The Skin-ny on Pressure Ulcers; Prevention, Recognition, Management
“Pressure ulcers are increasing among hospital patients”
Between 1993 and 2006, the total number of hospitalizations related to pressure ulcers increased by 78.9%*

AHRQ January 2009
• Incidence rate of .4 – 38% in acute care

• 2.5 – 3 million individuals treated for pressure ulcers each year in the U.S

Middaugh 2009
Pressure Ulcer:

Localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear and/or friction

NPUAP 2007
Dependent upon

1. Intensity of pressure
2. Duration of pressure
3. Tissue tolerance
Intensity of pressure plays significant role in tissue destruction

Capillary closing pressure = minimal amount of pressure required to collapse a capillary. (Burton and Yamada 1951)

Tissue anoxia develops when externally applied pressure causes vessels to collapse.

Commonly estimated at 12 - 32 mmHg.
Low intensity pressures over a long period can create as much tissue damage as high-intensity pressure over a short period. (Kosiak 1961)
Tissue Tolerance

Condition or integrity of skin and supporting structures that influence the skin’s ability to redistribute pressure applied to it.

Once skin has become “sensitized” by exposure to pressure, lower pressure to same area for shorter periods, may cause breakdown.

Husain 1953
Tissue Tolerance Affected By:

- Shear – combination of gravity and friction. Parallel force on skin as result of gravity pushing down and friction between patient and surface.
- Friction – alone, it produces abrasions on skin surface. With gravity it produces shear

- Moisture – alters resiliency of epidermis to external forces
Skin injury can occur in as little as two hours however, visual evidence of tissue necrosis may not show up for 48 + hours after the event.
Pressure ulcers cause harm to patients!

- Pain and discomfort
- Increased length of stay
- Increased use of health care resources
- Infection (osteomyelitis)
- Sepsis
- Premature death
Over 60,000 patients die each year from complications of pressure ulcers in the U.S.
Estimated Cost Of Treating A Single Ulcer Can Range From $500 To $40,000

Total Cost For Treatment Of Pressure Ulcers In The U.S Is Estimated At 11 Billion Dollars Per Year

JAMA 2006
CMS no longer provides additional reimbursement to cover the cost of treating hospital acquired pressure ulcers.
Most Pressure Ulcers Are Preventable!

“Preventing pressure ulcers requires a complex interaction of interventions”

Lyder 2003
Prevention Strategies

1. Head to toe skin inspection upon admission, every day or every shift
2. Risk assessment
3. Minimize forces of pressure/friction and shear
4. Optimize nutrition and hydration
5. Manage moisture
Skin Inspection

Should include skin under braces or other devices that may be removed safely.
Dark skin may make it difficult to see subtle changes in skin color.
Palpation should be used along with visualization.

Don’t dismiss risk in young, “healthy” individuals or pediatric patients.
Risk Assessment
More Than 100 Risk Factors Have Been Identified In The Literature

Braden, Norton and Waterlow scales are all determined to be more accurate than the clinical judgment of health care professionals.
Recognizing risk is first step in preventing pressure ulcers before they have a chance to develop.

Waiting even 48 hours to implement prevention strategies may be too late.
Minimize Pressure, Friction And Shear

- Turning/re-positioning
- Specialty mattress and positioning supports
- Head of bed at 30 degrees or less
- Heel suspension
- Turn sheets, air filled transfer mats, chair cushions
Support Surfaces

Mattress overlay vs. Mattress replacement
Static vs. Dynamic

- Foam – effectiveness varies greatly
- Gel – good at reducing shear; may increase moisture
- Air – non-powered vs. Powered
- Air fluidized – air and fluid support through silicone coated beads
Manage Moisture

- Moisture from incontinence alters skin’s protective pH and increases permeability of stratum corneum.

- Digestive enzymes in stool may further irritate the skin, causing erosion.

