




PRESSURE INJURY

## Learning Objectives

### Pressure Injury

At the conclusion of the module addressing pressure injury in the older adult, the learner should:

<p><b>KNOW</b></p> <ul style="list-style-type: none"><li>• Age-related changes to the integumentary system</li><li>• Pressure injury definition and classification</li><li>• Prevalence and impact of pressure injury in older adults in the U.S.</li><li>• Causes of pressure injury</li><li>• Pressure injury screening and assessment</li><li>• Age-friendly management of pressure injuries</li></ul>	<p><b>DO</b></p> <ul style="list-style-type: none"><li>• Interpret tests and measures specific to pressure injury</li><li>• Identify and apply evidence-based interventions for the prevention and treatment of pressure injury in older adults</li></ul>
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### Case Mrs. Chih


- 75-year-old female in the ED after a fall at home, changed mental status, abnormal labs, difficulty walking, on floor for 12 hours
- X-ray: no fractures, tenderness to palpation & purple discoloration over R hip greater trochanter
- PMHx: T2DM, hip OA, HTN, CKD, smoker
- SOCHx: Lives alone, ambulates with a cane at home, wheelchair in the community, family nearby

**Lab Values:**  
Prealbumin 12 mg/L  
Sodium 120 mEq/L  
Hemoglobin A1C 9%  
Serum Creatinine Phosphokinase (CPK) 900 IU/L


**Medications:**  
Ibuprofen 600mg twice daily  
Metformin 850 mg daily  
Lisinopril 2.5 mg daily

**Visit Summary:**

- Remained in ED x 24 hr before discharge home with home health care and no other changes to medication or referrals

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PRESSURE INJURY

## Definitions



- ! Geriatric Syndrome
- ✓ Screening
- 🔍 Assessment
- 🏠 Treatment
- ★ Pressure Injury

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# Definitions

## ! Geriatric Syndrome

- A multifactorial condition prevalent in older adults that develops when an individual experiences accumulated impairments in multiple systems that compromise their compensatory abilities.

Overarching Topics	Geriatric Syndromes		
Age-Friendly Care	Chronic Pain	Falls	Polypharmacy
Ageism	Cognitive Impairment	Frailty	Pressure Injury
	Delirium	Incontinence	Sleep Disturbance
	Depression	Malnutrition	🔊



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# Definitions

## ☑ Screening <sup>2</sup>

- Screening tools are tests or measures to evaluate for diseases and health conditions before symptoms appear.
- Screenings allow for earlier management and referral to appropriate providers.
- An age-friendly provider conducts screenings for conditions that are prevalent in older adults.

🔊



WHAT MATTERS  
MEDICATION  
MOBILITY  
MIND  
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# Definitions

## 🔍 Assessment <sup>3</sup>

- Assessment tools are tests and measures used to evaluate the patient's presenting problem, confirm a diagnosis, determine its severity, and aid in identifying specific treatment options.
- An age-friendly provider uses appropriate assessments, makes referrals, and communicates with the patient's care providers.



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# Definitions


## 🏠 Treatment

- An age-friendly care provider considers the 4Ms when making treatment recommendations so that **what matters** to the patient is always part of the plan of care.
- An age-friendly provider communicates with the patient, family, and interdisciplinary team.





## Pressure Injury Prevalence



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### Prevalence <sup>5,7-10</sup>

**7%**

Overall in medical facilities (acute care, LTAC, IRF, LTC, hospice)

**3%**

Iatrogenic  
10% occur in 1-2 days of hospital admission

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**<1%**

Due to medical devices


**Setting**

0-46% Acute Care  
10-25.9% Critical Care  
1-32.3% LTC

### Causes



## Pressure Injury Risk Factors



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### Risk Factors <sup>11,12</sup>

Intrinsic




- Normal Aging
- Bony Prominences /Deformity
- Low Body Weight
- Protective Sensation
- Mobility
- Cognition
- Renal Disease


