Objectives

- Define pressure ulcers, venous stasis ulcers, and arterial ulcer with treatment options
- Identify non-healing wounds and treatment
- Utilize M-E-A-S-U-R-E acronym for wound assessment
- Explain the principles of wound management and topical treatment
- Discuss advanced wound care modalities

Cascade of Wound Healing

Factors Effecting Wound Healing

- Co-morbidities
- Medications
- Age
- Infection
- Circulation! Circulation! Circulation!
- Nutrition

Normal Healing Process

Tissue Recovery

Recovery of Tensile Strength

INJURY

60 MINUTES

Mary D. Jones, RN, MSN, ANP-BC, CWON

Smith and Nephew, 1999

Smith & Nephew, 1999
Principles of Wound Management

- Identify and correct etiology factors (pressure, arterial or venous insufficiency, etc)
- Provide systemic support (blood glucose control, nutritional support, edema management, etc)
- Assess for infection
- Ongoing evaluation
- What is the **GOAL?**
  Maintenance vs Healing

Cost of Pressure Ulcers

- Cost to treat a PU in the US grew from $1.3 billion in 1992 to $17.2 billion in 2003 with an average cost of $21,675 per PU treated.
- In 2008, PUs are described as the most frequent and expensive medical error costing more than $3.8 million.
- Cost reporting methods vary across different healthcare systems.

Pressure Ulcers

- Localized tissue injury to the skin and underlying tissue.
- As a result of **pressure**.
- Ulcers are most commonly located over **bony prominences**.
- Staged to classify degree of tissue damage.
- The pressure ulcer staging system developed by the National Pressure Ulcer Advisory Panel.
- **Do not** back stage (stage 4 cannot become a stage 3).

Pressure Ulcer Contributed to The Death of Superman

Typical Pressure Site

Stage I Pressure Ulcer

- Intact skin with non-blanchable redness of a localized area usually over a bony prominence.
- Darkly pigmented skin may not have visible blanching, its color may differ from the surrounding area.
- Skin may be painful, firm, soft, warmer or cooler as compared to adjacent tissue.
- Remove the CAUSE.
Stage 2 Pressure Ulcer
*partial thickness skin loss*

- Loss of the epidermis presenting as a shallow open ulcer with a red pink wound bed, **without slough**.
- May also present as an intact or open/ruptured serum-filled blister
May use a barrier cream as zinc oxide

Stage 3 Pressure Ulcers
*Full thickness tissue loss*

- Subcutaneous fat may be visible but bone, tendon or muscle are not exposed
- Slough may be present but does not obscure the depth of tissue loss. May include undermining and tunneling
- Depth will vary based on anatomical location of the body
  - Nose, ears, thin/malnourished person

Wound or Surgical Consult

Unstageable Pressure Ulcer

- Full thickness tissue loss in which the base of the ulcer is covered by **slough** (yellow, tan, gray, green or brown) and/or **eschar** (tan, brown or black) in the wound bed.
- Until enough **slough** and/or **eschar** is removed to expose the base of the wound, the true depth, and therefore stage, cannot be determined.
Which is Pressure and Which is Not?

Assessing Wounds/Ulcers

- History of the wound
- Etiology factors
- Systemic Factors
- Infection?
- Diagnostic tests
- Topical treatment
- Pain
- Follow-up care

Clinical Wound Assessment

M - Measure (Length x Width x Depth)
E - Exudate (Quality and Quantity)
A - Appearance (Wound bed tissue type and amount)
S - Suffering (pain type and level)
U - Undermining (Presence or absence)
R - Reevaluate (Monitoring of all parameters routinely)
E - Condition of edges and surrounding tissue

Exudate/Drainage

- Wound fluid
  - Serum
  - Cellular debris
  - Bacteria and leukocytes
- Amount
  - Minimal
  - Moderate
  - Large
- Presence of odor
- Color
  - Sero-sanguinous
  - Serous
  - Tan
  - Green
Red is Good

- **Red** refers to granulation tissue
  - the goal for the wound bed to achieve healing
- **Yellow/tan** refers to loose stringy necrotic tissue
- **Black** is eschar. Thick, leathery, DEAD tissue

Appearance

- Eschar is brown or black avascular tissue.
- The eschar is DEAD tissue
- It may be tightly adhering or loosely adhering to the wound

Caution, Caution............

- If scab or dry eschar on lower extremities leave it dry and open to air unless further instructed by MD or wound care nurse
  - There may not be adequate blood flow to support wound healing
- Do NOT recommend a Hydrocolloid dressing over intact eschar!