- Frequent cleansing can lead to further pH changes and skin becomes damaged from friction.
● Under pads or diapers may trap moisture next to skin, rather than wick it away

● Incontinence, perineal skin breakdown and pressure ulcer development are linked

● Maklebust and Magnan (1992) found 56.7% of patients with pressure ulcers had fecal incontinence
Know the difference between pressure related injury and incontinence associated dermatitis.
Optimize Nutrition and Hydration

- Be proactive

- Liberalize patients’ diet as soon as able and encourage PO

- Consider supplemental tube feeding sooner rather than later
Tools to Assess Nutritional Status

PAB and albumin are not nutrition Markers
They are considered negative acute phase proteins and reflect the severity of the illness

Levels can drop with inflammation despite adequate nutrition
Wound Assessment and Management

Comprehensive assessment of patient and wound is first step in effective management.
Complete Patient Assessment

- Etiology of wound
- Duration of wound
- Wound assessment
- Factors that impede wound healing
  - Co-morbidities
  - Host infection/illness
  - Medications
  - Poor nutrition
  - Decreased perfusion
  - Pressure, Friction, Shear
Wound Assessment

- Determines dressing choice
- Ongoing re-assessment allows caregiver to determine whether current topical treatment is appropriate.
Wound Assessment Parameters

- Location
- Extent of tissue injury (Stage or Thickness)
- Dimensions
- Characteristics of wound base
- Exudate
- Wound edges
- Undermining or tunneling
- Peri-wound skin
- Pain
- S&S of infection
Extent of Tissue Injury (Staging)

Only pressure ulcers are staged.

Other types of wounds such as skin tears and vascular ulcers should not be staged so they are not mistaken for pressure ulcers.
Pressure Ulcer Stages: Stage I

- intact skin with non-blanchable redness over a bony prominence.
- darkly pigmented skin may not have visible blanching;
- may be painful, firm, soft, warmer or cooler as compared to adjacent tissue.
- may be difficult to detect in individuals with dark skin tones.
Pressure Ulcer Stage II

- partial thickness loss of dermis
- shallow open ulcer
- red pink wound bed, without slough, or
- intact or open/ruptured serum-filled blister or
- shiny or dry shallow ulcer without slough or bruising
Pressure Ulcer Stage III

- full thickness tissue loss
- subcutaneous fat may be visible but bone, tendon or muscle are not exposed
- may include undermining and tunneling
- depth of a stage III pressure ulcer varies by anatomical location.
- the bridge of the nose, ear, occiput and malleolus do not have subcutaneous tissue and stage III ulcers can be shallow.
Pressure Ulcer Stage IV

- Full thickness tissue loss with exposed bone, tendon or muscle.
- Slough or eschar may be present.
- May include undermining and tunneling.
- Depth varies by anatomical location. The bridge of the nose, ear, occiput and malleolus do not have subcutaneous tissue so these ulcers can be shallow.
- Potential for osteomyelitis.
Unstageable

- full thickness tissue loss
- base of the ulcer is covered by slough (yellow, tan, gray, green or brown) and/or eschar (tan, brown or black)
- the true depth, and stage cannot be determined until enough slough and/or eschar is removed to expose the base of the wound,
- Stable (dry, adherent, intact without erythema or fluctuance) eschar on the heels serves as "the body's natural (biological) cover" and should not be removed.
Deep Tissue Injury

- area of discolored purple or maroon localized intact skin or blood-filled blister
- due to damage of underlying soft tissue from pressure and/or shear.
- may be preceded by tissue that is painful, firm, mushy, boggy, warmer or cooler than adjacent tissue.
- may be difficult to detect in individuals with dark skin tones.
Pressure ulcers heal to progressively more shallow depth, they do not replace lost muscle, subcutaneous fat, or dermis before they re-epithelialize.

Instead, the full thickness ulcer is filled with granulation (scar) tissue composed primarily of endothelial cells, fibroblasts, collagen and extracellular matrix.
When a Stage IV ulcer has healed it should be classified as a healed Stage IV pressure ulcer not a Stage 0 pressure ulcer.

