Prevalence and type

How Many Wounds?

What Types of Wounds?

Types of Wounds

Pressure – 50%  
Malignant – 30%  
Venous / edematous – 10%  
Arterial – 5%  
Surgical – 5%  
Diabetic – few  
Skin Tears – ?

Types of Wounds

How Many Wounds?

What Types of Wounds?

Prevalence of Wounds

NPUAP (2001)
    Hospice population  14% – 28%
    LTC and Rehab 2% – 28%
    SCI Units 10% – 30%

Tippett (2005) – 35% of 400 patients in a single hospice had a skin wound

Reifsnyder and Magee (2004) – 26.9% of 980 patients at 4 hospices had pressure ulcers

Outline

• Prevalence and type
• Prevention
• Assessment, preparation, dressing
• Managing pain, odor, exudate, bleeding

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Co-morbid Disease
- Dementia
- Stroke
- Peripheral Vascular Disease
- Diabetes
- Cancer

Pathophysiology...
What is the root cause of all wounds?
- Pressure
- Malignant
- Venous / edematous
- Arterial
- Diabetic
- Tissue necrosis in
  - Dermis
  - Fat
  - Muscle
  - Associated structures
  - Nerves
  - Tendons
  - Vessels

Risk Assessment
Braden Pressure Ulcer Risk Assessment

Risk Assessment
<table>
<thead>
<tr>
<th>Sensory perception</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<tr>
<td>Moisture</td>
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<tr>
<td>Activity</td>
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<tr>
<td>Mobility</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nutrition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friction / shear</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

...Pathophysiology
- Wounds & surrounding tissues susceptible to
  - Infections
  - Inflammation

Pressure Relief:
Surfaces / Positioning
Beds
- Group 1 – Pressure relief mattress
- Group 2 – Low air loss
- Group 3 – Air fluidized

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Group 1

Well-fitting, smooth sheets

Group 2

Reduce Pressure, Shear, Friction and Moisture

- High pressure – short period only
- Head board < 30°
- Footboard or elevate knees
- Protect elbows/heels
- Powder of bedpans
- Incontinence plan, standards

- Positioning q 2 hours
- Weight shift q 15-30 min X 5 seconds
- Side position at 30° angle
- Pillow under calves when on back
- Assure adequate device inflation

Group 3

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Assessment . . .

Assess

- Person
  - Symptoms
    - “Woundedness”
- Wound
  - Type, cause
  - Bacterial burden
- Context
  - Underlying illness(es), prognosis
  - Nutritional status

Margaret . . .

- 68 year old woman
- Metastatic lung Ca
- Spinal cord compression, paraplegia
- Cared for at home
- Nutrition good
- Loving family

Woundedness

- Patient
- Family
- Caregivers
- Dysfunction
- Dependence
- Anxiety
- Depression
- Fear
- Abandonment
- Spiritual

Assess the Wound

- Size: L – W – D
- Tunneling
- Undermining
- Color
  - Red = viable tissue
  - Yellow = slough
  - Black = eschar
- Exudate
  - Serous
  - Serosanguineous
  - Purulent
- Odor
  - Putrid
  - Fruity
  - Bubbling
How to Measure and Chart

Pressure Ulcer Staging

- Stage III – full thickness skin loss
damage or necrosis of subcutaneous tissue
not through underlying fascia
- Stage IV – full thickness skin loss
extensive damage or necrosis of muscles,
bones or supporting structures
  - Undermining
  - Sinus tracts

Pressure Ulcer Staging

- Stage I – persistent changes in a
defined area of intact skin related to
  pressure
  - Red, blue or purple hues
- Stage II – partial thickness skin loss
  Epidermis and / or dermis

Margaret

- Stage III, sacral ulcer
  5 cm X 8.5 cm, undermining,
  additional 10 cm tunneling
  Color: Red, yellow, bluish-green
  Fruity smell
- Stage II, dermal breakdown
- Goal: Healing

Management Strategies

Healable Non-healable

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Goal of Wound Care

“The goal is to decrease the burden of the wound, while simultaneously hoping that the interventions will promote healing.”

