I. Skin Breakdown

- Total National cost of pressure ulcer treatment is more than $11 billion annually
- Estimated $2,000-$70,000 per pressure ulcer
- 60,000 people die from pressure ulcer complications each year
- More than 2.5 million pressure ulcers are treated each year

I. Skin Functions:

- A. Thermoregulation
- B. Protection from injury
- C. Shields underlying tissue
- D. Communicates with the environment
A. Thermoregulation
- Regulates body temperature

B. Protection From Injury
- Offers sensation
- Barrier
- Communication and identification

C. Shields Underlying Tissue
- A. Water loss
- B. Mechanical injury and infection
- C. Effects of chemicals
- D. Prevents micro-organisms from entering the skin
- E. Support (fibrous tissue, collagen, elastin)
D. Communication With The Environment

- A. Transmission and interpretation of sensation
- B. Appearance
- C. Non-verbal communication

III. Cross Section

A. Epidermis

- The most superficial layer of the skin and provides the first barrier of protection from the invasion of foreign substances into the body
B. Dermis

- The dermis assumes the important functions of thermoregulation and supports the vascular network to supply the vascular epidermis with nutrients. The dermis is typically subdivided into two zones, a papillary dermis and a reticular layer. The dermis contains mostly fibroblasts which are responsible for secreting collagen, elastin and ground substance that gives support and elasticity to the skin. Immune cells are also involved in the defense against foreign invaders passing through the epidermis.

C. Subcutaneous Tissue

- This is the third of three layers of the skin. The subcutaneous layer contains fat and connective tissue that houses larger blood vessels and nerves. This layer of skin is important as it regulates the temperature of both the skin and the body. The size of this layer varies throughout the body and from person to person.

Iv. Altered Function Of The Skin

- A. Aging
- B. Sun Exposure
- C. Hydration
- D. Nutrition
- E. Skin Cleansing / Care Products
- F. Medication
A. Aging
- Decreased epidural turnover rate
- Slower epithelialization
- Reduced Vitamin D production
- Diminished inflammatory response
- Diminished sensory reception
- Reduction of subcutaneous fat and less thermoregulation

B. Sun Exposure
- Accelerates aging of the skin
- Increases the risk of Cancer
- Reduces the immunocompetence of the skin

C. Hydration
- Reduced hydration leads to dryness, itching and scaling and may contribute to decreased resistance to skin breakdown
D. Nutrition

- Inadequate nutrition influences the health of skin and wound healing. Nutrition is a critical factor second only to immobility in the causation of pressure ulcers.
- Vitamins C, A, E, Zinc, and amino acids have been identified as necessary for preventing pressure ulcers and for adequate wound healing.

E. Skin Cleansing / Care Products

- Alkaline soaps reduce the thickness of the number of cell layers.
- Excessive use of skin cleaning products removes the sebum coating and its antibacterial and anti dehydration properties—exfoliants.
- This causes excessive dryness and increased opportunity for infection.

F. Medication

- Many classifications of medications interfere with healing and proliferation of new skin.
- Corticosteroids interfere with normal epidermal production and others may affect photosensitivity.
V. Definition Of A Pressure Ulcer

- Definition: A pressure ulcer is 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. (New February, 2007)
- Generally pressure ulcers occur when a person is sitting or lying in one position for too long without shifting their weight
- The constant pressure against the skin causes a decreased blood supply to that area; without sufficient blood supply, that area of tissue dies

New Definition

- February 2007 - The National Pressure Ulcer Advisory Panel has redefined the definition of a pressure ulcer and the stages of pressure ulcers, including the original 4 stages and adding 2 stages on deep tissue injury and unstageable pressure ulcers.
- See more at www.npuap.org

A. Unstageable

- 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.
Unstageable Pressure Ulcer Picture

Unstageable Pressure Ulcer

Unstageable Pressure Ulcer
B. Stage I Pressure Ulcer

- **Definition:** 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.

- In individuals with darker skin discoloration, warmth, edema, induration or hardness may also be indicators.

Stage I Picture

Stage I Pressure Ulcer
C. Stage II Pressure Ulcer

- Definition: Partial thickness loss of dermis 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.
D. Stage III Pressure Ulcer

- Definition: 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.

Stage III Picture

Stage III Picture
Stage III Pressure Ulcer

- Definition: Full thickness tissue loss with exposed bone, tendon or muscle. Slough or eschar may be present on some parts of the wound bed. Often include undermining and tunneling.

E. Stage IV Pressure Ulcer

- Definition: Full thickness tissue loss with exposed bone, tendon or muscle. Slough or eschar may be present on some parts of the wound bed. Often include undermining and tunneling.

