Moisture Balance and Dressing Selection

Content Creators:
Members of the South West Regional Wound Care Program’s Clinical Practice and Knowledge Translation Learning Collaborative
Learning Objectives

1. Identify the significance of exudates and how to manage them

2. Recognize the importance of moist wound healing

3. Identify the properties of ideal dressings

4. Recognize the need to thoroughly and holistically assess the whole person and their wound, addressing the cause, person-centered concerns, debridement and infection prior to selecting a dressing, as wound dressings are a very small part of managing any wound
Photographs and Illustrations

Images/illustrations obtained via Google Images, unless otherwise stated
SIGNIFICANCE OF EXUDATES
Wound Exudate\(^1\)

- A.k.a. wound fluid or wound drainage
- The fluid that leaks from a wound
- Consists of many components, including (but not limited to):
  - Electrolytes
  - Nutrients
  - Proteins
  - Inflammatory mediators
  - Protein digesting enzymes (MMPs)
  - Growth factors
  - Waste products
  - Neutrophils
  - Macrophages platelets
Healthy Wound Fluid\textsuperscript{1-2}

- In healthy wound fluid, the component of the exudate are balanced, allowing for:
  - Granulation tissue deposition
  - Regrowth of blood vessels
  - Epithelialization
  - Cell proliferation
  - Provision of nutrients for cell metabolism
  - Diffusion of immune and growth factors
  - Autolysis of necrotic tissue
  - The prevention of wound bed desiccation
Unhealthy Wound Fluid\(^2-5\)

• In a ‘healable’ chronic wound in which wound closure is stalled, the components of the wound exudate may be unbalanced and may be impeding ‘healing’ by:
  • Slowing/preventing cell proliferation
  • Interfering with growth factor availability
  • Increasing the number of inflammatory mediators and activated MMPs
  • Increasing the amount of proteolytic activity, which degrades the extracellular matrix
Wound Exudate

• So we must strike a balance between:
  • The components of the wound exudate
  • The amount of wound exudate

• A wound bed that is too moist may “delay or prevent healing, cause physical and psychosocial morbidity and/or increase demand on health care resources”

• Exudate production is influenced by wound etiology, wound healing physiology, the wound environment, and compounding pathological processes
# Factors Influencing Exudate

<table>
<thead>
<tr>
<th>Factor</th>
<th>Effect on Exudate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Increased</strong></td>
<td></td>
</tr>
<tr>
<td>Wound healing stage</td>
<td>• Inflammatory stage of normal wound healing</td>
</tr>
<tr>
<td></td>
<td>• Wounds that are not healing as expected (chronic wounds; sustained inflammatory phase)</td>
</tr>
<tr>
<td></td>
<td>• Autolytic debridement</td>
</tr>
<tr>
<td><strong>Decreased</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Near end of the healing process</td>
</tr>
<tr>
<td></td>
<td>• Wounds with dry eschar</td>
</tr>
<tr>
<td>Local factors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Local infection, inflammation, or trauma</td>
</tr>
<tr>
<td></td>
<td>• Presence of a foreign body</td>
</tr>
<tr>
<td></td>
<td>• Edema</td>
</tr>
<tr>
<td></td>
<td>• Sinus or urinary, enteric, lymphatic or joint space fistula</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Increased</strong></td>
<td></td>
</tr>
<tr>
<td>Systemic factors</td>
<td>• Cardiac, renal, hepatic failure</td>
</tr>
<tr>
<td></td>
<td>• Infection/inflammation</td>
</tr>
<tr>
<td></td>
<td>• Endocrine disease</td>
</tr>
<tr>
<td></td>
<td>• Medications</td>
</tr>
<tr>
<td></td>
<td>• Obesity/malnutrition</td>
</tr>
<tr>
<td><strong>Decreased</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Dehydration</td>
</tr>
<tr>
<td></td>
<td>• Hypovolemic shock</td>
</tr>
<tr>
<td></td>
<td>• Microangiopathy</td>
</tr>
<tr>
<td>Practical factors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Wound position</td>
</tr>
<tr>
<td></td>
<td>• Heat</td>
</tr>
<tr>
<td></td>
<td>• Reduced willingness/ability to cooperate with treatment</td>
</tr>
<tr>
<td></td>
<td>• Inappropriate dressing use/intervention</td>
</tr>
<tr>
<td><strong>Increased</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Decreased</strong></td>
<td></td>
</tr>
</tbody>
</table>
Exudate Characteristics

- Characteristics of the exudate help to:
  - Diagnose wound infection
  - Evaluate the effectiveness of topical therapy
  - Monitor wound ‘healing’
  - Confirm inflammatory response to initial injury
Wound Exudate Characteristics

• When assessing the characteristics of wound exudate, evaluate its:
  • Color
  • Consistency
  • Amount
  • Odor

• Evaluate the characteristics of the exudate by looking at the:
  • Wound itself, post wound cleansing and debridement
  • Dressing
## Exudate: Color

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>Color and Consistency</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Serous</strong></td>
<td>Clear/light yellow, thin/watery</td>
<td>‘Normal’ during the inflammatory and proliferative phase of wound healing, but may also be due to a urinary or lymphatic fistula or from fibrinolysis-producing bacteria</td>
</tr>
<tr>
<td><strong>Sero-sanguinous</strong></td>
<td>Pink – light red, thin/watery</td>
<td>‘Normal’ during the inflammatory and proliferative phase of wound healing. Color is due to the presence of red blood cells</td>
</tr>
<tr>
<td><strong>Sanguinous</strong></td>
<td>Bright red, thin/watery</td>
<td>Due to presence of red blood cells from new capillary growth or damage</td>
</tr>
<tr>
<td><strong>Purulent</strong></td>
<td>Darker yellow/tan or blue/green, thin → thick, watery → opaque</td>
<td>May be due to infection (presence of WBCs and bacteria), or may be from the presence of wound slough, fibrin strands, or materials from an enteric or urinary fistula. Blue/green color may be indicative of pseudomonas infection</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>Some dressings and topical preparations can alter the appearance of wound exudate, i.e. silver, cadexomer iodine, etc.</td>
<td></td>
</tr>
</tbody>
</table>
# Exudate: Consistency