“Hoping for the best, planning for the worst”

Liao S and Arnold R - JPM 2007

Margaret

- Stage X, R heel ulcer eschar
  4 x 6 cm
- Stage III, sacral ulcer
  5 x 8 cm;
- Goal: Healing

Goals of Care

- Protection
  Skin Integrity
- Prevention
  Pressure
  Edema
- Presence
  Body image
  Psychic distress – patient, caregivers

Goals of Care...

- Treat – wound, underlying disease
  Stabilize, ↘ progression, promote healing
  Moist interactive wound dressing
  Bacterial Burden Treatment
  Symptoms
  Exudate
  Pain
  Odor
  Bleeding

Debridement

The single most important parameter for reducing the level of bacterial contamination in the chronic wound is the removal of devitalized tissue


Margaret

- Stage X, R heel ulcer eschar
  4 x 6 cm
- Stage III, sacral ulcer
  5 x 8 cm;
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Debridement
- Surgery fastest, eg, scalpel, curette, scissors
  Aggressive
  Non-aggressive
- Autolytic (dressings)
- Enzymes
  Collagenase
- Mechanical, e.g., hydrotherapy
- Maggot therapy

Wound Pain
Nociceptive pain – due to chemical, mechanical & thermal stimuli
  - Wound edges
  - Surrounding tissues
  - Muscle sheaths
  - Periosteum

Debridement . . .
REQUIRES ADVANCE PLANNING FOR PAIN

Wound Pain
Neuropathic pain – due to nerve damage, death
  Hyperalgesia – due to inflammation
    - Sensitizes & recruits
    - Nociceptors
    - Opioid receptors
  Allodynia

Temporal Profile

Plan for Pain
- Pre-medicate with analgesics / anaesthetics
- Choose analgesics to match pain temporal profile to analgesic first order pharmacokinetics
  Match duration of procedure to $t_{1/2}$
  Wait $t_{\text{max}}$ before starting procedure

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Long Procedures
> 1 hour
- Prolonged debridement
- Cleansing
- Dressing changes

Short Procedures
< 1 hour
- Cleansing
- Dressing changes
- Turning
- Repositioning

### Plasma Concentration

<table>
<thead>
<tr>
<th>Time to Cmax</th>
<th>Half-life</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO / PR ≈ 1 hr</td>
<td>PO / PR ≈ 4 hr</td>
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</table>

### Long Procedures

<table>
<thead>
<tr>
<th>Route</th>
<th>Time to Cmax</th>
<th>Half-life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphine</td>
<td>PO / PR 60 min</td>
<td>4 hr</td>
</tr>
<tr>
<td>Hydrocodone</td>
<td>SC / IM 30 min</td>
<td>4 hr</td>
</tr>
<tr>
<td>Hydromorphone</td>
<td>IV 15 min</td>
<td>4 hr</td>
</tr>
<tr>
<td>Oxycodone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fentanyl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anesthetics – topical / injectable</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Short Procedures

<table>
<thead>
<tr>
<th>Time to Cmax</th>
<th>Half-life</th>
</tr>
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<tr>
<td>PO / PR ≈ 1 hr</td>
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<thead>
<tr>
<th>Route</th>
<th>Time to Cmax</th>
<th>Half-life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fentanyl lozenges</td>
<td>Buccal 15 min</td>
<td>2.5 hr</td>
</tr>
<tr>
<td>Remifentanil</td>
<td>IV 1-3 min</td>
<td>1 min</td>
</tr>
<tr>
<td>Nitrous oxide</td>
<td>inhaled rapid</td>
<td></td>
</tr>
<tr>
<td>Ketamine</td>
<td>SC 30 min</td>
<td>1-3 hr</td>
</tr>
<tr>
<td>Ketamine</td>
<td>IV 6-10 min</td>
<td></td>
</tr>
<tr>
<td>Anesthetics – topical / injectable</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**EMLA,* Eutectic Mixture of Local Anesthetics**