Extrinsic

- Exposure to Moisture
- Body Positioning
- Surface
- Mobility
- Equipment

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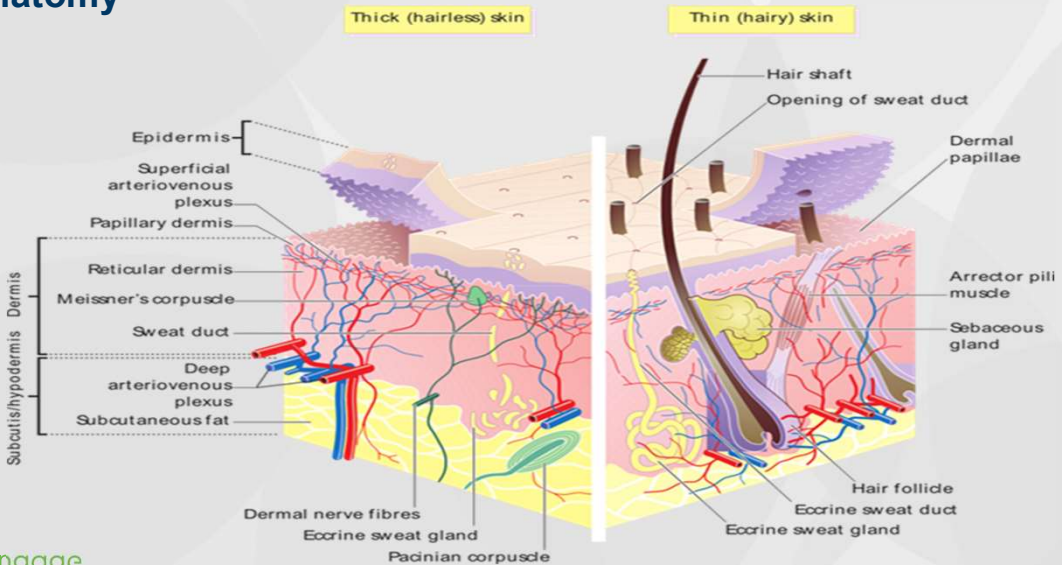
## Anatomy <sup>13</sup>

Epidermis	Dermis	Basement Membrane
		
<ul style="list-style-type: none"> <li><input type="checkbox"/> Keratinized epidermis</li> <li><input type="checkbox"/> Outermost layer (0.05 -1.5 mm)</li> <li><input type="checkbox"/> Physical &amp; Chemical (pH 4-6) barrier</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Superficial Papillary &amp; Reticular Layers</li> <li><input type="checkbox"/> Papillary vessels nourish epidermis</li> <li><input type="checkbox"/> Superficial free nerve endings light touch/temp. Pain, deep pressure, vibration deeper</li> <li><input type="checkbox"/> Hypodermis (subcutaneous tissue) is adipose &amp; loose connective tissue</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Binds Epidermis &amp; Dermis</li> <li><input type="checkbox"/> Epidermal pegs (Rete Pegs) &amp; dermal papillae</li> <li><input type="checkbox"/> Dermal appendages (oil glands, sweat glands, &amp; hair follicles)</li> </ul>




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## Anatomy <sup>13</sup>



















The diagram illustrates the structural differences between thick (hairless) skin and thin (hairy) skin. Thick skin features a significantly thicker epidermis with a well-developed papillary dermis and a deep dermal papillary plexus. It also has a prominent subcutaneous fat layer. Thin skin, in contrast, has a thinner epidermis and a less developed dermis. It contains hair shafts, sebaceous glands, and eccrine sweat glands. Labels include: Epidermis, Superficial arteriovenous plexus, Papillary dermis, Reticular dermis, Meissner's corpuscle, Sweat duct, Deep arteriovenous plexus, Subcutaneous fat, Dermal nerve fibres, Eccrine sweat gland, Pacinian corpuscle, Hair shaft, Opening of sweat duct, Dermal papillae, Arrector pili muscle, Sebaceous gland, Hair follicle, Eccrine sweat duct, and Eccrine sweat gland.