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>Consistency</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low viscosity</td>
<td>Thin, runny</td>
<td>• Low protein content due to malnutrition and/or venous or congestive cardiac disease&lt;br&gt;• Urinary, lymphatic or joint space fistula</td>
</tr>
</tbody>
</table>
## Exudate: Amount

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>There is no visible exudate on the dressing or on the wound tissue</td>
</tr>
<tr>
<td>Scant</td>
<td>There is no measurable exudate on the dressing; however the wound tissues are moist</td>
</tr>
<tr>
<td>Small</td>
<td>&lt;25% of the dressing has drainage on it, the wound tissues are visibly moist, and the moisture is evenly distributed in the wound</td>
</tr>
<tr>
<td>Moderate</td>
<td>Drainage involves &gt;25% to ≤ 75% of the dressing, the wound tissues are saturated, and the moisture is/is not evenly distributed in the wound</td>
</tr>
<tr>
<td>Large</td>
<td>Drainage involves &gt;75% of the dressing, the wound tissues are saturated and drainage is freely expressed from the tissue, and the moisture is/is not evenly distributed in the wound</td>
</tr>
</tbody>
</table>
## Exudate: Odor

<table>
<thead>
<tr>
<th>Odor</th>
<th>Significance</th>
</tr>
</thead>
</table>
| New odor in a wound with previously no odor or a changed odor in a wound with a chronic odor | • Increased bacterial burden/infection  
• Presence or increase in necrotic tissue  
• Presence of a sinus/enteric or urinary fistula  
• Type of dressings being utilized |
| Sickening sweet wound odor        | • Along with blue/green exudate, may indicate the presence of pseudomonas     |
Characteristics of Acute and Chronic Wound Fluid

• Acute wound fluid:
  • Exudate on incision 48-72hr is normal
  • Exudate presence after 72 hours indicates infection or seroma

• Chronic wound fluid:
  • Increased exudate is the result of inflammation or infection
  • Normally exudate is serous or sero-sang
  • If infected, exudate may be thickened, purulent, and in large amounts. Infected fluid contains enzymes and toxins that are harmful to healthy tissue
  • If there is a lot of necrotic tissue in the wound the exudate may be thick, opaque, purulent, malodorous and in large amounts
Wound Etiology and Exudate

- The etiology of the wound can also effect/predict the type of exudate

<table>
<thead>
<tr>
<th>Wound Etiology</th>
<th>Exudate Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arterial Ulcer</td>
<td>Often dry or has scant/small amount of serous exudate</td>
</tr>
<tr>
<td>Neuropathic Ulcers</td>
<td>Usually minimal serous or sero-sang exudate</td>
</tr>
<tr>
<td>Venous Ulcers</td>
<td>Often highly exudating – serous or sero-sang</td>
</tr>
<tr>
<td>Pressure Ulcers</td>
<td>If partial-thickness, exudate likely to be serous or sero-sang in minimal to moderate amounts. If full-thickness, exudate may be serous → purulent in moderate to large amounts</td>
</tr>
</tbody>
</table>
MANAGEMENT OF EXUDATES
Management of Wound Exudates

- Management of exudates includes:
  - Wound cleansing
  - Use of topical antimicrobials, antiseptics and antifungals
  - Use of antimicrobial dressings
  - Use of topical dressings
Wound Cleansing\textsuperscript{1-2}

- Removes debris, inflammatory contaminants and bacteria, devitalized tissue and excess exudates that support bacterial growth and delays healing

- Effective cleansing removes harmful materials from the wound bed without causing trauma to healthy living cells/tissue
Cleansing Solutions

• Process of wound cleansing involves choosing an appropriate\textsuperscript{1}:
  • Cleansing solution
  • Method of wound cleansing

• Choice is dependent upon the\textsuperscript{2}:
  • Wound characteristics
  • Presence of spreading or systemic infection
  • Goals of care
  • Severity of any wound related pain
  • Toxicity and allerginicity of the solution
  • Availability of solutions
  • Cost effectiveness
## Solutions Appropriate for Wound Cleansing

