CURRENT CONCEPTS IN PRESSURE INJURY PREVENTION AND CARE

JOIE WHITNEY, PHD, RN, CWCN, FAAN
PROFESSOR
BIOBEHAVIORAL NURSING AND HEALTH SYSTEMS
UNIVERSITY OF WASHINGTON
HARBORVIEW ENDOWED PROFESSOR IN CRITICAL CARE NURSING

OBJECTIVES

- Describe and stage pressure injuries using current staging guidelines
- Choose strategies designed to reduce pressure injury
- Identify evidence and guideline based interventions for prevention and treatment of pressure injuries
PRESSURE INJURIES: FACT OR FICTION?

- PI develop because of poor care
- PI are preventable
- PI result from pressure
- Specialty equipment prevents PI
- Massaging reddened tissue can prevent a PI from developing

Makelbust and Sieggreen, 2001

OUTLINE

- Classification
- Pathways of injury
- Assessing risk
- Selected prevention measures
- Selected treatments
CLASSIFICATION—WHAT’S NEW?

- Old–
  - Bed sore
  - Decubitus ulcer
  - Pressure ulcer
- New – Pressure injury
- Distinct from other chronic wounds
  - Venous, Neuropathic, Arterial

COMMON CHRONIC WOUNDS—VENOUS

- Classic location and Hemosiderosis
- Fibrinous Slough
- Lipodermatosclerosis
VENOUS ULCERS

- Lipodermatosclerosis & atrophie blanche
- Medial malleolus-gaiter area
- Irregular borders
- Exudative
- Aching pain worse at end of day relieved by elevation
- Base ruddy often with slough

COMMON CHRONIC WOUNDS-
NEUROPATHIC

Commonly on plantar surface
Peri-wound callous is often present
WOUNDS-ARTERIAL

- Absence of palpable pulses
- Pain with elevation
- Absence of hair
- Atrophy below level of occlusion
- Shiny taunt skin at LE
- Cool LE
- Distal wounds
- Punched out appearance of wound

PRESSURE INJURY DEFINITIONS-SOME CHANGES

- National Pressure Advisory Panel

A PI is localized damage to the skin and/or underlying soft tissue usually over a bony prominence or related to a medical or other device. Can present as intact skin or an open ulcer and may be painful. The injury occurs as a result of intense and/or prolonged pressure or pressure in combination with shear. The tolerance of soft tissue for pressure and shear may also be affected by microclimate, nutrition, perfusion, co-morbidities and condition of the soft tissue.

www.npuap.org
EXAMPLES

PATHWAYS OF INJURY-WHAT’S NEW?

- **Pressure**
  - 12-32 mmHg “closing pressure”
  - Varies widely with location, age, disease

PRESSURE AND TISSUE TOLERANCE

- Pressure
  - Intensity
    - Pressure restricting blood flow
  - Duration
    - Interaction with intensity
  - Tissue Tolerance
    - Skin integrity
    - Microclimate

PATHWAYS OF INJURY

- Pressure

- Friction

- Shear
  - Gravity + Friction

PATHWAYS OF INJURY
“MICROCLIMATE”

- **Humidity**
  - Interface of skin and support surface
- **Moisture**
  - Skin surface, sub epidermal
- **Temperature**
  - Low or high levels increase risk

HOW BIG IS THE PROBLEM?

- Prevalence in high risk settings
  - Acute Care: 12-18%
  - Intensive Care: 22-49%
  - Long Term Care: 8-53%
  - Home Care: 0-29%

Tayyab et al 2016; Mallah et al 2015
LTC AND ICU EXAMPLES

LTC: 72 yr. old man, Dementia, Parkinson’s, CAD, HTN; Stage 4 18cm, medial malleolus (6 weeks)

ICU: 70 yr. old man s/p CABG; Stage 4 3cm, coccyx (1 month)

WHO IS AT RISK?