- Lidocaine 2.5% / prilocaine 2.5% cream
- Liquid when cold, solid at room temp.
- Apply thick coat, “icing on a cake”
- Leave on 30-60 minutes
- Need complete seal eg, plastic wrap, transparent film (adhesive)

*Approved for use on open wounds in Canada / Europe, but not US FDA

**Local Anesthetics**

<table>
<thead>
<tr>
<th>Local Anesthetics</th>
<th>Amide - less allergy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lidocaine</td>
<td>Quick onset of action</td>
</tr>
<tr>
<td>Topical</td>
<td>Onset 10 - 15 min</td>
</tr>
<tr>
<td>Injectable</td>
<td>t&lt;sub&gt;Cmax&lt;/sub&gt; = 30 - 60 min</td>
</tr>
<tr>
<td></td>
<td>Dose &lt; 200 mg / 24 hr</td>
</tr>
<tr>
<td>Epinephrine</td>
<td>↓ bleeding</td>
</tr>
</tbody>
</table>

**Benzocaine (ester) is a topical sensitizer**

**Lidocaine Topical Solution**

- 2 % (2 gm / 100 ml) or 4 % (4 gm / 100ml)
  - Spray or drip on
- Sprinkle 2 % or 4 % on 10 ml = 200 mg or 5 ml = 200 mg
- Acidic
  - Buffer with sodium bicarbonate
    - ≈ 5 mL of 1 mEq / ml NaHCO<sub>3</sub> +
    - ≈ 45 mL 2 % or 4 % lidocaine
  - Test with pH paper
- Warm

---

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Cleansing . . .

- Hydrogen peroxide
- Sodium hypochlorite eg, Hygeol, Dakin’s
- Povidone iodine eg, Betadine
- Aniline dyes eg, Neutral Red, Crystal Violet
- Aluminum salts eg, Burow’s Solution

These agents will delay healing and decrease bacterial burden

Cleansing Technique

- Rinse
- Cleanse
- Irrigate
  Pressure < 15 psi
  18 - 20 angiocatheter + 30 – 60 cc syringe

SALINE, SALINE, SALINE

Cleansing

Dressing . . .

- SALINE – preserved vs. unpreserved
  Stove-top saline
  10 ml / 2 tsp salt in 1 liter / quart water
  Boil 3 - 20 minutes

- Cleansers
  Skin – bacteriocidal
  Wound – less toxic

Moist Interactive Healing Guideline

1. Use a dressing that will keep the ulcer bed continuously moist. Wet-to-dry dressings should only be used for debridement and are not considered continuously moist saline dressings

Strength of evidence: A
- more than one random controlled trial

Ovington L. Ostomy / Wound Management
1999; 45 (Suppl. 1A): 94S-106S
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Moist Interactive Healing

- Increased cellular function
- Facilitate autolytic debridement
- Lower infection rates
- Decreased pain

Foams

- Absorbency: ++++
- Wear time: 1 to 7 days
- Comments:
  * Need moisture from the wound
  * May macerate surrounding skin

Moist Interactive Healing Guideline

2. Use clinical judgment to select a type of moist wound dressing suitable for an ulcer. Studies of different types of moist wound dressings showed no differences in pressure ulcer healing outcomes.

**Strength of evidence: A**
- more than one random controlled trial

Ovington L. Ostomy / Wound Management 1999; 45 (Suppl. 1A): 945-1065

Types of Dressings

- Foams
- Calcium Alginate
- Hydrogels
- Hydrocolloids
- Transparent Films
- Gauze
- Non-adherent

Calcium Alginate

- Absorbency: +++
- Wear time: 12 to 48 hours
- Comments:
  * Hemostasis
  * Can be used in infected wounds
  * Rope - wicks vertically
  * Wafer - wicks laterally
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Hydrogels

| Absorbency | ++ |
| Wear Time | 12 to 72 hours |
| Comments |
  * Lattice - saline propylene glycol hydrocolloid
  * Good autolytic debridement
  * Amorphous & sheet forms