<table>
<thead>
<tr>
<th>Solution</th>
<th>Notes</th>
</tr>
</thead>
</table>
| **Normal Saline (NS)**  | • Preferred as it is isotonic (physiologically compatible), non-toxic, and inexpensive  
                          • Can be made at home by adding two tsp of table salt to 1L of boiling water (discard after 24hrs) |
| **Sterile Water**       | Needed to activate metallic/nanocrystalline silver dressings         |
| **Tap Water**           | Can be used to cleanse chronic wounds if:                            |
|                         | • The quality is acceptable, i.e. it is potable                      |
|                         | • There are no systemic or local factors that increase the person’s risk of infection (see the chart below) |
|                         | Tap water is cost effective and easily accessible                    |
| **Commercial Cleansers**| • Contain varying ingredients, including antimicrobials and/or surfactants (to lower surface tension, to lift slough/debris from the wound surface and to penetrate biofilms)  
                          • Be aware of the cleansers toxicity index (least toxic are 1:10, the most toxic are 1:1000²)  
                          • A desirable commercial cleanser will be isotonic, pH –balanced, have the lowest possible toxicity index, and will provide two options for delivery: direct stream (4-15PSI) and gentle spray (<4PSI) |
| **Antimicrobials**      | • Indicated to reduce bacterial burden in critically colonized or infected wounds  
                          • NOT indicated for healthy, proliferative wounds  
                          • See:  
                          • “Safest Topical Antimicrobials for Use in Wound Care”  
                          • “Topical Antimicrobials for Selective Use in Wound Care”  
                          • “Topical Antimicrobials for Cautionary Use in Wound Care” |
<table>
<thead>
<tr>
<th>Agent</th>
<th>Vehicle</th>
<th>Spectrum</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Iodine</strong></td>
<td>• Iodophor-impregnated gauze</td>
<td>SA</td>
<td>MRSA</td>
</tr>
<tr>
<td></td>
<td>• Slow release molecular iodine in cadexomer starch beads</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>• Povidone iodine impregnated non-adherent dressing</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Powder</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Silver</strong></td>
<td>• Atomic</td>
<td>SA</td>
<td>MRSA</td>
</tr>
<tr>
<td></td>
<td>• Ionic</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>• Oxysalt</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Polyhexamethyline</strong></td>
<td>• Biguanide (PHMB)</td>
<td>SA</td>
<td>MRSA</td>
</tr>
<tr>
<td></td>
<td>• Ribbon gauze, gauze squares</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>• Transfer foam</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Backed foam</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Non-adherent</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Gels</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Leptospermum Honey</strong></td>
<td>• Calcium alginate</td>
<td>SA</td>
<td>MRSA</td>
</tr>
<tr>
<td></td>
<td>• Hydrocolloids</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>• Gels</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Paste</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gentian Violet</strong></td>
<td>• Foam</td>
<td>SA</td>
<td>MRSA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Silver Sulfadiazine</strong></td>
<td>• Paste</td>
<td>SA</td>
<td>MRSA</td>
</tr>
<tr>
<td></td>
<td>• Ointment</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Agent</td>
<td>Vehicle</td>
<td>Spectrum</td>
<td>Comments</td>
</tr>
<tr>
<td>--------------------</td>
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<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Benzyl Peroxide</td>
<td>• Gel</td>
<td>X</td>
<td>• Reserve for MRSA and other resistant gram positive organisms</td>
</tr>
<tr>
<td></td>
<td>• Lotion</td>
<td>X</td>
<td>• May be an allergen</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
<td>• Requires direct contact with the wound surface</td>
</tr>
<tr>
<td>Povidone Iodine</td>
<td>• Solution</td>
<td>X</td>
<td>• Has a moderate cytotoxic effect</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
<td>• Appropriate for use on ‘maintenance’/‘non-healable’ wounds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
<td>• May use on ‘healable’ wounds, if reduction of bacterial burden is of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
<td>greater immediate concern than wound healing (two week course maximum)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
<td>• Requires direct contact with the wound surface</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
<td>• An iodine-surfactant complex</td>
</tr>
<tr>
<td>Chlorhexidine</td>
<td>• Solution</td>
<td>X</td>
<td>• Appropriate for use on ‘maintenance’/‘non-healable’ wounds</td>
</tr>
<tr>
<td></td>
<td>• Tulle gauze</td>
<td>X</td>
<td>• May use on ‘healable’ wounds, if reduction of bacterial burden is of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
<td>greater immediate concern than wound healing (two week course maximum)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
<td>• In ‘healable’ wounds, it is best used during the inflammatory stage of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
<td>wound healing, as it is cytotoxic during the proliferative phase</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
<td>• Requires direct contact with the wound surface</td>
</tr>
<tr>
<td>Acetic Acid</td>
<td>• Solution</td>
<td>X</td>
<td>• Requires direct contact with the wound surface for a minimum of five</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>minutes to be effective</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Apply a 0.5-1% strength (i.e. 4 parts water to 1 part white table</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>vinegar) compress to the wound to manage Pseudomonas – STOP when the</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>greenish wound discharge stops</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Consider protecting periwound skin during use</td>
</tr>
<tr>
<td>Mupuricin</td>
<td>• Cream</td>
<td>X</td>
<td>• MUST be in direct contact with the wound bed</td>
</tr>
<tr>
<td></td>
<td>• Ointment</td>
<td>X</td>
<td>• Reserve for MRSA decolonization</td>
</tr>
<tr>
<td>Metronidazole</td>
<td>• Cream</td>
<td>X</td>
<td>• Requires direct contact with the wound surface</td>
</tr>
<tr>
<td></td>
<td>• Lotion</td>
<td></td>
<td>• Reserve for use on anaerobes, i.e. to reduce odor</td>
</tr>
<tr>
<td></td>
<td>• Gel</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
When selecting a topical antimicrobial consider **STAR:**

- Not systemically used
- Not highly toxic to tissues
- Not likely to induce an allergy
- Not likely to be associated with bacterial resistance

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## Topical Antimicrobials For Cautionary Use In Wound Care

<table>
<thead>
<tr>
<th>Agent</th>
<th>Vehicle</th>
<th>Spectrum</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SA</td>
<td>MRSA</td>
</tr>
<tr>
<td>Fucidic Acid</td>
<td>• Cream&lt;br&gt;• Ointment&lt;br&gt;• Tulle gauze</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gentamycin</td>
<td>• Cream&lt;br&gt;• Ointment</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polymyxin B Sulphate Bacitracin Zinc Neomycin</td>
<td>• Cream&lt;br&gt;• Tulle gauze</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

**DO NOT USE:**
- Alcohol
- Hydrogen peroxide (risk of gas embolism)
- Hypochlorite solution (Dakin’s/Hygeol)
Wound Cleansing\textsuperscript{6-7}