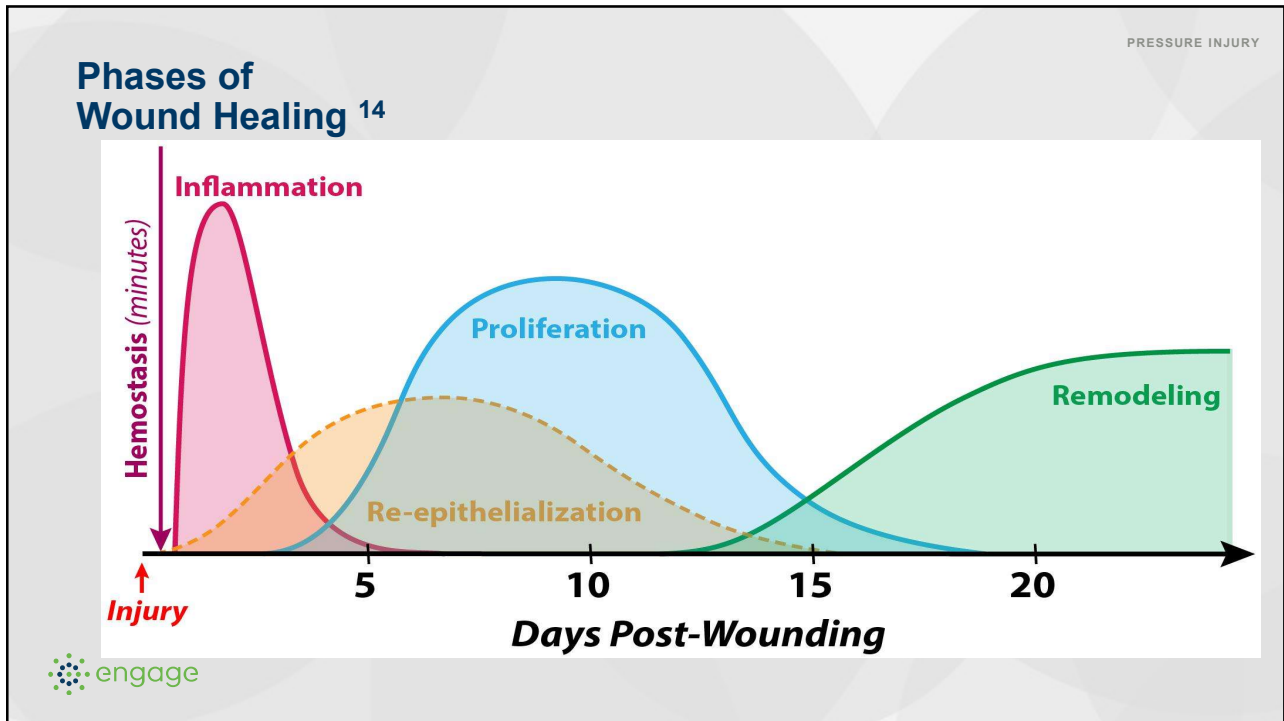


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## Phases of Wound Healing <sup>14</sup>

Inflammation	Proliferation	Remodeling/Maturation
		
<ul style="list-style-type: none"> <li> 1-4 days from injury; initiates healing cascade</li> <li> WBC migrate to area; clean non-viable tissue &amp; phagocytize bacteria</li> <li> Cardinal signs of inflammation present: erythema, increased temperature, pain, edema</li> <li> Infection may be present</li> </ul>	<ul style="list-style-type: none"> <li> Angiogenesis &amp; granulation</li> <li> Contraction (myofibroblasts); reduce size</li> <li> Epithelialization; close wound</li> <li> Closed Wound: wound completely covered with epithelium</li> </ul>	<ul style="list-style-type: none"> <li> Type III collagen replaces Type I along lines of tension</li> <li> May take up to 2 years</li> <li> Healing complete after remodeling finished</li> <li> Healed Wound: wound completely closed, completed all 3 phases of wound healing</li> </ul>







## Wound Closure

### Primary Intention

- Defect below dermis
- Edges approximated via suture, staples, or glue
- Surgical wounds, small cutaneous wounds

### Secondary Intention

- Defect below dermis & edges can't be approximated
- Granulation tissue fills defect, then re-epithelialization from edges. Moist wound healing environment optimal
- More scar tissue compared to primary intention
- Primary method of wound closure

### Tertiary (Delayed Primary) Intention

- Defect below dermis & edges can't be approximated due to high bioburden, risk of infection, significant tissue loss
- Wound left open, cleansed, and monitored for infection
- May be surgically closed if without signs/symptoms infection
- Scar tissue