Appearance

- Slough is a yellow or tan colored tissue
- Slough is avascular tissue
- Treatment varies:
  1. May be mechanically removed with wet-to-dry gauze dressings,
  2. surgically removed or
  3. Enzymatically

Suffering

Referral for Wound Care or Surgeon
Re-evaluate Wounds with Follow-up Plan

Feet, Diabetic ulcers, toenail problems = **Podiatry**
Complex wounds, Stage 3 or 4 Pressure Ulcers = **Surgeon**
Chronic wounds or ulcerations/ostomy = **Out-Patient Wound / Ostomy Clinic**
Must have a **PCP**
Vascular ischemic arterial wounds = **Vascular Surgeon**

Non-Healing Wounds

If the wound does not respond to therapy in a timely manner

**BIOPSY**
and it looks funky
**BIOPSY**
and located in a strange place.........
**BIOPSY**

Edges and Peri-wound Skin

Non-Healing Wounds

Marjolin Ulcer

- Malignant transformation of chronic ulcer, scar or area of chronic inflammation with average time from injury to diagnosis was 21.4 years
- Secondary to trauma, burns or chronic non-healing ulcers
- Well-differentiated squamous cell carcinoma
- Usually on extremity
- Males > Females
- Ages ranged from 32 to 70 years (mean 46.6)


Marjolin Ulcer

Venous Stasis Ulcer
- Edema
- Hemosiderin staining
- Location
  - Medial malleolus
- Highly exudating
- Shallow
- Dark red, often with thin layer of slough
- Irregular edges
- Painful

Venous Stasis Treatment
GOLD Standard
IS COMPRESSION

Arterial Ulcers
- Distally located on toes and areas of trauma
- Painful
- Minimal exudate
- Punctuated ulcer with pale ulcer bed
- Decreased edema
- Pallor with elevation of the limb and rubor in the dependent position

Arterial Ulcer Treatment
- Minimize risk of infection
- Continual assessment/management for tissue deterioration of tissue status
- Pain Management
- Patient Education
Debride or NOT Debride

Debride
- Removal of Senescent/Non-healing cells
- Necrosis associated with infection
- Remove necrotic tissue
- Converts chronic to acute wound
- Preparation for Advanced wound modalities

Not Debride
- Ischemic wound
- Intact dried eschar in non-infected wound, on distal extremity
- Clotting disorder
- Systemic infection, i.e., cellulitis with risk of sepsis

Non-Surgical Debridement Options

- **Enzymatic Debridement (Santyl)**
  Somewhat costly
  Prescription required
- **Autolytic Debridement**
  Healthy person
- **Chemical Debridement**
  Dakin's solution soaked gauze changed every 12 hrs
  Good for malodorous wounds
- **Ultrasound Debridement**
  Mist therapy
- **Mechanical Debridement**
  Non-selective wet-to-dry gauze
- **Maggot Therapy**
  Used with containment dressing

Debride or Not?

- Debridement is not a single event:
  * Initial debridement
  * Maintenance phases
- There is evidence for a "cellular burden" of senescent cells need to be removed

Chronic Wounds and Bacteria

Infection
- Contamination
- Colonization
- Critical Colonization

Infection = Organism x number x virulence

Host Resistance

Debridement: development of the concept | In Perioper Practice 2011;21 (3):104-5

Guidelines for the Management of Skin and Soft Tissue Infections (SSTI)

- Cutaneous abscess: I & D is primary tx
- Abscesses associated with severe , extensive or rapid progression of the infection start antibiotic therapy
- For empirical coverage for CA-MRSA in out-patient with SSTI oral antibiotics: Clindamycin, Septra, a tetracycline and Linezolid
- Out-patient purulent cellulitis empirical antibiotic therapy for CA-MRSA until culture results
- Out-patient with non-purulent cellulitis empirical therapy for B-hemolytic streptococci is recommended
- If no improvement recommended empirical coverage for CA-MRSA
- Hospitalized patient with complicated SSTI required surgical debridement with broad spectrum antibiotic and empirical therapy for MRSA pending cultures
- Children with minor infections as impetigo and secondarily infected skin lesions use Mupirocin 2% topical treatment

Preventive Education

- Maintain good personal hygiene with bathing and hand washing with soap and water or alcohol-based hand gel
- Not sharing personal items (i.e., razors or towels)
- Cleaning high-touch surfaces cleaned routinely
- Decolonization to be considered infection recurrence despite the hygiene efforts using:
  - Nasal decolonization with mupirocin 2% ointment 2x/day for 5-10 days
  - Body decolonization with antiseptic solution (i.e., chlorhexidine) for 5-14 days.
  - Taking dilute bleach baths for 15 minutes 2x/week for 3 months.
  - Dilute bath receipt is 1 teaspoon per gallon of water or ¼ cup per ¼ tub or 13 gallons of water

Laboratory Essentials

- Cultures of the wound using Levine technique
- Non-invasive arterial study with ABI and Toe pressures
- Arterial Doppler
- Venous Doppler study
- HgbA1C
- CBC with a complete Nutritional Panel including the prealbumin
- Plain x-ray with 3 views

Principles for Topical Wound Therapies:

- Address the etiology of the wound
- Identify and treat infection
- Debride necrotic tissue
- Manage the dead space, tunnels and undermining
- Absorb excess exudate
- Maintain a moist wound surface
- Open all wound edges
- Protect the healing wound from trauma
- Insulate the wound bed
- Pack wounds lightly but not too tightly

Purpose of Wound Therapies

To Augment the Body’s Ability to Heal

Keep in Mind...

What is the Goal of Treatment?