- Regardless of the solution used, it is best to use solutions that are at room temperature (20 degrees Celsius), although body temperature is ideal.
- Cold solutions may cause the wound bed temperature to drop below 37 degrees Celsius, which slows mitotic activity for up to four hours!
- Macrophages are also inhibited in such cold environments, and leukocyte activity reduces to zero, and as such, the incidence of sepsis is higher when cleansing solutions are cold.
Cleansing Method

- There are a variety of methods of cleansing wounds, each with their own indications:
  - Swabbing or scrubbing
  - Compress or soaking
  - Irrigating or flushing
  - Sitz bathing
  - Whirlpool
  - Pouring
## Cleansing Methods\(^1\-2,7\-9\)

<table>
<thead>
<tr>
<th>Technique</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Swabbing Or Scrubbing</strong></td>
<td>Use of gauze to wipe/scrub away non-viable tissue and to wipe off the wound surface</td>
<td>Swabbing redistributes bacteria(^7), traumatizes new granulation tissue(^8), and sheds fibers which can contribute to granuloma formation</td>
</tr>
</tbody>
</table>
| **Compress Or Soaking** | Use of gauze soaked in a cleansing solution applied directly to the surface of a wound with or without pressure to soften/loosen necrotic tissue and/or to remove gross contaminants | • Appropriate only for wounds with large amounts of necrotic debris  
• Soaking the wound increases the permeability of the tissue, increases bacterial counts, and does not effectively clean the wound bed\(^9\) |
| **Irrigating Or Flushing** | Use of cleansing solutions delivered at pressures less than 15PSI to loosen/flush away non-viable tissue from the wound bed, and to stimulate granulation tissue formation | A 30cc syringe with an 18 gauge angio-cath held approximately 2cm above the wound surface will deliver approximately 8PSI when the plunger is depressed at max force. Other options include commercial cleansers set on direct stream (4-15PSI) and pre-filled NS irrigation bottles (110mL). |
| **Sitz Bathing** | Used for anorectal/gynecological wounds, sitz baths involve placing the affected area in water to reduce pain, help with per-anal hygiene, and cleanse wounds | There is a lack of randomized controlled trials supporting sitz baths to promote faster healing or fewer complications. Immersing in a tub can cause systemic vasodilatation, decreasing the circulation to the perineal area, theoretically delaying healing |
| **Whirlpool** | Use of rapidly rotating water in a tub to increase vascular perfusion and allow for mechanical wound debridement | This type of cleansing is not appropriate for clean, proliferating wounds |
Cleansing: Pouring

- Low pressure of less than 8 psi, obtained by pouring the solution over the wound to protect granulating tissue, with enough fluid to adequately rinse the entire surface

- Indications:
  - Healing wounds without debris or infection: granulating wounds
  - Healing wounds without debris or infection: epithelializing wounds
  - Painful Wounds

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Wound Characteristics and Cleansing

Wound characteristics can influence the method of wound cleansing used, and the solution used:

<table>
<thead>
<tr>
<th>Wound Characteristic</th>
<th>Cleansing Method/Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Healable’ wound with debris</td>
<td>Irrigation (7-12PSI) to remove/loosen/soften debris and necrotic tissue without damaging viable tissue&lt;sup&gt;10&lt;/sup&gt;</td>
</tr>
<tr>
<td>Healthy epithelializing wound</td>
<td>Low pressure (4-7PSI) cleansing, i.e. pour solution over the wound to prevent trauma and removal of growth factors&lt;sup&gt;1, 11&lt;/sup&gt;. Avoid antimicrobial solutions</td>
</tr>
<tr>
<td>Healthy granulating wound progressing towards closure in a timely manner</td>
<td>Gently cleanse with non-cytotoxic solutions, warmed at room temperature, at low pressure (less than 8PSI), i.e. pour solution. No antimicrobial solutions&lt;sup&gt;1,11&lt;/sup&gt;</td>
</tr>
<tr>
<td>Deep wound with tunneling or undermining</td>
<td>Cleanse undermining/tunneling using a 30cc syringe and a pediatric NG tube/small lumen Foley/wound irrigating tip, if the angio-cath will not reach. Flush until irrigant runs clear. Massage tissue above the undermining/tunnel and reposition the person on their side to express all irrigant. NEVER force solution into a wound. If irrigant is not returning, STOP flushing and contact the primary care physician</td>
</tr>
<tr>
<td>‘Non-healable’ necrotic wound</td>
<td>As the goal is to dry out and stabilize the wound, painting such wounds with povidone-iodine and allowing it to air dry is appropriate. Do NOT soak or regularly cleanse stable, dry eschar in such a person</td>
</tr>
<tr>
<td>Wound with localized or spreading infection</td>
<td>High pressure irrigation (7-12 PSI) using 150cc + of NS or use of a commercial wound cleanser set at direct stream (4-15PSI) will help remove surface bacteria/debris/chronic wound fluid and may penetrate biofilm. Use of topical antiseptics for cleansing may be appropriate (see “Guideline: The Assessment and Management of Bacterial Burden in Acute and Chronic Wounds”)</td>
</tr>
</tbody>
</table>
# Wound Cleansing Algorithm

