mind (Covey)
- Base cleansing on wound appearance and presumption of bioburden – Clean or disinfect?
- Base decisions on risk-benefit analysis

THANK YOU!