Reverse staging does not accurately characterize what is physiologically occurring in the ulcer.
New Law in October 2008

Stage 3, Stage 4 and Unstageable pressure ulcers that are documented upon admission will provide a higher reimbursement rate from Medicare.

Documentation of pressure ulcers upon admission to the hospital is even more important than in the past!
Principles of Wound Management
from Acute and Chronic Wounds, Bryant and Nix

1. Control or eliminate causative factors
2. Provide systemic support to reduce co-morbidities
3. Maintain a physiologic local wound environment.
Objectives To Achieve A Physiologic Wound Environment

1. Cleanse wound
2. Remove necrotic/non-viable tissue
3. Prevent and manage infection
4. Eliminate “dead space”
5. Manage exudate
6. Maintain a moist wound bed
7. Protect wound and peri-wound skin from trauma, bacteria and cold
# Wound Care Product Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Characteristics</th>
<th>Trade Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alginate/ Hydrofiber</td>
<td>Highly Absorbent Conformable</td>
<td>Sorbsan, AlgiSite</td>
</tr>
<tr>
<td>Foam</td>
<td>Moderate absorption, non-stick</td>
<td>Biatain, Allevyn</td>
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<tr>
<td>Gauze</td>
<td>Inexpensive</td>
<td>Nu Gauze packing strips</td>
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<tr>
<td>Impregnated gauze</td>
<td>Packing material</td>
<td>Mesalt, Adaptic</td>
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## Wound Care Product Categories

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<th>Category</th>
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<tr>
<td>Hydrocolloid</td>
<td>Min. absorption</td>
<td><em>Duoderm</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Restore</em></td>
</tr>
<tr>
<td>Hydrogel</td>
<td>Donates fluid to wound bed</td>
<td><em>Inrarasite,</em></td>
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<td></td>
<td></td>
<td><em>Curasol</em></td>
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<tr>
<td>Contact Layer</td>
<td>Protects wound base</td>
<td><em>Mepitel,</em></td>
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<td><em>Tegapore</em></td>
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</table>
Wet to Dry vs. Moist Gauze Packing

Form of non-selective mechanical debridement

- Barely moistened gauze is packed into wound with dry gauze over
- Dry packing is removed briskly, removing both necrotic and viable tissue that is “stuck” to the gauze

Promotes wound healing by filling wound bed/cavity with moist gauze

- Packing should remain moist while in wound bed-if gauze is dry when removed, change more frequently or add hydrogel to gauze
- If large amounts of exudate, change more frequently or use alginate or hydrofiber for increased absorption
Moist Wound Healing is associated with:

- Less intense, less prolonged inflammation (Rovee et al. 1972)
- Increased fibroblast proliferation (Katz et al. 1992)
- Increased collagen synthesis (Leipziger et al. 1985)
- Earlier, less prolonged angiogenesis (Lydon et al. 1989)
Topical Products That Delay Wound Healing

Providone iodine, acetic acid, hydrogen peroxide are cytotoxic to white blood cells and fibroblasts.

Primary mechanism is to destroy cell walls.
References


NPUAP 2007 National Pressure Ulcer Advisory Panel NPUAP.org


References


NPUAP 2007 National Pressure Ulcer Advisory Panel NPUAP.org


**Resources**

Minnesota Hospital Association, Safe Skin Initiative at: [www.mnhospitals.org/](http://www.mnhospitals.org/)


National Pressure Ulcer Advisory Panel at: [NPUAP.org](http://www.npuap.org)