- Major Domains
  - Mobility/Activity
  - Perfusion
  - Skin/Pressure injury status
Skin changes with aging

AGE RELATED SKIN CHANGES

- Epidermal thinning
- Flattened layers
- Reduced barrier and immune functions
- Less elasticity and adipose layer
- Melanocytes
- Fragile capillaries

A NEW FRAMEWORK

Figure 3: New pressure ulcer conceptual framework.
COMMON LOCATIONS


AND UNCOMMON LOCATIONS....
DESCRIBING EXTENT OF INJURY

- Staging: assessment that classifies pressure injury based on anatomic depth of soft tissue damage
- Initial evaluation
  - Follows removal of necrotic tissue
  - Stage does not change
  - Reverse Staging is considered inaccurate
  - Used only for PI

PRESSURE INJURY STAGING

On average, a pressure ulcer 2.075 mm or deeper is classified at least as a Stage III.

Skin sample enlarged to show detail.
STAGE 1 PRESSURE INJURY

- Non-blanchable erythema of intact skin:
  - Intact skin
  - Skin temperature (warmth or coolness),
  - Tissue consistency (firm or boggy feel)
  - Color may vary by natural pigmentation
**STAGE 2 PRESSURE INJURY**

- Partial thickness skin loss with exposed dermis:
  - Pink, red, moist wound bed
  - Ø fat, or deeper tissues visible
  - Ø granulation tissue, slough, eschar
  - Not used for: dermatitis conditions or skin tears
STAGE 3 INJURY

http://www.burnsurgery.com/.../images/fig%2016a.jpg
http://www.ruralfamilymedicine.org/educationalstrategies/htm

STAGE 3 PRESSURE INJURY

- Full thickness skin loss:
  - Fat, granulation visible
  - May have slough or eschar
  - May have undermining or epibole
  - Ø visible fascia, muscle, tendon, ligament, bone
STAGE IV PRESSURE ULCER

- Full thickness skin and tissue loss:
  - Exposed fascia, muscle, tendon, ligament, cartilage or bone
  - Slough or eschar may be present
  - May have epibole, undermining, tunneling
  - Depth varies by anatomical location

https://www.flickr.com/photos/drewm Griffi/1807430966

STAGE 4 PRESSURE INJURY
DEEP TISSUE PRESSURE INJURY

- Intact or non-intact skin
- Persistent non-blanchable area
- Deep red, maroon, purple or epidermal separation
- Dark wound bed or blood filled blister
UNSTAGEABLE PRESSURE INJURY

- Obscured full-thickness skin and tissue loss
  - Cannot confirm extent of injury
  - Assumed Stage 3 or 4

OTHER PRESSURE INJURIES

Medical Device Related

Mucosal membrane injury
OTHER SKIN INJURIES

Skin tears

Incontinence Associated Dermatitis ‘IAD’

PREVENTION AND TREATMENT GUIDELINES

- www.npuap.org
- www.epuap.org
- www.awma.com.au
- www.etnurse.com.hk
- www.nzwc.org.nz
- www.woundhealingsociety.org.sg
- www.internationalguideline.com

Quick Reference Guide
IS PREVENTION POSSIBLE?

Assess risk
- Structured approach using scale
  - (e.g., Braden, Norton, Waterlow)
  - Predictive validity varies by clinical settings
  - Within 8 hours of admission & with condition changes
    - Mobility and activity
    - Skin status
    - Previous ulcer

ASSESS RISK

- Perfusion/oxygenation
- Nutrition
  - Weight loss
  - Total intake
  - Albumin <3.5 significant risk
- Skin Moisture

- Additional factors:
  - Body temperature
  - Age
  - Sensory perception
  - Labs: albumin, Hb, creatinine, CRP
  - General health status
PREVENTION AND TREATMENT GUIDELINES

- Reduce pressure, friction, shear
  - Turn, small position shifts
  - Limit HOB elevation
- Provide nutrition
  - Protein 1.2-1.5 g/kg/d
  - 30-35 calories/kg/day
  - Other nutrients
- Treat infection
- Prepare wound bed

What about massage?

PREVENTION AND TREATMENT GUIDELINES

- Provide topical treatment
- Manage incontinence, protect skin
- Surgery
- Adjunctive therapies
  - HBO
  - Negative pressure
  - Growth factors
  - Skin substitutes
  - Ultrasound
  - Electrical stimulation
ALWAYS AVOIDABLE?