Stage IV Picture
**F. Suspected Deep Tissue Injury:**

Purple or maroon localized area of discolored intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or shear. The area may be preceded by tissue that is painful, firm, mushy, boggy, warmer or cooler as compared to adjacent tissue.
Suspected Deep Tissue Injury

Vi. Contributing Factors To Development Of A Pressure Ulcer

A. Friction:

- A mechanical force that occurs when the skin moves against a support surface, as when extremities are brushed across a mattress. Friction may be inadvertent as in spasticity or may be from carelessness
B. Shear

- Shear injury occurs when the skin remains stationary and the underlying tissue shifts.
- Shearing forces cause blood vessels to become angulated, disrupting the arteries of the skin and the blood supply of the muscle.
- Typical shear injuries have large areas of undermining and may be caused by excessive head angle of the bed, poor posture, and sliding rather than lifting.

C. Moisture

- Moisture alone makes the skin five times as likely to become ulcerated as compared to dry skin.
- Prolonged moisture may cause maceration, rash and infection predisposing the skin to pressure ulcer formation.
Effects of Moisture-incontinence related dermatitis

D. Incontinence
- A major risk factor and the most reliable predictor for pressure ulcer formation especially when combined with friction and neurological disorders.

E. External Pressure
- External pressure applied to the skin for prolonged periods of time and in amounts greater than capillary closing pressure will produce ischemia in underlying tissue.
External Pressure

This causes the blood vessels to dilate and leakage of fluid eventually causing interstitial edema. Blood is accumulated and metabolic byproducts accumulate. Cellular death is the result.

F. Immobility

- A high risk factor for pressure ulcer formation. There is a close relation to physical inactivity and the susceptibility to pressure ulcers.

G. Altered Sensory Perception

- The inability to detect sensation that would indicate the need to change position is the 3rd most critical risk factor for pressure ulcer development (behind immobility and inactivity).
H. Chemical Damage

- May result from fecal or urinary incontinence, harsh wound and skin care products and poorly contained wound drainage

I. Radiation

- Can cause damage to the epidermis, presenting with dry sweat and sebaceous glands
- Destroys the cell nucleus and reduces fibroblasts causing large shallow irregularly bordered wounds

J. Smoking

- Positive correlation between pressure ulcers and SCI patients who smoke
- They have a higher incidence of pressure ulcer development
K. Diabetes

These ulcers may exist because of
- diabetic neuropathy
- loss of sensation
- ischemia
- infection
- venous stasis

Diabetic Ulcers

Arterial Ulcers
L. Increased Body Temperature

- Elevated temperature puts increased demand for oxygenation on already compromised tissue. Diaphoresis can cause skin to become macerated. Heat can cause thermal injury and increased metabolic activity induced by elevated temperature.

M. Hypothermia

- Hypothermia blankets or ice bags may cause a thermal burn. Decreased temperatures can cause impaired circulation, vasoconstriction and make the skin more susceptible to breakdown.

N. Psychosocial Factors

- Life satisfaction and self esteem are correlated with decreased ulcer formation whereas stress, pain and little family support increase the prevalence of ulcer formation.
Vii. Location Of Pressure Ulcers

- A. Ischium 24%
- B. Sacrum 23%
- C. Trochanter 15%
- D. Heel 8%
- E. Malleolus 7%
- F. Knee 6%
- G. Iliac Crest 4%
- H. Elbow 3%
- I. Pretibial Crest 2%
- J. Skull 1%

Vii. Formation Of A Pressure Ulcer

- A. Local Ischemia
- B. Cell Death
- C. Tissue Collapse
- D. Infection

A. Local Ischemia

Pathological changes to capillaries and tissues. May occur in less than 2 hours
B. Cell Death

- Progression of tissue change in response to obstruction of capillary blood flow. Patient may report pain, warmth to area and slight edema.

C. Tissue Collapse

- Non reversible. Area will be cool to the touch, may feel hard or indurated, or soft and boggy.

D. Infection

- Soft tissue infection. When cultures are required to diagnose a soft tissue infection, the Centers for Disease Control and Prevention recommend obtaining fluid through needle aspiration or tissue through ulcer biopsy.

- Osteomyelitis. Examination of a bone biopsy specimen is the “gold standard” for diagnosing osteomyelitis; however, this invasive diagnostic technique is not always appropriate. A combination of three tests (white blood cell count, erythrocyte sedimentation rate, and plain x-ray) has a positive predictive value of 68 percent when all three tests are positive.
I. Pressure Ulcer Risk Assessment Tools

- A. Braden Scale - assesses 6 client factors: mobility, activity, moisture, sensory perception, nutrition, friction and shear
- B. Norton Scale - assesses 5 factors: physical condition, mental condition, activity, mobility and incontinence

Braden Scale

- Highest possible score is a 23
- Lowest possible score is a 6
- Mild risk = 15-18
- Moderate risk = 13-14
- High Risk = 10-12
- Very High Risk <9