**SOUTH WEST REGIONAL WOUND CARE PROGRAM**

**WOUND CLEANSING ASSESSMENT ALGORITHM**

<table>
<thead>
<tr>
<th>Wound Assessment</th>
<th>Clean Epithelializing Wound</th>
<th>Clean Granulating Wound, Decreasing in Surface Area 20-30% in 3-4 Weeks*</th>
<th>Clean Granulating Wound NOT Decreasing in Size 20-30% in 3-4 Weeks*</th>
<th>Necrotic Healable Wound (Debridement is Appropriate)</th>
<th>Necrotic Non-Healable Wound (Debridement is NOT Appropriate)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Irrigate with ≤ 7 PSI pressure, or pour solution over the wound bed. Use at least 100cc’s of solution, at room or body temperature. Cleanse the periwound skin of debris, exudates. No antimicrobial solutions.</td>
<td>Irrigate with ≤ 7 PSI pressure, or pour solution over the wound bed. Use at least 100cc’s of solution, at room or body temperature. Cleanse the periwound skin of debris, exudates.</td>
<td>Irrigate with 7-15 PSI pressure. Use at least 150cc’s of solution, at room or body temperature. Cleanse the periwound skin of debris, exudates. *Granulating wounds not decreasing in size may have a localized infection.</td>
<td>Irrigate with 7-15 PSI pressure. Use at least 150cc’s of solution, at room or body temperature. Cleanse the periwound skin of debris, exudates.</td>
<td>Do not irrigate or cleanse the wound itself (the intent is to allow the necrotic tissue to dry out and stabilize). If there is exudate present on the periwound skin, gently cleanse it and pat dry. Topical application of providone-iodine solution or Chlorhexidine to the wound surface is appropriate, i.e. paint with Proviodine.</td>
</tr>
</tbody>
</table>

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*SWRCWCP: Wound Cleansing Assessment Algorithm_jan_2011_rev_November_2013*
## Wound Cleansing

### Wound Assessment – Continued

<table>
<thead>
<tr>
<th>Malignant Wounds</th>
<th>Wound with Debris or Contamination/ Superficial &amp; Partial Thickness Burns</th>
<th>Tunneling or Undermined Wound</th>
<th>* + Localized And/Or Spreading Infection</th>
<th>Maintenance Wounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigate with 7-15 PSI pressure, if tolerated. Reduce pressure as needed to minimize pain and damage to friable tumor tissue. Use at least 150cc’s of solution, at room or body temperature. Cleanse the periwound skin of debris, exudates. Foul odor indicates presence of anaerobes - use an antimicrobial solution, and/or topical Metronidazole.</td>
<td>Irrigate with 7-15 PSI pressure. Use at least 150cc’s of solution, at room or body temperature. Cleanse the periwound skin of debris, exudates. May cleanse small burns with lukewarm tap water and mild soap.</td>
<td>Irrigate into tunnelled/undermined area using a 5Fr catheter or “soft cath” with a 30cc syringe. Use at least 150cc’s of solution, at room or body temperature. Irrigate until returns are clear. Gently palpate over undermined or tunnelled areas to express any irrigation solution that is retained. Do not force irrigation when resistance is detected. Cleanse the periwound skin of debris, exudates.</td>
<td>Irrigate with 7-15 PSI pressure. Use at least 150cc’s of antimicrobial solution, at room or body temperature. Cleanse the periwound skin of debris, exudates. <strong>Two week challenge:</strong> May use a 10 – 14 day cleansing regime with an antimicrobial solution to address bacterial burden.</td>
<td>Cleansing will be dependent on characteristics of wound bed and goal of treatment. If goal is to prevent wound from deteriorating, cleanse as per a Necrotic Non-Healable Wound.</td>
</tr>
</tbody>
</table>
MOIST WOUND HEALING
Moist Healing Environment

Why maintain a moist wound healing environment?

• Decreased cell dehydration and death
• Increased angiogenesis
• Enhanced autolytic debridement
• Increased rate of epithelialization
• Bacterial barrier and decreased infection rates
• Decreased pain
• Decreased costs
• Increased granulation formation
How Wounds Heal in a Moist Interactive Environment

- Provides scaffold for cell growth
- Minimizes scarring
- Forms barrier against infection
- Strengthens new tissue
- Encourages natural blood clotting
- Provides Protein for healing
- Absorbs fluids from inflammation
- Blocks nerve endings to reduce pain

Click on the image above for a webinar on moisture management in wounds

©Connie Harris 2002
Why Not Gauze$^{12}$?

- Sheds fibers, contaminating the wound
- Dries the surface of the wound quickly, increasing cell dehydration and death and risk for infection
- Permeable to bacteria – bacteria have been shown to penetrate 64 layers of dry gauze
- May adhere to the wound, causing pain and trauma with removal
- Requires more frequent dressing changes (labor intensive and contributes to increased costs – supplies, labor, time to heal)
- Induces local tissue cooling which causes vasoconstriction and hypoxia, impairment of leukocyte and phagocyte activity, and increases the affinity of oxygen for hemoglobin
- Distribute airborne bacteria contributing to cross-contamination
THE IDEAL DRESSING
Ideal Dressings

• Choose a dressing that meets the needs of the wound, the person, the caregiver, and the setting

• “There is no recipe for a particular wound type ... each wound must be treated individually”¹
The Ideal Dressing: Considerations

- Wear time and ability of the dressing to remain in place
- Ability of the dressing to manage pain
- Ability of the dressing to effectively manage exudates and odor
- Conformability, flexibility, weight/bulk
- Comfort
- Ease of application, use and removal
- Cost of the dressing vs. the frequency of dressing change and the nursing time required to apply it
- Moisture vapor transfer rate
- Ability to retain fluid under compression
- Ability to manage bacteria and/or inflammation
- Autolytic debridement properties/abilities
- Potential allergenic/sensitivity components
- Ethics
- How the dressing accommodates the person’s needs
- Ability of the dressing to control bleeding
- How the dressing effects the exudate composition
- Manufacturers approved use for the dressing
- Availability of the dressing
- Ability of the dressing to act as a barrier to outside contaminants
REMEMBER