- 2017 “Given the clinical complexities and constellation of comorbidities commonly encountered in today’s healthcare environment, it is reasonable to state that not all pressure ulcers/injuries are avoidable or preventable.” (WOCN Position Paper, JWOCN 44(5):458-69.)

TAKING A CLOSER LOOK-SELECTED INTERVENTIONS

- Support surfaces
- Infection and wound bed preparation
- Topical treatments
- Adjunctive treatments
PRESSURE REDUCTION—WHAT ABOUT THE SURFACE?

- Pressure relief as indicated by risk
- Microclimate factors
- High specification foams
- “Active” overlay or mattresses

SURFACE TERMINOLOGY—REACTIVE SUPPORT

Immersion  Envelopment  Partial immersion with envelopment
WHAT’S THE EVIDENCE?

- Higher-specification foam is better than standard hospital foam
- Medical grade sheepskins offer preventive benefit
- Merits of higher-tech constant low-pressure and alternating-pressure??
- Alternating pressure mattresses may be more cost effective than alternating-pressure overlays (UK data)

RESULTS OF SYSTEMATIC REVIEWS – WOCN TASK FORCE FOR SUPPORT SURFACES

- “Insufficient evidence to conclude superiority of one type of support surface over another.”

SURFACES FOR OLDER ADULTS?

In medical surgical settings:

- “AP support surfaces seem to be effective in prevention of PUs in compared to standard foam mattresses.”
- No evidence to support one type of AP, or that AP are better than continuous low pressure.
- “Continuous low pressure seem effective in prevention of PUs compared to standard foam mattresses.”
- Australian medical sheepskin better than usual care.


ADDITIONAL PREVENTION MEASURES

- Chair bound
  - Pressure releases every 15 minutes
- Relieve heel pressure
- Relieve pressure between joints
  - Knees and ankles
- HOB elevation below 30 degrees
INFECTION AND WOUND BED PREPARATION

- Pressure injury wounds and chronic wounds are colonized
  - Common pathogens: staph aureus, pseudomonas, ecoli
  - Often polymicrobial
- Infection- local, systemic
- Osteomyelitis: suspect in non-healing ulcers
  - 25-30% of non-healing Stage 4 ulcers
  - If + follow with bone biopsy and culture

WOUND DEBRIDEMENT DEFINED

- Removal from the wound of:
  - Necrotic Tissue
  - Non-viable Tissue
  - Slough
  - Foreign material
DEBRIDEMENT

- Selective-only necrotic tissue removed
- Non-selective-necrotic and viable tissue removed
- Types:
  - Mechanical
  - Chemical
  - Autolytic
  - Surgical or Sharp

DEBRIDEMENT-AUTOLYSIS
DEBRIDEMENT-ENZYMES

- Act on specific by-products, denatured collagen, protein, fibrin, DNA
- Prescription needed
- Cost effective cover dressing
- Fairly slow process

Image from Royal College of Surgeons Edinburgh. http://www.edu.rcsed.ac.uk

DEBRIDEMENT-
CHEMICAL AND BIOLOGICAL

- Dakin’s Solution
  - Antimicrobial but also cytotoxic
  - Controls odor
  - Protect peri-wound skin
  - Controversial but has uses
- Larval
  - Secrete proteolytic enzymes
  - Fairly rapid, control odor
  - Confine maggots to wound
  - Protect peri-wound skin
DEBRIDEMENT - BIOLOGICAL

Initial application

Covering and containing

After 48 hours of Maggot therapy

WHAT ABOUT BIOFILMS?

