

Comprehensive Briefing on Skin Integrity, Pressure Injury Pathogenesis, and Wound Management (Ch.42- Fundamentals of Nursing: Skin Integrity and wound care)

Executive Summary

Skin integrity is a critical indicator of patient safety and a vital component of physiological defense. The transition in clinical terminology from "pressure ulcer" to **pressure injury (PI)** reflects a modern understanding of localized damage to the skin and underlying soft tissue, typically occurring over bony prominences or resulting from medical devices. The pathogenesis of these injuries is driven by three primary factors: pressure intensity, pressure duration, and tissue tolerance.

Effective management requires a proactive approach centered on systematic risk assessment—most commonly utilizing the **Braden Scale**—and a deep understanding of the wound healing process. Key challenges include the detection of injuries in patients with dark skin tones, the management of medical device-related pressure injuries (MDRPI), and the mitigation of systemic factors such as malnutrition and the physiological effects of aging. Complications such as dehiscence, evisceration, and infection present significant risks to patient outcomes and increase the economic burden on the healthcare system, as organizations are increasingly held financially responsible for hospital-acquired Stage 3 and 4 injuries.

Scientific Foundations of Skin and Tissue Integrity

Anatomical Structure

The skin consists of two primary layers separated by a dermal-epidermal junction:

- **Epidermis:** The outermost layer, featuring the *stratum corneum* (dead, keratinized cells) which protects against dehydration and chemical entry. The basal layer facilitates constant cell proliferation and migration.
- **Dermis:** The inner layer providing tensile strength and mechanical support. It contains connective tissue, blood vessels, nerves, and **fibroblasts**, which are responsible for collagen formation.

Physiological Vulnerabilities in Older Adults

Aging alters skin characteristics, increasing susceptibility to injury:

- **Reduced Elasticity and Thinning:** Decreased collagen and muscle/tissue thinning increase risks for skin tears and PIs.

- **Flattened Junction:** The attachment between the epidermis and dermis flattens, making the skin easily torn by mechanical trauma (e.g., tape removal).
- **Diminished Response:** A slowed inflammatory response leads to delayed epithelialization and wound healing.

Pressure Injury Dynamics and Pathogenesis

Mechanisms of Injury

Pressure is the primary causative element, interfering with blood flow and cellular metabolism.

- **Tissue Ischemia:** Prolonged pressure occludes blood vessels, leading to tissue death.
- **Top-Down vs. Bottom-Up Damage:** Superficial damage (Stage 1) is often caused by shear or friction. Deep damage starts at the bone-muscle interface and extends outward toward the skin.
- **Blanching vs. Nonblanchable Erythema:** Normal reactive hyperemia (blanchable) is a transient attempt to overcome ischemia. Nonblanchable erythema indicates probable deep tissue damage.

Contributing Physical Forces

1. **Shear:** Gravity pushing down while the skin is fixed by friction (e.g., sliding down in bed). This causes damage at the deep fascial level.
2. **Friction:** The mechanical force of two surfaces moving across each other, affecting the epidermis and causing "sheet burns."
3. **Moisture:** Moisture-associated skin damage (MASD) reduces skin resistance, softening the tissue and increasing vulnerability to pressure and shear.

Classification and Staging of Pressure Injuries

The staging system describes the depth of tissue destroyed at the time of assessment. An injury cannot be staged if it is covered by necrotic tissue (slough or eschar).

Stage	Clinical Description
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Stage 1	Intact skin with localized nonblanchable erythema. May be preceded by changes in sensation or temperature.
Stage 2	Partial-thickness loss with exposed dermis. Wound bed is viable, pink/red, and moist. No adipose or deep tissue visible.
Stage 3	Full-thickness skin loss. Adipose (fat) is visible; granulation tissue and rolled wound edges (epibole) are common.
Stage 4	Full-thickness skin and tissue loss. Exposed or palpable fascia, muscle, tendon, ligament, or bone.
Deep Tissue Injury	Persistent nonblanchable deep red, maroon, or purple discoloration. Results from intense/prolonged pressure at the bone-muscle interface.
Unstageable	Full-thickness loss obscured by slough or eschar. Depth cannot be confirmed until necrotic tissue is removed.

Specialized Injury Types

- **Medical Device-Related Pressure Injury (MDRPI):** Results from the use of diagnostic or therapeutic devices (e.g., oxygen masks, catheters). The injury typically conforms to the shape of the device.
- **Medical Adhesive-Related Skin Injury (MARSI):** Erythema or abnormalities (vesicles, stripping) persisting 30+ minutes after adhesive removal.