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# Pressure Injury Staging

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**Stage 1<sup>4</sup>**

Non-blanchable erythema of intact skin

**Stage 2**

Partial thickness skin loss with exposed dermis

**Stage 3**

Full thickness skin loss

**Stage 4**

Full thickness skin & tissue loss


**Unstageable**

Obscured full thickness skin & tissue loss

**Deep Tissue Injury**

Persistent non-blanchable deep red, maroon, or purple discoloration

Pressure Injury Staging

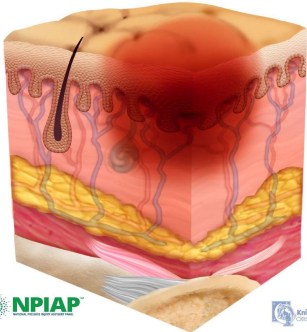




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**Stage 1**

Non-blanchable erythema of intact skin


Stage 1 Pressure Injury - Lightly Pigmented



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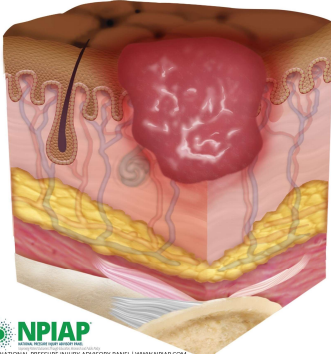
Pressure Injury Staging





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**Stage 2**

Partial thickness skin loss with exposed dermis



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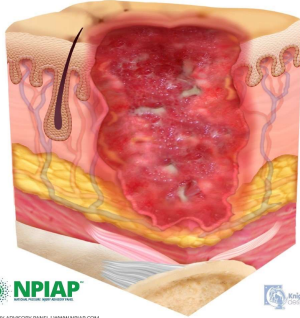
Pressure Injury Staging

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**Stage 3**

Full thickness skin loss

Stage 3 Pressure Injury



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Detailed description: This slide illustrates Stage 3 of pressure injury. On the left, a blue vertical bar contains the Engage logo and the text 'Pressure Injury Staging'. The main content area features a horizontal arrow graphic with a white center containing the text 'Full thickness skin loss'. Below this, an anatomical diagram shows a cross-section of skin with a large, deep, crater-like ulcer extending through the epidermis and dermis into the subcutaneous fat. The ulcer bed is filled with red, necrotic tissue. Labels include 'Stage 3 Pressure Injury' above the diagram, and logos for 'NPIAP' and 'engage' below it. A copyright notice '©2020 NATIONAL PRESSURE INJURY ADVISORY PANEL | WWW.NPIAP.COM' is also present.

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Pressure Injury Staging

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**Stage 4**

Full thickness skin & tissue loss




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Detailed description: This slide illustrates Stage 4 of pressure injury. On the left, a blue vertical bar contains the Engage logo and the text 'Pressure Injury Staging'. The main content area features a horizontal arrow graphic with a white center containing the text 'Full thickness skin & tissue loss'. Below this, an anatomical diagram shows a cross-section of skin with a large, deep ulcer that has penetrated through the skin, dermis, and subcutaneous fat into the muscle and bone. The ulcer bed is filled with red, necrotic tissue. Labels include 'Stage 4' above the diagram, and logos for 'NPIAP' and 'engage' below it. A copyright notice '© 2020 NATIONAL PRESSURE INJURY ADVISORY PANEL | WWW.NPIAP.COM' is also present.

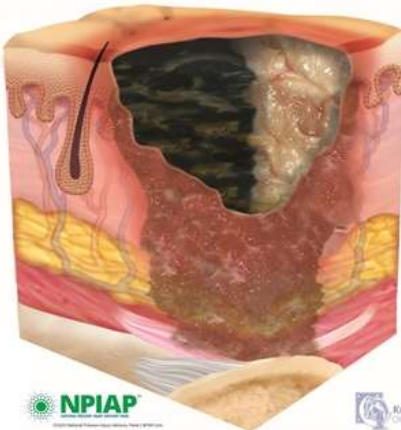
Pressure Injury Staging




**Unstageable**

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Obscured full thickness skin & tissue loss



Pressure Injury Staging

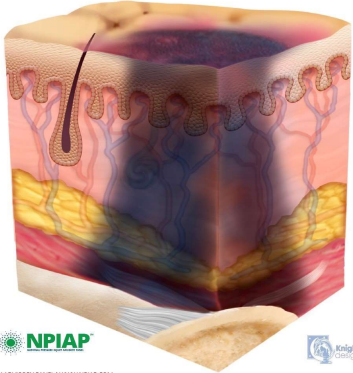


**Deep Tissue Injury**

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Persistent non-blanchable deep red, maroon, or purple discoloration