Norton Scale

- Highest Score is a 20
- Lowest possible score is a 5
- Onset of Risk = 16 or below
- High Risk = 12 or below
X. Wound Assessment

- A. Consistency / Accuracy
- B. Measurement
- C. Tissue
- D. Culture
- E. Pain

Consistency / Accuracy

- A. Initial assessment
- B. Weekly Assessment

Measurement Techniques
Measurement
- Rulers: measure at 12 and 6 o'clock and 3 and 9 o'clock
- Tracings
- Photography
- Ultrasonic measurement: captures soft tissue at a high resolution
- Documentation

Tracing

Tissue
- A. Tissue type
- B. Presence of granulation
- C. Tissue color
- D. Drainage
- E. Odor
- F. Surrounding tissue
**Culture**

- (not recommended)
- Swab cultures do not effectively reveal the infecting organism. Swab cultures only collect the surface contaminating organisms. Tissue biopsy and culture, fluid aspiration cultures and possible bone biopsy are better alternatives for culturing the infecting organism. Usually, osteomyelitis is detected in 69 percent of the cases where the WBC, ESR and plain x-rays were all positive, therefore, the need for an invasive bone biopsy may be reduced.

**Assess Drainage**

- **Serosanguineous** is a combination of blood and serous drainage. The drainage would be thin watery, pale red or pink in color.
- **Serous** is clear fluid.
- **Sanguineous** is bloody flow.
- **Purulent** is drainage that is thin or thick and color sometimes yellow or brown. Could be related to type of dressing being used. Wound is in the inflammatory stage of wound healing, or an indication of infection.

**Assess Pain**

- Pain before dressing change/treatment
- Pain after treatment
- How are they tolerating their therapeutic surface?
Prevention

- Most cost-effective means of skin management
- Identify patients at risk
- Maintain and improve tissue tolerance to pressure in order to prevent injury
- Protect against friction, shear and pressure
- Educate staff and patients

Daily Inspection

- Inspect the skin of all at-risk patients at least once a day; pay particular attention to bony prominences

Cleansing

- Cleanse the skin when soiled and individualize frequency of cleansing according to client need or preference
Avoid Hot Water And Caustic Cleansers

- May cause thermal or chemical tissue disruption

Minimized Force And Friction

- Care must be applied to reduce risk factors

Avoid Massage

- Avoid massage especially over bony prominences
- Use massage only as indicated
- i.e. as to break up non-healing scar adhesions
Minimize Exposure To Moisture

- Incontinence
- Perspiration
- Wound drainage
- Wound exudates
- Wound Preparations

Reduce Friction Through Proper Positioning During Transfer And Turning Techniques

Reposition Q 2 Hours And Q 30-45 Minute Weight Shifts When OOB To Wheelchair
Use Pillows For Positioning

- Foam wedges are also helpful
- Multi-podus booties to prevent foot, ankle and heel wounds

Maintain HOB At Lowest Angle

- Limit the amount and time the HOB is elevated
- This will reduce friction and shear
- Will reduce pressure on ischium and sacral areas

Pressure Redistribution Devices

- 1. Beds
- 2. Wheelchair cushions
Beds:

- i. Air flotation
- ii. Air fluidization
- iii. Alternating air mattress
- iv. Dynamic support surfaces
- v. Foam mattress overlay
- vi. Low air loss
- vii. Overlay
- viii. Static air mattress

Wheel Chair Cushions

- Roho
- Gel cushions
- Air cycling
- Foam

Debridement

- A. Sharp
- B. Enzymatic
- C. Mechanical
Sharp Debridement

Enzymatic Products
Collagenase, Trypsin & Honey
(chemical/autolytic)

Mechanical Debridement
Cleansing

- 1. Normal Saline
- 2. Hydrogen peroxide (no)
- 3. Commercially Prepared Solutions
- 4. Betadine (no)
- 5. Dakins (no)

Wound Dressings

- 1. Absorptive fillers: Used to absorb exudate and fill dead space
- 2. Alginates: Occur naturally in seaweed, absorb exudates, maintains a moist wound bed and can be used with either shallow or deep wounds

Alginate Packing
Wound Dressings (Cont.)

- 3. Foams: Non-adherent wafers; good absorption; hydrophobic surface repels contaminants

- 4. Gauze: Purpose to absorb; supports moist wound healing if kept moist; used to fill sinuses or dead space; should be packed lightly to prevent impaired circulation
Wound Dressings (Cont.)

5. Hydro colloids: Wafer that protects the moist wound bed yet absorbs exudate; Occlusive and prevents O2 from entering the wound. This occlusion promotes wound healing when growth factors are allowed to proliferate under the dressing.