Wound Classification and Healing Processes

Types of Wound Repair

Wounds are classified by their healing intent:

- **Primary Intention:** Occurs in clean surgical incisions with approximated edges. Healing is rapid with minimal scarring.
- **Secondary Intention:** Occurs in wounds involving tissue loss (e.g., burns, Stage 2 PIs). The wound is left open and fills with scar tissue; infection risk is higher.
- **Tertiary Intention:** Closure is intentionally delayed until infection or edema is resolved.

Phases of Full-Thickness Wound Repair

1. **Hemostasis:** Vasoconstriction and platelet gathering to stop bleeding and form a fibrin matrix.
2. **Inflammatory Phase:** Mast cells secrete histamine, causing vasodilation. Macrophages clean the wound via phagocytosis and release growth factors.
3. **Proliferative Phase:** Lasts 3–24 days. Key activities include granulation tissue formation, wound contraction, and epithelialization.
4. **Maturation/Remodeling:** Can continue for over a year. Collagen fibers reorganize; the healed tissue rarely regains the full tensile strength of the original tissue.

Risk Assessment and Clinical Management

The Braden Scale

The Braden Scale is a validated tool for predicting PI risk based on six subscales: Sensory Perception, Moisture, Activity, Mobility, Nutrition, and Friction/Shear.

- **Score Range:** 6 to 23.
- **Risk Threshold:** A score of 18 or lower generally indicates risk.

Nutrient Requirements for Healing

Proper nutrition is essential for tissue repair and collagen synthesis.

Nutrient	Role in Healing	Sources
Calories	Fuel for cell energy; "protein protection."	Smoothies, nuts, beans, salmon.
Protein	Collagen formation, immune function.	Poultry, fish, eggs, milk.
Vitamin C	Capillary wall integrity, antioxidant.	Citrus, tomatoes, potatoes.
Vitamin A	Epithelialization, wound closure.	Spinach, broccoli, carrots.
Zinc	Protein synthesis, immune competence.	Vegetables, meats, legumes.
Fluid	Essential environment for cell function.	Water (best), non-caffeinated fluids.

Diagnostic Indicators of Malnutrition

While serum albumin is frequently measured, **prealbumin** is the preferred indicator of current nutritional status because it reflects what the body has recently absorbed and metabolized.

Critical Complications and Clinical Considerations

Healing Complications

- **Hemorrhage:** Internal or external bleeding. Internal bleeding may manifest as a **hematoma**, which can obstruct blood flow if near a major vessel.
- **Infection:** Indicated by purulent drainage (yellow, green, or brown), odor, fever, and elevated white blood cell count.
- **Dehiscence:** Partial or total separation of wound layers, often occurring 3–11 days post-injury in patients with poor nutrition or infection.
- **Evisceration:** An emergency involving the protrusion of visceral organs through a wound opening. Requires immediate sterile saline covering and surgical intervention.

Cultural and Clinical Variations in Assessment

- **Darkly Pigmented Skin:** Standard blanching tests are often ineffective. Clinicians must prioritize palpation for changes in tissue consistency (firm or "boggy"), sensation (pain), and temperature (warmth or coolness). Natural or halogen lighting is preferred over fluorescent light, which can cast a misleading bluish tint.
- **COVID-19 Impact:** Critically ill patients face unique PI risks due to prone positioning during ventilatory support, microvascular injury, and hypercoagulation. Common sites include the cheeks, lips, and mouth.

Study Guide Format:

Comprehensive Study Guide: Skin Integrity and Wound Care

This study guide provides a detailed review of skin physiology, the pathogenesis and classification of pressure injuries, the biological processes of wound healing, and essential nursing assessment strategies based on clinical standards.

Part 1: Short-Answer Quiz

Instructions: Answer the following questions using 2-3 sentences based on the provided text.

1. **What are the primary functions of the skin, and what are its two main layers?**
2. **How does a pressure injury (PI) develop, and what role does tissue ischemia play?**
3. **Why is the assessment of pressure injuries more challenging in patients with darkly pigmented skin?**
4. **Distinguish between blanchable hyperemia and nonblanchable erythema.**
5. **What is the difference between shear and friction in the context of skin injury?**
6. **Describe the six subscales of the Braden Scale and how the total score indicates risk.**
7. **Explain the difference between healing by primary intention and secondary intention.**
8. **What are the four phases involved in full-thickness wound repair?**
9. **Identify the clinical signs of a wound infection.**
10. **Define Medical Device–Related Pressure Injuries (MDRPIs) and where they most commonly occur.**

Part 2: Answer Key

1. **What are the primary functions of the skin, and what are its two main layers?** The skin acts as a protective barrier against disease-causing organisms,

a sensory organ for pain, temperature, and touch, and a site for vitamin D synthesis. It consists of two main layers: the epidermis (the thin, outermost layer) and the dermis (the inner layer providing tensile strength and mechanical support).