Deep Tissue Pressure Injury




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**Anatomical & Physiological Changes in Normal Aging**

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### Normal Age-Related Changes <sup>15</sup>

Blood Flow	Collagen & Elastin	Subcutaneous Fat
Sweat Glands	Sebaceous Glands	Sensory Structures
Hair Follicles	Hyperpigmentation	Finger Nails




**Considerations for Wound Healing in Older Adults**


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### Considerations in Older Adults <sup>15-18</sup>

Normal Aging	Comorbidities	Nutrition
Social Factors	Medications	



## Considerations for Wound Healing in Older Adults



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## Considerations<sup>15-17</sup>


Normal Aging

- Decreased dermal blood flow & lymph drainage
- Impaired waste clearance
- Impaired contraction & increased infection risk

Comorbidities

- Diabetes, CVD, PVD, Arthritis, Cancer
- Decreased blood flow, Immunosuppression
- Pain, lack of protective sensation, risk of infection

## Considerations for Wound Healing in Older Adults



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## Considerations<sup>15-17</sup>

Nutrition

- Prealbumin (15-36 mL/dL)
- Low protein: slows proliferation, delays closure, increased risk dehiscence
- Hydration: protein & fluid loss due to exudate

Social Factors

- Smoking: Carbon Monoxide, Nicotine
- Oxygenation, neutrophils, fibroblasts, scar remodeling/maturation, dehiscence
- Sleep, alcohol intake, stress, depression, physical activity

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# Medications

15

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Anticoagulants	NSAIDS	Steroids
<ul style="list-style-type: none"><li>• Delayed hemostasis</li><li>• Fibrin deposition inhibited</li><li>• Limits sharp debridement</li></ul>	<ul style="list-style-type: none"><li>• Weaken inflammatory response</li><li>• Slows tissue healing</li><li>• Increased risk of infection</li><li>• Poor quality granulation tissue</li></ul>	<ul style="list-style-type: none"><li>• Decreased inflammatory mediators, WBC recruitment, remodeling</li><li>• Decreased closure / scar strength</li><li>• Increased dehiscence</li></ul>

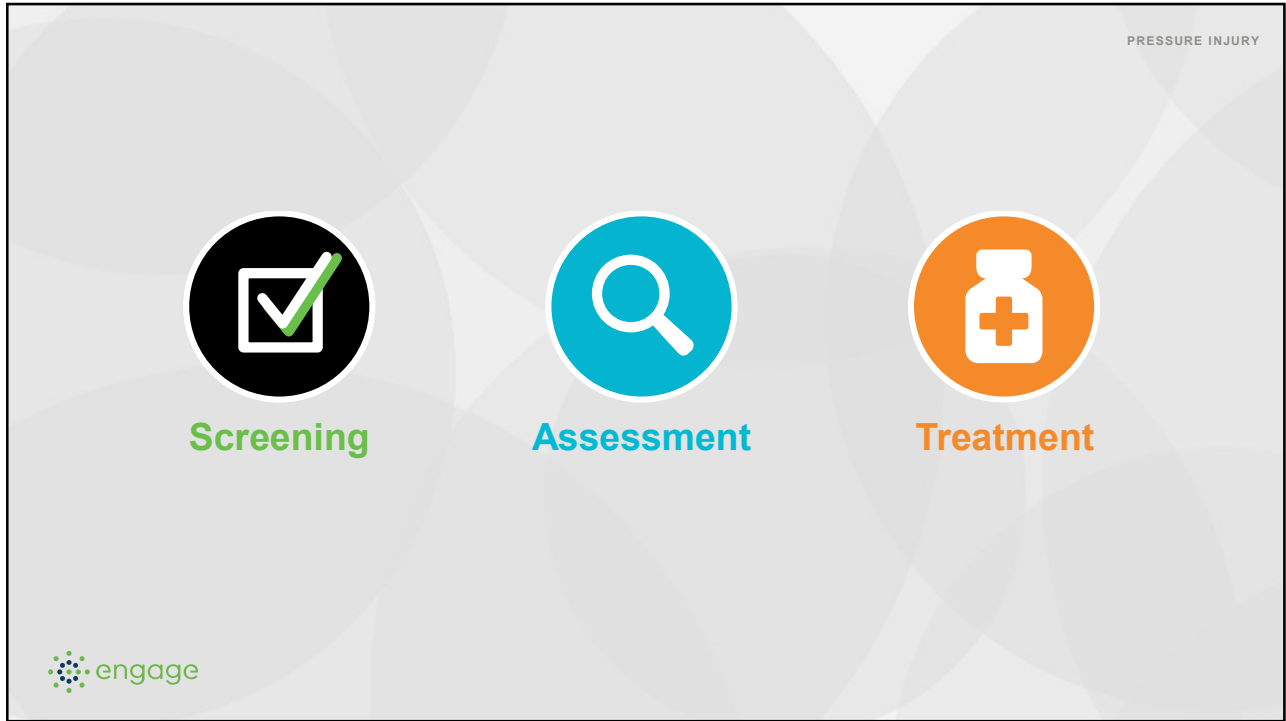
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# Medications