6. Hydro gels: Gels that may be poured into the wound; mild absorption; may fill dead space; painless.
Wound Dressings (Cont.)

- 7. Transparent Film: The first occlusive dressings; insulate, protect, and maintain the moist wound surface. But exudate may build up under the dressing, negating its use.

Wound Dressings (Cont.)

- Hydrofibers-gel on contact with the wound fluid creating a large fluid-absorption capacity.
Wound Dressings Cont.

- Collagen containing dressings: often combined with silver to deliver a balanced combination for protection and growth that is appropriate for a variety of wound types and conditions.

Contact Layer

- Wound contact layers comprise a single layer of non-adherent mesh-like material designed as protection for fragile tissue on the wound bed. They are usually used in the early, proliferative stages of healing to promote granulation and epithelialisation.

Transparent Film
**Anabolic Steroids**

- Oxandrolone is gaining acceptance in wound management
- It has been shown to increase lean body mass and protein stores and improve the healing rate of wounds. Use of these anabolic steroids has not presented serious side effects.

**NPWT**

- A negative-pressure sponge dressing is placed within the wound to increase blood flow, increase granulation tissue and nutrients to the wound
- Very time consuming

**VAC Pump**
VAC Dressing Kit

VAC Dressing

VAC Suction applied over a skin graft
Surgical Management

- Stage III and IV wounds are often closed by myocutaneous flap
- Early closure decreases loss of fluid and nutrients, improves the health status of the client, and leads to earlier recovery and mobilization
Myocutaneous Flap

Education

- Coordinated and comprehensive education directed to all levels of providers, clients, families and caregivers is integral to rehabilitation nursing.
- Key to decreasing the prevalence of pressure ulcers is patient involvement in care.

Planning

- A. Short term goals - Positioning, nutritional status
- B. Long term goals - wound healing, knowledge of skin care, treatments, prevention
- C. Facility setting - provide therapeutic surface, appropriate wound care, nutritional consult, family teaching.
- D. Home setting – provide therapeutic surfaces, patient family teaching/support, evaluate home setting for risk factors.
Burn Patients Suffer the Effects From Loss of Skin Function.

Types of Burns
- Scalds, the number-one culprit (from steam, hot bath water, tipped-over coffee cups, cooking fluids, etc.)
- Contact with flames or hot objects (from the stove, fireplace, curling iron, etc.)
- Chemical burns (from swallowing things, like drain cleaner or watch batteries, or spilling chemicals, such as bleach, onto the skin)
- Electrical burns (from biting on electrical cords or sticking fingers or objects in electrical outlets, etc.)
- Overexposure to the sun

Burns are Measured
- TBSA
- Total Body Surface Area
- Measured in %
Rule of 9’s for Adults: 9% for each arm, 18% for each leg, 9% for head, 18% for front torso, 18% for back torso.

Rule of 9’s for Children: 9% for each arm, 14% for each leg, 18% for head, 18% for front torso, 18% for back torso.

Depth of Injury

1st Degree (partial thickness)
Reddened, painful, warm to touch, no blisters or skin sloughing e.g. sunburn
1st Degree Burn

Depth of injury

2nd Degree (partial thickness)
- Reddened, painful, warm to touch, blistered blanches to touch, when blister debrided weeps fluid from wound

2nd Degree Burn
**Depth of Injury**

3rd degree (full thickness) Black, brown, white or leathery wound, firm in appearance; does not blanch and is not painful to touch

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**3rd Degree burn**

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**Points to remember**

- Pre medicate before shower or wound care
- Allocate enough staff
- Prepare dressings before change
- Ensure that temperature and pressure of water can be regulated
Hypertrophic Scar Formation

The original skin is replaced by a non-functional mass of tissue. It is highly vascular with inflammatory cells that contributes to a disorganized matrix. Causes problematic contracture and joint erosion.

Tanking
Folliculitis After Burn

Burn Patient

Treatment
- Bathing - mild soap
- Wound care - moist healing
- Apply dressings in extension
- Compression
- Silicone
- Pressure Garments
Compression Garment

Name the Treatment

Name the Stage
True or False: Heel Protectors Protect Heels From Pressure...

Name This Type of Wound

What Happened Here?
True or False?
A person who cannot move should be repositioned while sitting in the wheelchair every two hours…..

True or False?
A low humidity environment may predispose a person to pressure ulcers…

True or False?
Scarring will break down faster than unwounded skin…
**True or False?**

A low Braden score is associated with and increased pressure risk...

**True or False?**

Shear is the force which occurs when the skin sticks to a surface and the body slides....

**What Kind of Pressure Ulcer?**
What Stage pressure Ulcer?

Answer the question...
Nonblanchable erythema can be first sign of tissue destruction in pressure ulcer ___

Thank You & Good Luck