WOUND CARE (with focus on pressure ulcers)

**Definition**

- **Pressure Ulcer (PU):**
  - Localized injury to skin and/or underlying tissue, usually over a bony prominence, as a result of pressure, or pressure in combination with shear and/or friction

**Epidemiology**

- Estimated 1.3-3 million individuals develop PUs annually
- U.S. incidence: 0.4-38% for hospitals; 2.2-23.9% for long-term care; 0-17% for home care → ideal: < 2%
- Estimated cost to heal each ulcer = $500-$40,000 → estimated cost = > 3 billion acute healthcare dollars
- Indicator of quality of care → need to evaluate initially & assess to prevent

**Predisposing factors**

- > 100 risk factors identified → PU prediction tools used to help identify those at risk
  - Norton Scale (based on physical condition, mental state, activity, mobility, incontinence)
  - Braden Scale (based on sensory perception, moisture, activity, mobility, nutrition, friction & shear)
- Groups at risk:
  - Age: > 65 yo, neonates & < 5 yo
  - Spinal cord injury
  - Acute care setting: usually develop within 1st 2 weeks of hospitalization
  - Long-term care setting: usually develop within the 1st 4 weeks of admission

**Pathophysiology**

- Interference of tissue blood supply occurs with compression of soft tissue → vascular insufficiency, tissue anoxia, cell death
- Occurs over bony prominences where there is less tissue to compress (can develop on any part of body)
- Other factors (e.g. impairment of microcirculatory system, incontinence, poor nutrition, friction & shear, moisture immobility etc) contribute to tissue breakdown
- PUs can develop within 2-6 hours
- Factors impairing wound healing once a PU develops: impaired mobility, impaired sensation, excessive moisture, malnutrition, age, immunosuppression, compromised circulation, insufficient O2 (low hemoglobin), excessive pressure, diabetes, low protein stores

**Differential Diagnoses**

- Ischemic ulcer
- Diabetic ulcer
- Stasis ulceration & dermatitis
- Skin tears, abrasion lesions, maceration lesions
- Burns
- Sickle cell ulcers

**Clinical Features**

- Staging (International NPUAP-EPUAP PU classification system)
  - stage 1: intact skin with non-blanchable erythema of a localized area, usually over a bony prominence
  - stage 2: partial thickness loss of dermis → shallow open ulcer with red pink wound bed (without slough)
  - stage 3: full thickness tissue loss (subcutaneous fat may be visible, slough may be present)
  - stage 4: full thickness tissue loss with exposed muscle/bone/tendon (slough or eschar may be present)
  - Unstageable: full thickness tissue loss in which actual depth is completely obscured by slough/eschar → likely stage 3 or 4
  - Deep tissue injury: purple/maroon localized area of discolored intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or shear

**Clinical Assessment/Evaluation**

- At admission
  - Assess patient’s risks for developing a PU
  - Examine skin completely at initial evaluation
    - If PU is present, stage appropriately (depth) & characterize
    - Do NOT use staging system if it is not a pressure ulcer
- Implement comprehensive preventive programs
  - Assess &inspect skin regularly
  - Assess for immobility, friction/shearing, incontinence, nutrition status
- If PU(s) present → photograph
  - Clean ulcer prior to evaluating

**Types of tissue found in wounds**

- Granulation
- Necrotic
- Slough
- Eschar
Prevention
- Out of bed (PT)
- Reposition patient: q2 hour schedule for bed-bound patient; q1 hour schedule for chair-bound patient
- Maintain head of bed < 30° or at the lowest degree of elevation possible consistent with medical condition
- Use pillows or other devices to relieve pressure under heels
- Avoid using foam rings, donuts, sheepskin for pressure reduction; avoid vigorous massage over bony prominences
- Use turning or left sheets or devices to turn/transfer patient
- Clean & dry skin after each incontinent episode → consider collection device for urine/stool
- Maintain adequate nutrition

Classes of support surfaces

<table>
<thead>
<tr>
<th>Support Surface</th>
<th>↑ Support Area</th>
<th>↓ Pressure</th>
<th>↓ Shear</th>
<th>Dynamic</th>
<th>Low Moisture Retention</th>
<th>↓ Heat Accumulation</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Mattress</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$</td>
</tr>
<tr>
<td><strong>Group 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foam</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$</td>
</tr>
<tr>
<td>Static Flotation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Group 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$$</td>
</tr>
<tr>
<td>Alternating Air</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Air Loss</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Group 3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$$$</td>
</tr>
<tr>
<td>Air Fluidized &amp; Devices</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Treatment
- Prevention is key
- Provide appropriate support surface
- Clean ulcer using saline solution or potable water; use caution with antiseptics
- Debride (exception: thick dry eschar in ischemic limb or at heel)
  - Mechanical: wet to dry dressing (WTDD), hydrotherapy, wound irrigation/scrubbing
  - Sharp: scalpel, scissors
  - Enzymatic: topical agents to promote granulation tissue
  - Autolytic: occlusive dressing with enzymes to digest necrotic tissue
- Select dressing to maintain moist wound environment

Dressing Classification

<table>
<thead>
<tr>
<th>Dressing Classification</th>
<th>Stage I</th>
<th>Stage II</th>
<th>Stage III/IV</th>
<th>Dry</th>
<th>Light Drainage</th>
<th>Moderate Drainage</th>
<th>Heavy Drainage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transparent Films</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrocolloids</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alginates</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foams</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrogels</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrofibers</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Nutrition
- Adequate calorie (30-35kcal/kg/d) & protein (1.25-1.5g/kg/d) intake
- Correct deficiencies (otherwise there's lack of evidence of helping to heal/prevent ulcers)

Assess & treat pain (e.g. with medications, choose treatment with less dressing changes etc)

Regularly evaluate healing (should see improvement within 2 weeks)
- Do NOT reverse stage as wound heals
- Validated tools: Pressure Sore Status Tool (PSST)\(^4\), Pressure Ulcer Scale for Healing (PUSH)\(^5\)

Wound Infections
- Regular swab cultures not clinically useful → tissue biopsy or Levine quantitative swab technique
- Topical agents: silver sulfadiazine, antibiotic ointment, propylene glycol
- Systemic infections: use systemic antibiotics

Surgery (stage III/IV PU): direct closure vs. flap vs. diverting colostomy (high ulcer recurrence)

Adjunctive therapies
- Electrical stimulation, electromagnetic agents, phototherapy, acoustic energy, negative pressure wound therapy, hypertherapy, oxygen therapy

Complications
- Local or/and systemic infection
- Death

Resources
- http://www.npuap.org/
- http://champ.bsd.uchicago.edu/woundCare/index.html

References
2. Lyder CH. *JAMA* 2003;289(2):223-26