Hydrocolloids

| Absorbency | + |
| Wear Time | 2 to 7 days |
| Comments |
  * Not vascular insufficiency / Infection
  * Must have seal
  * Good autolytic debridement
| Components: |
  * Hydrophilic - gelatin, pectin
  * Hydrophobic - cellulose
  * Adhesive - can cause allergy

Transparent Films

| Absorbency | 0 |
| Wear Time | 1 to 7 days |
| Comments |
  * Adhesive forms may damage surrounding skin
  * Cannot have leakage channels
  * Best re-epithelialization / protection
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**Prepare the Wound Carefully…**
Residual exudate can add to pressure and pain
• Wick exudate away from wound surface
• “Clean” the wound bed
Keep open wound warm / moist
• Wrap to keep warm
• Don’t let wound dry out
  Dry nerve endings
  Exposure to air

...Prepare the Wound Carefully
Protect skin margins and surrounding tissues with barrier films & creams
• Polymer solutions form a uniform film when applied to the skin
• Protect intact and damaged skin from irritation and drainage
• Allow moisture-vapor permeability
• Prolonged peri-wound inflammation results in a edematous, hemorrhagic granulation tissue

**Dressing Summary**
- Foams
- Calcium Alginate
- Hydrogels
- Hydrocolloids
- Transparent Films
- Gauze
- Non-adherent

**Gauze**
- Cotton mesh
  - Kerlix
  - 4x4’s
- Synthetic
  - Kling
  - Conform
- Hypertonic / Absorbing

**Non-adherent**
- Non-impregnated
  - Adaptic
  - Telfa
  - Soft silicones
- Impregnated
  - Vaseline gauze
  - Xeroform

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**Dress the Wound Carefully**

Use dressings that
- Protect the wound from pressure – pack tightly
- Insulate the wound
- Remove drainage from the peri-wound surface
- Adhere to healthy tissue, not to the wound

Dressings that attach to the wound bed
- Pulling the tissue inside the wound is very painful
- Traumatic inflammatory response reoccurs

**Choose Least Traumatic Dressings**

<table>
<thead>
<tr>
<th>Dressing Type</th>
<th>Occasional &amp; regularly cause pain</th>
<th>Occasionally &amp; regularly cause burns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gauze</td>
<td><img src="gauze.png" alt="Gauze" /></td>
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<td>Film dressing</td>
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</tbody>
</table>

Choose Least Traumatic Dressings

**Topical Opioids**

Morphine Pharmacology
- Water soluble
- Does not cross intact dermis significantly
- Easily absorbed through wound bed

**Formulation**
- 1 – 10 mg morphine / ml hydrogel (0.1 – 1%)  
- Apply to open wound every dressing change
- Frequently produces effective analgesia until next dressing change

**Neuropathic Wound Pain**

Occurs frequently in wounds due to ischemia, nerve damage

- **Adrenergic / serotonergic agonist**
  - Amitriptyline, nortriptyline, imipramine, desipramine

- **NMDA antagonist**
  - Methadone, ketamine

- **Ca channel blocker**
  - Gabapentin, pregabalin

- **Na+ channel blocker**
  - Carbamazepine, lidocaine, valproic acid, mexiletine

- **SNRI**
  - Duloxetine, venlafaxine

- **GABA agonist**
  - Baclofen

**Dressings for Packing**

- Fill dead space
- Moisture balance
- Non-toxic to cells
- Bacterial balance
- Pain control
- Minimize pressure

- Not saline-soaked gauze
- Vaseline covered gauze
- Alginates
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Minimize Trauma During Dressing Removal
Before a dressing change
- Inquire if the patient has a preferred method to remove tape / dressing?
- Inform the patient to ask for a “timeout” during the procedure

Soak Dressings Off
- Saline or gentle wound cleanser
- Warm; consider topical lidocaine

Remove Dressing & Wraps Gently

Power of Compassionate Touch

Odor . . .