## Advanced Wound Care Product Categories

<table>
<thead>
<tr>
<th>Product Category</th>
<th>Action</th>
<th>Indications</th>
<th>Contraindications</th>
<th>Guidelines for Use</th>
<th>Trade Names</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hydrocolloid</strong></td>
<td>⬤ Supports autolytic debridment, ⬤ Maintains moist wound surface ⬤ Limited absorption ⬤ Will not adhere to wound bed; may adhere to peri-wound skin.</td>
<td>Partial thickness wounds or Stage 2-3 pressure ulcers (shallow, not cavity wounds) Wounds requiring debridment Granulating wounds</td>
<td>Wounds with large amounts of exudate Wounds with undermining, tunnels or tracts. Infected wounds Full thickness wounds with depth, unless hydrocolloid is used over packing.</td>
<td>May need to secure edges with transparent dressing or tape to prevent rolling.</td>
<td>Duoderm Replicare Tegaderm Hydrocolloid Comfeel Plus</td>
</tr>
<tr>
<td><strong>Foam</strong></td>
<td>⬤ Absorb excess exudate. ⬤ Insulate wound surface ⬤ Autolytic debridment if wound bed is moist.</td>
<td>Partial to full thickness wound with moderate to large amounts of drainage. As a cover dressing to provide additional absorption.</td>
<td>Dry wounds Wounds with dry eschar Wounds with tunnels or sinus tracking</td>
<td>Dressing change frequency is dependent upon amount of exudate</td>
<td>Allevyn Optifoam Lyofoam Polymem</td>
</tr>
<tr>
<td><strong>Alginate and Hydrofiber</strong></td>
<td>⬤ Support autolytic debridment as long as wound bed is moist. ⬤ Absorb large volumes of exudate. ⬤ Eliminate dead space. ⬤ Maintain moist wound surface. ⬤ Conforms to shape of the wound.</td>
<td>- Wounds with large amounts of exudate - Wounds with undermining or easily accessed sinus tracts. - Wounds with combination of exudate and necrotic tissue.</td>
<td>Dry wounds – unless dressing is meant to be moistened before placing in wound bed. Wounds with dry eschar</td>
<td>Always require a cover dressing May be cut to fit appropriate size Should not be packed tightly into wounds as dressing may swell when wet</td>
<td>Alginate – Algisite SeaSorb Maxorb Kaltostat Hydrofiber – Aquacel</td>
</tr>
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<tr>
<td><strong>Hydrogel</strong></td>
<td>- Support/encourage autolytic debridment</td>
<td>Amorphous</td>
<td>Wet or moist wounds</td>
<td>Must match appropriate form of gel to wound type.</td>
<td>Amorphous SoloSite Skintegrity Intrasite Saf-Gel</td>
</tr>
<tr>
<td></td>
<td>- Maintain or add moisture to wound bed</td>
<td>Dry wounds with eschar</td>
<td></td>
<td>Amorphous hydrogels may vary a great deal in water vs. glycerin content. Gels with high water content may dry out more easily. Gels with high glycerin content may macerate surrounding skin.</td>
<td>Sheet ElastoGel FlexiGel</td>
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<td></td>
<td>- Encourage softening of eschar</td>
<td>Wounds with mixed clean and necrotic wound bed</td>
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<td>- Sheet form may provide limited absorption of exudate with protection of peri-wound skin.</td>
<td><strong>Sheet</strong> Lower extremity wounds Skin tears Shallow wounds Painful wounds where dressing removal may be traumatic</td>
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<tr>
<td><strong>Impregnated Gauze</strong></td>
<td>Wide variety of uses and applications from wound debridment from effect of hypertonic saline to sin protection from Vaseline.</td>
<td>According to type of product</td>
<td></td>
<td>Always require a secondary dressing.</td>
<td>Vaseline gauze Adaptic Oil Emulsion Dressing Mesalt (hypertonic saline)</td>
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<td><strong>Gauze may be impregnated with a variety of substances to achieve a variety of healing goals.</strong></td>
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<tr>
<td><strong>Transparent Film</strong></td>
<td>Support autolytic debridment in wounds with dry eschar.</td>
<td>Dry necrotic wounds which require debridment.</td>
<td>Wet wounds</td>
<td>Frequency of change depends on amount of exudate or loss of secure seal.</td>
<td>Tegaderm OpSite Sureview</td>
</tr>
<tr>
<td></td>
<td>Maintain moist wound surface.</td>
<td>Intact skin which needs thermal protection or protection from friction.</td>
<td>Wounds with tracts or tunnels Friable, fragile skin around wound</td>
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<tr>
<td></td>
<td>Protect intact skin from friction.</td>
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