15

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Immunosuppressants	Chemotherapeutic	Antibiotics
<ul style="list-style-type: none"><li>• Weaken inflammatory response</li><li>• Slows tissue healing</li></ul>	<ul style="list-style-type: none"><li>• Weaken inflammatory response</li><li>• Reduced protein synthesis</li><li>• Increased risk of bleeding &amp; infection</li><li>• Myelosuppression</li></ul>	<ul style="list-style-type: none"><li>• Weaken inflammatory response</li><li>• +/- re-epithelialization</li></ul>



Screening


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### Screening for Pressure Injury <sup>6</sup>

- Early screening and use of valid screening tools are important
- Prevention is a key aspect of pressure injury management

Patient mobility	Cognition	Sensation
Skin Moisture	Nutrition / Malnutrition	Friction / Shear during ADLS




Screening 

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## Pressure Injury Screening <sup>11</sup>

### The Braden Scale


- Six subscales:
  - sensory perception
  - moisture
  - activity
  - mobility
  - nutrition
  - friction and shear
- Subscales scored 1-4 except friction/shear scored 1-3
- Range is 6-23
- Lower scores reflect lower function and **greater risk** for pressure injury
  - Severe Risk:  $\leq 9$
  - High Risk: 10-12
  - Moderate Risk: 13-14
  - Mild Risk: 15-18
  - Cut-off score 16, <16 at risk

Assessment 

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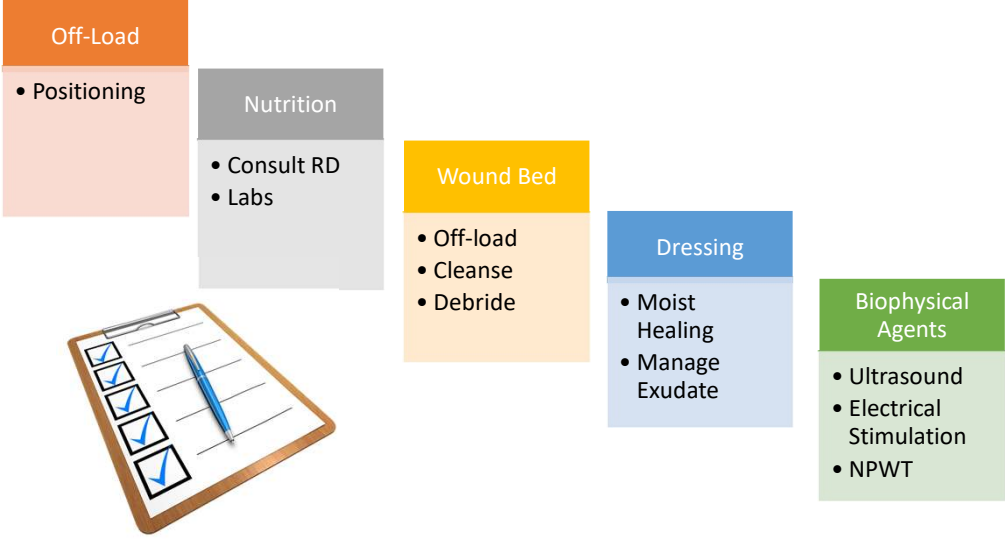
## Pressure Ulcer Scale for Healing 3.0 (PUSH) <sup>19</sup>