Bacterial Burden
- Anaerobes
  - Metronidazole
  - Silver sulfadiazine
- Tissue depth
  - Topical
  - Systemic
- Alginate dressings

John
- 62 year old man
- 18-month Hx malignant melanoma
- Now metastatic
- Tumour didn’t respond to chemotherapy, radiation therapy
  - Declined to participate in clinical trials
- Pain well controlled

Metronidazole Gel Compounding
- US commercial product is 1 % gel
- Use 1 gm metronidazole powder per 100 ml (100 mg / 10 ml) of hydrogel or KY gel, or
- Crush 2 x 500 mg tablets per 100 ml
- May add morphine sulfate 0.1 – 0.5% (1 – 5 mg / ml)

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**Topical Antiseptics**
- Hydrogen peroxide
- Sodium hypochlorite, e.g., Hygeol, Dakin’s
- Povidone iodine, e.g., Betadine
- Aniline dyes, e.g., Neutral Red, Crystal Violet
- Aluminum salts, e.g., Burow’s Solution

These agents will delay healing and decrease bacterial burden

**Aromatherapy - Malodor**
- Clean air spray
  - Lemon, eucalyptus, thymus & tea tree oil
  - Neutralizes odors, purifies room
  - Uplifts mood
- Nasal comfort gel
  - Aloe vera, chamomile, rose & sandalwood
  - Used by patient or caregiver on upper lip
- Lavender room spray

**Odor Control**
- Decrease bacterial burden
- Ventilation
- Absorbers
  - Kitty litter
  - Charcoal
  - Coffee grounds
  - Burning flame, e.g., candle
- Alternate smells
  - Aromatherapy
  - Vanilla
  - Vinegar (cider)
  - Beware perfumes

**Aromatherapy - Comfort**
- Lavender
  - Relaxes, calms
  - Improves comfort
  - Provides clean feeling
- Melissa 2% in Eucerin Cream
  - Relaxes, calms
  - Effective for agitation

**Exudate . . .**

**Exudate / Dressing Layers**
1. Alginites
   - Absorbent +
   - Bacteriostatic
   - Hemostatic
2. Foams
   - Absorbent +++
3. Cotton – pads, gauze
   - Hold, cover up
- Beware sticking, pain
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Bleeding . . .

Mary

- 65 year old woman
- 3-year Hx inflammatory breast cancer
- Tumor unresponsive to several chemotherapy and radiotherapy protocols
- Extensive open, areas of skin ulceration across her chest due to recurrent tumor
- Painful – at rest, with dressing changes
- Friable, oozing, occasional bleeding

Tearing of Friable Tissues

- Minimize tearing
  - Inert mesh
  - Mepitel
  - Alginates
  - Non-adherent dressings
  - Tulle
  - Petrolatum coated

Risk of Bleeding

- Alginate
- Silver nitrate
- Moh’s Paste (Zinc Chloride)
- Topical thromboplastin
  - 1,000  5,000  10,000 units / ampule
- Tranexamic acid
  - 500 mg / 10 ml ampule
- Reassess NSAIDs, aspirin, anticoagulants
Integrating Palliative and Curative Wound Care

**Acute Bleed**
- Minimize dressing changes – alginates
- Goals of care, advance directives
  - Family discussion
- Pressure bandage
- Dark towels
- Sedatives – midazolam, lorazepam

**Non-pharmacological Interventions**
- Warmth & cold (warm towels)
- Massage, pressure, vibration
- Exercise
- Repositioning
- Immobilization
- Counter-stimulation
  - Relaxation
  - Imagery
  - Cognitive distraction, reframing
  - Education, both oral & written
  - Psychotherapy
  - Support groups, pastoral counseling

**Summary**
The best clinical practices for chronic wound care
- Prevent
- Treat the cause
- Local wound care
- Quality of life

**Specific General Reviews:**

Rosene D. Pirrello, Pharmacist Specialist, Palliative Care Team
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PCQN 2014