• Dressings are but one small part of the holistic management of an individual and their wound. You must address the cause of the wound and co-factors affecting healability, person-centered concerns, debridement, infection/inflammation and wound edge in addition to wound moisture (including dressings). **Without this holistic approach, it wouldn’t matter what dressing you placed on the wound, it would not close!**

• Dressings must be evaluated each dressing change for their appropriateness

• As the person factors and wound characteristics change over time, the dressing needs too will change
Dressing Categories

- Antimicrobial
- Biologic
- Calcium Alginate
- Charcoal
- Clear Acrylic
- Composite Dressing
- Films/membranes
- Foams
- Hydrocolloid
- Hydrogel
- Hydrophilic Fiber
- Hypertonic
- Non-adherent Synthetic
Antimicrobials

• Description:
  • Sheets, gels, pastes
  • Silver compounds, cadexomer iodine, povidone-iodine, manuka honey, polyhexamethylene biguanide

• Usage Considerations:
  • Broad spectrum topical antimicrobials to reduce localized bacteria
  • Immunosuppressed people
  • Prophylactically when wounds are at risk for AROs
  • Chronic wounds that have repeated incidences of infection
  • Does not replace antibiotics for deeper tissue infections
  • Not to be used if known hypersensitivities to any product components
Antimicrobials: Silver

- Used in elemental form
- Broad spectrum antimicrobial, including MRSA and VRE
- No cases of bacterial resistance
- Range of dressings – deliver varying levels of silver
- Hydrocolloids, foams, gels, polyethylene mats

Some images have attached videos
Antimicrobial: Silver

• Some dressings release silver into the wound, others keep their silver in their dressing and kill bacteria as they are absorbed into the dressing

• Most dressings allow for silver activity for up to 7 days

• Indications:
  • Reduction of bioburden
  • Reduce risk of infection over skin grafts, burns, injection sites

• Choice of silver dressing depends on:
  • Wound type
  • Level of exudate
  • Depth
Silver Continued

• Practice Considerations:
  • Should be used short term to reduce bioburden
  • Silver allergy
  • Some must be premoistened before application, i.e. Acticoat
  • Some must be used in combination with sterile water versus saline, i.e. Acticoat
  • Remove prior to radiotherapy
  • May cause discoloration of wound bed and/or periwound
Antimicrobial: Cadexomer Iodine

- Description:
  - Cadexomer iodine (0.9% elemental iodine)
  - Polysaccharide starch mix beads
  - As exudates absorbed by beads, beads release iodine and form a gel
  - Will appear white in color when all iodine released
  - Enhances inflammation
  - Enhances autolytic debridement
  - Promotes moist wound healing environment
  - Odor controlling
  - Ointment, medicated sheet, powder
Cadexomer Iodine

• Practice Considerations:
  • Wounds must be exudating
  • DO NOT USE:
    • Iodine hypersensitivity
    • Hashimoto’s Thyroiditis
    • Hyperthyroidism
    • Non-toxic thyroid goiter
    • Children
    • Pregnant women
    • Greater than 3 months
    • More than 5-10gm tubers per dose or 15-10gm tubes per week
Antimicrobial: Povidone-Iodine (PVP-I)

- **Description:**
  - Antimicrobial low adherent knitted viscose dressing impregnated with polyethylene glycol and 10% povidone-iodine
  - Fading of color of dressing indicates loss of antiseptic efficacy and should be changed
  - Minimizes adherence to wound bed
  - Reduces pain
  - Can be used as primary dressing

- **Indications:**
  - Ulcerative wounds
  - Prevention of infection
Antimicrobial: Manuka Honey

- Description:
  - Anti-inflammatory
  - Antibacterial
  - Promotes moist wound healing
  - Facilitates autolytic debridement
  - Alleviates pain associated with inflammation
  - Odour controlling
  - Alginates, hydrocolloids, gels, paste
Manuka Honey

• Practice considerations:
  • Not to be used on full thickness burns
  • Allergies
  • As it lowers pH, may feel slight stinging
  • Because highly osmolar, may increase amount of exudates for first few days of use

Medi Honey- Derma Sciences
Antimicrobial: Polyhexamethylene Biguanide (PHMB)

• Description:
  • Bacteria killing polymer
  • Attacks bacteria on and within dressing fabric
  • Keeps infection out of wound and limits cross contamination
  • Nothing is left behind to mutate or replicate, so no known resistance
  • Transfer foam, kerlix, packing, gauze, foam dressings, non-adherent

• Indications:
  • Prophylactically
  • Increased bacterial burden
  • Post op on surgical line
Barrier Films

• Description:
  • A sting-free, alcohol-free liquid barrier film that dries quickly to form a breathable, transparent coating on the skin
  • Designed to protect intact or damaged skin from urine, feces, other body fluids, tape trauma, and friction
  • Hypoallergenic
  • Non-toxic
  • Available in wipes, wand applicators, and spray
  • Sterile

• Indications:
  • Preventing incontinence associated dermatitis
  • To protect from adhesives
  • To protect from friction

Cavilon – 3M
Biologic²

• Description:
  • Gels, wafers, sheets
    • Oasis → porcine derived, acellular small intestine submucosa material
    • Promogran → 55% bovine collagen and 45% oxidized regenerated cellulose (ORC)
    • Prisma → 55% bovine collagen, 44% ORC, 1% silver
Biologic

• Indications:
  • Use when other factors have been corrected and healing does not progress at the expected rate

• Usage Considerations:
  • Skill required for selection of the appropriate person/wound and application
  • Should not be used on wounds with infection/sinus tract, excessive exudate, or on those with a known sensitivity
  • Cultural or ethical issues may affect usage
Calcium Alginate