- Assesses change over time using scoring record and graph
- Measures 3 parameters
  - Wound Size (length x width = surface area)
  - Exudate Amount (light, moderate, heavy)
  - Tissue Type (closed, epithelial, granulation, slough, necrotic/eschar)
- Scoring range 0-17
  - Increasing score reflects deterioration of wound
  - Decreasing score reflect improvement


Treatment 

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## Treatment of Pressure Injury <sup>7</sup>

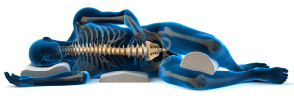


- Off-Load**
  - Positioning
- Nutrition**
  - Consult RD
  - Labs
- Wound Bed**
  - Off-load
  - Cleanse
  - Debride
- Dressing**
  - Moist Healing
  - Manage Exudate
- Biophysical Agents**
  - Ultrasound
  - Electrical Stimulation
  - NPWT

Treatment 

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## Positioning <sup>20-22</sup>



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- **Positioning**
  - Pressure reduction/relief decreases PIs by 70%
  - Supine: Changes every 2 hours
  - Sitting: every 15-30 min for 15-30 seconds
    - 60-second second duration if hourly
    - Pressure relief cushion: air, gel, urethane honeycomb
  - Lower bed angles support pressure relief
  - Specialty foam mattress optimal
- Prophylactic dressings: silicon foam to bony prominences

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Positioning Strategy <sup>20,23</sup>	Pro	Con
<b>Positioning Schedule</b>	PIs reduced by up to 70% with pressure distribution	Assistance for repositioning if patient unable
<b>Lower head of bed angle</b>	Reduced shear forces from sliding down in bed	Functional tasks are more difficult
<b>30° body tilt versus direct sidelying</b>	Pressure redistributed from bony prominences (trochanter, medial knee, lateral shoulder)	Difficulty to maintain 30° tilt
<b>Support surfaces</b>	Pressure redistribution	Cost
<b>Offloading education</b>	Individual performs direct offloading techniques	Adherence

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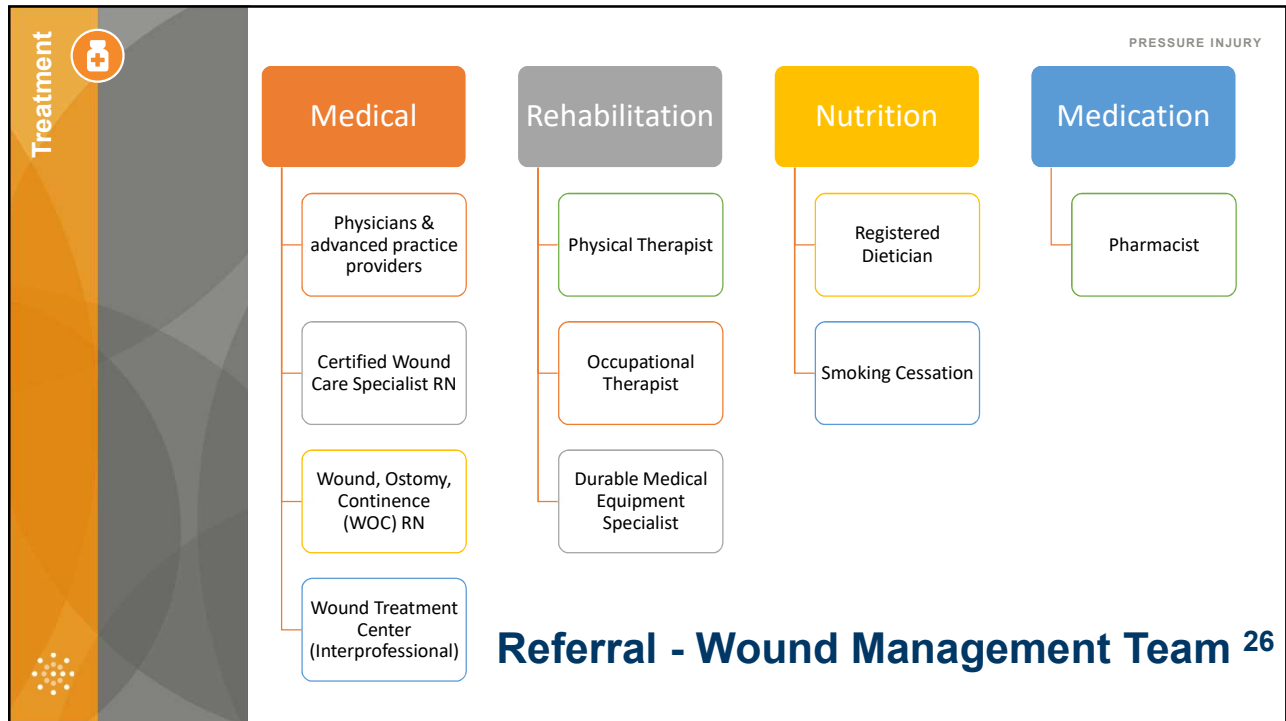
### Treatment of Pressure Injury <sup>20,24,25</sup>