- Structure of microbial cells surrounded by self produced polymer matrix
  - One organism or polymicrobial
  - Chronic infections
- Concern for biofilms when:
  - Delayed healing – no change in 2 wks/present 4 wks
  - s/sx of inflammation
  - No response to antimicrobials
- Cannot identify with the naked eye
- Tolerance to abx treatment in 24-96 hrs
TOPICAL CARE PRINCIPLES

- Match to patient/PI
- Cleanse/debride
- Bioburden/Biofilms
- Protect
- Provide physiologic environment
- Manage exudate, odor, dead space
- Modify as ulcer heals

TOPICAL OPTIONS

- Protection
  - Sealant, Film, Thin HCD or Foam
- Moisture
  - Film, Hydrogel, Moist gauze
- Exudate
  - Alginate, HCD, Foam, Filler + composite, Hydrofiber, Silver containing, Super absorbent, cadexmer
- Bioburden
  - Honey, silver containing, cadexmer idodine
- Odor
  - Impregnated gauze, Charcoal layer foam

HOW TO DECIDE?

GOOD CHOICE

BAD CHOICE
Moisture retentive dressings-Hydrocolloids

- Benefits: provide moist wound surface, autolysis, protection
- Negatives: only absorb small to light moderate, can be occlusive, may cause stripping

Absorptive Dressings-Alginates

- Benefits: highly absorptive, autolysis, gentle
- Negatives: requires secondary dressing, can cause odor with dressing changes
Moisture retentive dressings-
hydrogel sheets

- Benefits: provide moist wound environment, autolysis, may not need secondary dressing, soothing
- Negatives: some brands macerate, some require a secondary dressing.

Absorptive dressings-Foams

- Benefits: absorb drainage, protective, primary or secondary when used with adhesive border, decrease dressing freq.
- Negatives: cost, non-adhesive requires securing with tape or wrap.
Moisture retentive dressings-
Hydrogels

- Benefits: provide moist wound environment, gentle autolysis, can impregnate on gauze for tunneling
- Negatives: need secondary dressing, do not absorb, can macerate.

WHAT'S NEW?
DRESSINGS AS PREVENTATIVE MEASURES

- Multi-layer soft silicone foam dressing
- Sacrum, heels
- Action- limit shear and friction
- Lab and clinical studies indicate reduction in pressure injury
ADJUNCTIVE THERAPIES
TOPICAL, DEVICE, SYSTEMIC

- Growth factors
- Negative pressure wound therapy
- Electrical stimulation
- Hyperbaric oxygen therapy

GROWTH FACTORS?

- Part of normal healing
- PDGF, Platelet rich plasma
- Not currently approved for PI treatment
- Consider for Stage 3 or 4 if unresponsive to comprehensive therapy
NEGATIVE PRESSURE WOUND THERAPY?
- Applies negative pressure to the wound
- Removes exudate and debris
- Reduces edema
- Increases perfusion
- Stimulates granulation
- Consider for Stage 3 or 4 PI that have not progressed with standard care

ELECTRICAL STIMULATION
- Direct current
- High voltage pulsed current
- Consider for PI Stages 2-4 that have not responded to conventional therapy
HYPERBARIC OXYGEN

- Evidence of improved healing in other chronic wounds, ie Diabetic foot ulcers
- No evidence to have any effect in pressure injuries
- Not recommended at this time for routine use in PI

TIMEFRAME FOR HEALING

- Assess at least weekly
- Slow to heal – 75% Stage 2 heal by 8 weeks but only 17% of Stage ¾
- Look for evidence of healing within 2 weeks of starting therapy
- Evidence of healing within 2 weeks predicts closure
REFERRALS

- Evidence of poor or slow healing
- Complex wounds, Lower extremity
- Patients with diabetes, venous or suspected mixed disease
- Wound Clinics or wound teams with expertise

It takes a team!

- Consult specialists
- Labs
- Biopsies
- Radiologic studies

RED FLAGS

- Varying descriptions of ulcer
- Odd and unexplained locations
- Apparent disordered care
- Lack of ongoing evaluation
- Lack of care in response to changes in need
- Lack of evidence based or guideline based care
  - No longer recommended: heat lamp, antacids, “donuts”, massage
CASE EXAMPLES

- What type of ulcer?
- Important ulcer characteristics?
- What care is indicated based on wound management principles?
- Treatment options?
- Patient education?
Week 8: 8 cm²

Week 27: Healed
SUMMARY

- PU develop because of poor care
- All PU are preventable
- PU result from pressure
- Specialty equipment prevents PU
- Massaging reddened tissue can prevent a PU from developing

QUESTIONS?