- Description:
  - Sheets, fibrous ropes derived from seaweed
  - Contributes to acute inflammatory response
  - Calcium ion and phospholipid surface promote activation of thrombin in clotting cascade
  - Provide moist environment
  - High absorptive capacity
  - Conform to body shape
  - Protect from microbial contamination
  - Do not adhere to the wound

Biatain Alginate - Coloplast
Calcium Alginate

• Indications:
  • Wounds requiring absorbent packing
  • Wounds prone to bleeding
  • Post sharp debridement
  • Infected wounds

• Usage Considerations:
  • Requires a secondary moisture retentive dressing
  • Should not be used on dry wounds (may premoisten with NS)
  • Low tensile strength – avoid packing into narrow deep sinuses (leave a 2.5cm tail)
  • Moderate ability to promote autolytic debridement
  • Remain in place a maximum of 7 days
Charcoal

- Description:
  - Odor absorbent activated charcoal contained within product
  - Some include a layer of silver, i.e. Actosorb Silver

- Indications:
  - Odorous wounds

- Usage Considerations:
  - Masks the odor but does not treat the cause
  - Ensure that the dressing edges are sealed to control odor
  - Some charcoal products are inactivated by moisture and should not be used as a contact layer
  - Watch for signs of deeper infection
Clear Acrylic²

• Description:
  • Transparent film contact layer and clear, acrylic polymer pad, topped with breathable, waterproof film
  • Impermeable to bacteria, liquids, viruses
  • Various sizes/shapes
  • Maintains moist wound healing environment

• Indications:
  • Skin tears
  • Superficial wounds and burns
  • Pressure ulcers
  • Donor sites
  • Surgical incisions
Clear Acrylic

- **Usage Considerations:**
  - Enables clinicians to monitor small to moderately exudating wounds without changing dressing
  - Supports autolytic debridement
  - Extended wear time (14-21 days)
  - Low potential for skin maceration
  - Do not cut acrylic pad
Composite Dressing

• Description:
  • Multilayered, combination dressings to increase absorbency
    • Diaper bead technology (Combiderm)
    • Hydrofiber technology (Versiva)
  • Some are appropriate for autolysis
  • Hold exudate in dressing
  • Prevent maceration
  • Maintains moist wound healing environment
  • Secondary dressing
  • Aide in autolytic debridement

• Indications:
  • Moderate to highly exudating wounds
  • Pressure wounds, leg ulcers, surgical wounds
Composite Dressings

- Usage Considerations:
  - Wear time determined by amount of drainage
  - Choose dressing size and shape where the absorptive area is at least 3.2cm larger than wound
  - Some dressings can be cut to conform to foot, heel, or elbow

Mesorb - Molnlycke
Films/Membranes

- **Description:**
  - Semi-permeable, polyurethane adhesive sheets
  - Moisture vapor transmission rate varies from film to film
  - Impermeable to liquid and bacterial infiltration
  - Flexible, elastic, extensible
  - Allow easy assessment of the wound (transparent)
  - Do not have ability to absorb exudate
  - Provide for moist environment
  - Enable autolytic debridement
  - Function as a secondary dressing
  - Various sizes/shapes

- **Indications:**
  - Minor burns and simple injuries
  - Post operatively over a suture line
  - Wounds at risk for contamination, trauma
  - Donor sites or partial thickness wounds
Films and Membranes

• Usage Considerations:
  • Can be combined with hydrofibers to alginates to create an island dressing
  • Should not be used on:
    • Deep cavity wounds
    • Full thickness burns
    • Moderate to heavily draining wounds
    • Infected wounds
  • Need to stretch away from skin when removing
  • Use barrier wipe/spray to increase adhesion
  • Apply with no tension
  • May remain in place for 7 days
Foams\textsuperscript{2}

- **Description:**
  - Non-adherent or adherent polyurethane (one layer or multiple layers)
  - May have occlusive properties depending on outer layer
  - Some have other properties such as low tack, antimicrobial action, or pain control
  - Absorb exudate
  - Protect surrounding skin from maceration
  - Raise the core temperature of wounds
  - Maintain a moist wound healing environment
  - Conformable
  - Produce no residue
  - Used as both primary and secondary dressings

Mepilex Border - Molnlycke

Click on the image for a video on the product
Foams

• Indications:
  • Exudating wounds
  • Leg ulcers (even under compression)
  • Pressure ulcers
  • Sutured wounds
  • Skin grafts, donor sites
  • Minor burns

• Usage Considerations:
  • Foams with silver may be indicated for use on infected wounds
  • Occlusive foams without silver should not be used on infected wounds
  • Some wick vertically, some wick laterally
  • Do NOT over pack when using as cavity dressing
  • Do no replace pressure relief devices
  • May remain in place up to seven days
  • Can be cut in shapes
Hydrocolloid

- Description:
  - May contain gelatin, sodium carboxymethylcellulose, and pectin
  - Sheet dressings are occlusive with polyurethane outer layer, forming a barrier against contamination
  - Varied thickness and shapes
  - Also available as granules, powder, and paste
  - Varied occlusiveness
  - Absorbs exudate and forms a gel
  - Doesn’t adhere to wound itself, only intact tissue around wound
  - Moisture retentive primary or secondary dressing
  - Promotes autolytic debridement and granulation
  - Decreases pain and frequency of dressing changes
  - Conform to body shape
  - Protect from microbial contamination

Click on the image for a case study video on the product

Comfeel - Coloplast
Hydrocolloid

- Indications:
  - Superficial leg ulcers
  - Burns
  - Donor sites
  - Pressure ulcers
  - Over sutures