Risk vs Benefit
Multiple Wound Therapies

- Gels, Sterile Medical-Grade Honey, Silver
- Dressings, i.e., foam, composite, absorbent
- Larva Therapy
- Negative Pressure Wound Therapies
- Hyperbaric
- Ultrasound
- Biological

Topical Therapies

**Antimicrobial Topical Therapies**

1. Sterile Medical Grade Honey
   - Honey is broad-spectrum antimicrobial with low sugar content, low water content and acidity inhibiting a wide range of bacteria, fungi, protozoa, and viruses
   - Possible presence of bacterial spores in OTC honey should not be ignored
   - Sterile medical grade honey recommended

2. Cadexomer iodine
   - Improved venous stasis ulcers (Cochrane review, 2008)
   - Can cause a stinging sensation in wound beds
   - Iodine allergy is contraindicated

3. Silver-containing dressings
   - May stain the skin
   - Questions of developing silver resistance over time

4. Hydrofera Blue
   - Bacteriostatic combining Methylene blue and Gentian Violet

*All antimicrobial topical treatments have limited evidence on the effectiveness and require more research to make any definitive conclusion*

Dressings Options

- Mepilex
  - Used on skin tears, wounds with moderate amount of drainage
  - Good for 2-3 days
  - $4.80/each

- Feminine Pads
  - Used on all types of wounds and drainage
  - Easily purchased
  - Change prn
  - Cost $.40/each

Negative Pressure Wound Therapy

- Microstrain and macrostrain of cell stimulating cell proliferation and increase wound healing
- Promotes granulation tissue
- Reduces edema
- Removes exudate and infectious fluid
- Increases cellular perfusion
- Draws the wound edges together
- Decreases frequency of dressing changes

Seal-A-Meal

Hyperbaric Therapy

- Hyperoxygenation increase the amount of oxygen in the blood, reducing nitrogen and carbon monoxide levels thus supplying more oxygen to the skin and underlying tissues
- Reduction in edema occurs because of an adrenergic-like vasoconstriction like in burns and crushing injuries
- Antimicrobial effect includes inhibition and inactivation of toxins, bacteriostasis; enhances white blood function and improves antibiotic transport
- Enhanced angiogenesis and increases capillary formation
- Tissue viability maintained in the ischemic regions
HBO Chambers

Biological Therapies

- **Apligraf**
  *Bi-layered skin substitute: Epidermal layer with human keratinocytes and a dermal layer with fibroblasts*
  *From the neonate male foreskin*

  **Indications:** Ulcers **NOT** responding to conventional therapy
  - Non-infected partial and full thickness venous stasis ulcer greater than 3 month duration
  - Diabetic foot ulcer greater than 3 weeks duration not involving tendon, muscle, capsule or bone exposure

Treat for Success

- **NPWT**
  Outpatient costs for one month = $3,870
  *Data provided by “The Clinical Advantage” KCI*
  Total Cost to heal a wound 22.2cm with NPWT for 97 days = $14,546
  *Data from Kirby in Brit J Diabetes and Vascular Disease 2007*
- **HBO**
  Medicare reimbursement is approx $14,700 for 120 minutes/session for 30 treatment (This is estimated cost)
  *Apligraf*
  *Approximately $1373.00 per sheet*
  - Medihoney: $60.00 per box of 10 of 2”x2”
  - Aqueous Ag: $100.00 per box of 10 of 2”x2”
  - Foam: $70.00 per box of 10 of 2”x2”
  *(All the pricing is a ballpark figure not actual and depends on insurance)*

TEAM Approach

- PCP actively participates in the plan
- Patient actively participates in the wound care
- Wound care providers communicate with the provider and patient about the wound and expectations to achieve maximum healing
- Multi-disciplinary approach to wound healing

Multidisciplinary Team

- **Apligraf**
  *Bi-layered skin substitute: Epidermal layer with human keratinocytes and a dermal layer with fibroblasts*
  *From the neonate male foreskin*

  **Indications:** Ulcers **NOT** responding to conventional therapy
  - Non-infected partial and full thickness venous stasis ulcer greater than 1 month duration
  - Diabetic foot ulcer greater than 3 weeks duration not involving tendon, muscle, capsule or bone exposure
The More you Learn
The More you Know
Who Knows the Places
You'll GO
Thank You

Dr. Seuss

Vasculitis

An immune-mediated disorder leading to inflammation and necrosis of blood vessels, which may result in tissue necrosis. Any size vessel may be affected.

Clinical Presentation

depends on the underlying etiology but fever, malaise, and joint pain is common

Local cutaneous presentation:

- Palpable purpura: small papules, nodules, large ecchymotic areas
- Bulha
- Tissue necrosis/eschar
- Pruritis
- Very painful
- Livedo reticularis

Consult Hematologist
Anticoagulation with Warfarin or LMWH

Treatment

Vasculopathy

Inherited and acquired defects in coagulation with an increase of thrombotic event

Clinical Presentation

- Necrotizing purpura
- Very painful necrotic ulcers
- Livedo reticularis
- Digital cyanosis and gangrene
- Possible Raynaud's phenomenon
- Possible co-existing CVI (previous DVT)
- Warfarin necrosis

Consult Hematologist
Anticoagulation with Warfarin or LMWH

Treatment