Treatment	Considerations	
	Pros	Cons
<b>Wound Bed Preparation:</b> Wound Cleansing (Saline, Tap water)	Ease of access for clinicians and home use	Little evidence for use of one over another
<b>Debridement</b>	Decreased bacterial load, infection risk, odor. Promotes faster closure	Painful Enzymatic expensive Conservative sharp in older persons
<b>Exudate Management:</b> Dressing selection based on the amount of exudate	Absorption, cost, comfort +/- infection Maintains moist healing Protects fragile skin	Requires knowledge of specific dressing types

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## Wound Dressings <sup>26</sup>

Dressing Type	Description
Gauze	Common dressing, moistened with saline; can wick, fill, or cover a wound; removes healthy/nonhealthy tissue; inexpensive
Foam	Absorbs wound exudate; with/without adhesive border; type depends on volume of exudate; primary or secondary dressing
Hydrofiber	Nonadherent, highly absorptive dressing; contraindicated in dry wound beds; requires secondary dressing
Calcium Alginate	Composed of fibers derived from seaweed; moderately absorptive; can promote hemostasis; contraindicated over dry wound beds or over tendons, joint capsule, or bone
Hydrogel	Nonadherent, provides moisture to wound; may be in dressing or applied directly to wound bed; inexpensive
Transparent Film	Semi-occlusive; allows moisture transfer while impermeable to liquids, solids, and bacteria; no absorptive capacity; primary or secondary dressing; waterproof; contours to wound
Hydrocolloid	Occlusive, gelatin-based; contraindicated over infected wounds; best for shallow, low exudate wounds; change 1-2x/week



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# Remember Mrs. Chih?





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## Un-Age-Friendly Care (4Ms)




- Discharge to home vs SNF
- Insufficient assessment: hematoma vs deep tissue injury
- Lab values not addressed
- Smoking not addressed

- No formal positioning program
- No patient/caregiver education for positioning/unloading
- DC to home with the expectation of increased sitting without offloading DME

- Lack of blood sugar management due to deep tissue injury
- Lack of caregiver medication education

- No screening for delirium
- No screening for depression
- No assessment of capacity-informed consent



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## Age-Friendly Care

- Use evidence-based tools (Braden Scale, PUSH Tool)
- POC to address risk factors
- Nutritional consultation
- Short-term post-acute care stay
- Monitor deep pressure injury due to the inflammatory stage of healing

- Smoking cessation support
- Nicotine replacement
- Blood sugar medication adjustment
- Medication Therapy Management
- Caregiver education
- Communication with home health agency

- PT & OT in the home health plan
- Positioning program/education
- Plan for DME at discharge with support services including an emergency alert system
- Wound Monitoring

- Mental status for informed consent
- Screen for delirium & depression
- Home health social worker

Mrs. Chih

**WHAT MATTERS**      **MEDICATION**  
**MOBILITY**      **MIND**

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# Pressure Injury

## Clinical Pearls

### Evaluating Pressure Injury

- Screen & assess using valid tools for at-risk patients
- Consider age-related physiological changes
- Stage pressure injury per NPIAP guidelines
- Assess nutrition (Pre-albumin, Albumin)

### Managing Pressure Injury

- Prevention is the primary management strategy
- Position appropriately to offload pressure
- Provide support surfaces (mattress, cushion)
- Promote moist wound healing
- Cleanse, debride nonviable tissue, & manage exudate
- Consider biophysical agents
- Use an interprofessional, team-based management approach

# About Engage

An interdisciplinary team of clinician-educators

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 Susan W. Miller, BS Pharm, PharmD  
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**engage is part of Georgia Gear, a multi-institute partnership whose goal is to improve clinical care and quality of life for older adults and their families.**

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