- Usage Considerations:
  - May use in combination with other products
  - Observe peri-wound skin for maceration (minimal to moderate absorbency)
  - Characteristic odor may accompany dressing change and should not be confused with infection
  - Creates occlusive barrier against bacterial invasion
  - Caution when used on fragile skin
  - Should not be used on heavily draining or infected wounds
  - Choose a dressing size and shape that is 3.2cm larger than the wound area
  - May remain in place for 5-7 days
Hydrogel

- Description:
  - Polymers with high water content (30-90%)
  - Two types:
    - Amorphous (gels)
    - Fixed (sheets)
  - Some contain pectin, collagen, preservatives
  - Provide moisture to dry wounds
  - Aide in autolytic debridement
  - Conform to body shape
  - Do not adhere to wound
  - Relieve pain
Hydrogel

• Indications:
  • Dry and/or sloughy wounds
  • Leg ulcers, pressure ulcers
  • Necrotic wounds
  • Superficial and superficial partial thickness burns
  • Carrier of topical drugs applied to wounds

• Usage Considerations:
  • Apply at a minimum thickness of 5mm
  • Peri-wound skin may need protection from maceration
  • Require a secondary dressing
  • Solid sheets should not be used on infected wounds
  • May stay insitu for 3 days (on burns, sheets may remain in place up to 7 days)
  • Monitor closely for infection during autolysis
  • Note shelf life of product after opening – 7 days
  • Do not fill dead space – butter packing with gel
Hydrophilic Fiber

- **Description:**
  - Sheet or packing strip of sodium carboxymethylcellulose
  - Converts a solid gel when activated by moisture
  - Wick vertically

- **Indications:**
  - Moderate to heavily exudating wounds
  - Leg ulcers, pressure ulcers, cavity wounds, minor burns, donor sites, minor burns, donor sites

Aquacel Extra - Convatec
Click on the image for a video of how this product works
Hydrophyllic Fibres

• Usage Considerations:
  Best for moderate amounts of exudate – some may have fluid lock
  • Low tensile strength – avoid packing into narrow, deep sinuses where breakage could happen
  • Should not be used on dry wounds
  • Compatible with other dressings
  • Apply one or more layers to the wound, overlapping the wound edges by 1cm
  • Fill deep wounds loosely – no more than 80%
  • Must ensure that all product is removed
  • Remain in place 1-3 days
Hypertonic²

• **Description:**
  - Gauze ribbon, gauze wafer or gel impregnated with salt concentrate (hypertonic sodium chloride solution or crystals)
  - Hypertonic saline draws fluid from surface cells via osmosis

• **Indications:**
  - Can be used on wounds that have moderate to large drainage
  - Used for wounds with necrotic tissue (autolytic debridement)
  - Hypergranulation tissue
Hypertonic

• Usage Considerations:
  • Requires a secondary dressing
  • May be painful on sensitive tissue
  • Gauze dressings should not be used on dry wounds
  • May help to relieve local edema
  • Must be applied dry to remain hypertonic
  • Gel most effective when eschar has been cross-hatched
  • Should be changed every 24 hours
Non-adherent Synthetic

• **Description:**
  - Porous sheets of dressings with low adherence to tissue
  - Serves as a contact layer that allows the transfer of exudate to secondary dressing
  - May be composed of silicone, medicated or non-medicated tulles

• **Indications:**
  - Facilitates application of topical preparations
  - Use with wounds that are painful or friable
Non-Adherent Synthetic

- Usage Considerations:
  - May require a secondary dressing
  - Some products may be left on for up to 7 days
  - Evidence exists that rinsing and reusing product does not eradicate bacteria on surface of silicone dressing
Pain Control Dressings

• **Description:**
  • Foam dressing with continuous release of Ibuprofen and low tack surface

• **Indications:**
  • Painful exudating wounds

• **Considerations:**
  • Can use a silver powder or mesh with this product
  • Do not use with known IBU hypersensitivities

Biatain IBU - Coloplast
Dressing Selection

Summary

• Get to know your dressings – all dressings are not created equally

• Simplify by considering where a dressing fits in the major classes

• Choose a dressing which takes into account:
  • Wound bed state
  • Goals of therapy
  • Person’s preference
  • Caregiver needs

• Change dressing type as needs change
SWRWCP Moisture/Dressing Resources

- Debridement
- Infection/Inflammation
- Moisture Balance and Dressing Selection

Guideline: The Assessment and Management of Moisture in Acute and Chronic Wounds

Generic Dressing Selection and Cleansing Enablers:
- Dressing Selection and Cleansing Enabler – HEALABLE WOUNDS
- Dressing Selection and Cleansing Enabler – MAINTENANCE/NON-HEALABLE WOUNDS
- Table of Frequently Used Wound Care Companies, and their Products Categorized by Type

Community Nursing Specific Dressing Selection and Cleansing Enablers:
- Dressing Selection and Cleansing Enabler – HEALABLE WOUNDS
- Dressing Selection and Cleansing Enabler – MAINTENANCE/NON-HEALABLE WOUNDS
- Community Focused Dressing Enabler Catalogue

Hospital Specific Dressing Selection and Cleansing
Review

1. The significance of exudates and how to manage them

2. The importance of moist wound healing

3. Properties of ideal dressings

4. The need to thoroughly and holistically assess the whole person and their wound, addressing the cause, person-centered concerns, debridement and infection prior to selecting a dressing, as wound dressings are a very small part of managing any wound
For more information visit: swrwoundcareprogram.ca
References

7. Thomlinson D. To clean or not to clean? Nursing Times. 1987;83(9):71-75.