2. **How does a pressure injury (PI) develop, and what role does tissue ischemia play?** A PI develops due to intense or prolonged pressure, often over bony prominences, which interferes with blood flow and cellular metabolism. This pressure results in tissue ischemia (obstructed blood flow), which leads to tissue death if the pressure is not relieved.
3. **Why is the assessment of pressure injuries more challenging in patients with darkly pigmented skin?** In patients with dark skin tones, standard signs like redness (erythema) or the blanching response may not be visible. Assessment must instead rely on changes in skin temperature, edema, tissue consistency (firm or boggy), and localized pain or color changes that differ from the patient's baseline skin tone.
4. **Distinguish between blanchable hyperemia and nonblanchable erythema.** Blanchable hyperemia occurs when an erythematous area turns pale when pressed and the redness returns after the finger is removed, indicating a transient attempt to overcome ischemia. Nonblanchable erythema persists even when pressure is applied, indicating that deep structural damage to the capillary bed has likely occurred.
5. **What is the difference between shear and friction in the context of skin injury?** Shear is a deep-tissue force occurring when the skeleton moves while the skin remains fixed to a surface, causing damage at the fascial level. Friction is a superficial mechanical force exerted when skin is dragged across a coarse surface, affecting only the epidermis and appearing as red, painful "sheet burns."
6. **Describe the six subscales of the Braden Scale and how the total score indicates risk.** The Braden Scale evaluates sensory perception, moisture, activity, mobility, nutrition, and friction/shear. Total scores range from 6 to 23, where a lower score indicates a higher risk for pressure injury development; a score of 18 is typically the cutoff for identifying at-risk adults.
7. **Explain the difference between healing by primary intention and secondary intention.** Primary intention occurs in wounds with little tissue loss and approximated edges, such as surgical incisions, resulting in rapid healing and minimal scarring. Secondary intention involves wounds with tissue loss, like

burns or Stage 2 PIs, where the wound is left open to fill with granulation tissue, leading to a longer healing process and greater risk of infection.

8. **What are the four phases involved in full-thickness wound repair?** The four phases are hemostasis (blood loss control and clot formation), the inflammatory phase (cleaning the wound via white blood cells), the proliferative phase (filling the wound with granulation tissue and resurfacing via epithelialization), and maturation (the final reorganization of collagen and scar strengthening).
9. **Identify the clinical signs of a wound infection.** Local signs include erythema, increased or purulent (yellow, green, or brown) drainage, odor, periwound warmth, pain, and edema. Systemic indicators may include a fever and an elevated white blood cell (WBC) count.
10. **Define Medical Device–Related Pressure Injuries (MDRPIs) and where they most commonly occur.** MDRPIs result from sustained pressure or shear caused by poorly positioned or ill-fitting diagnostic or therapeutic devices, often conforming to the shape of the device. They occur most frequently in the face and head regions, particularly the ears, and are commonly associated with oxygen tubing, masks, and various catheters.

Part 3: Essay Questions

1. **The Impact of Aging on Skin Integrity:** Analyze how physiological changes in older adults—such as reduced elasticity, thinned subcutaneous tissue, and diminished inflammatory responses—contribute to an increased risk of pressure injuries and delayed wound healing.
2. **Pathogenesis and Mechanical Load:** Discuss the three pressure-related factors (intensity, duration, and tissue tolerance) that contribute to "bottom-up" pressure injury damage. How should a nurse apply this knowledge to clinical practice?
3. **Nutritional Requirements for Healing:** Detail the specific roles of calories, protein, Vitamin C, Vitamin A, and Zinc in the wound-healing process. Explain why prealbumin is considered a more sensitive laboratory indicator than albumin for assessing a patient's current nutritional status.
4. **Wound Complications and Emergency Management:** Compare and contrast the complications of hemorrhage, dehiscence, and evisceration. Detail the

immediate nursing actions required when a patient experiences an evisceration of an abdominal wound.

5. **Cultural Competence in Skin Assessment:** Evaluate the strategies a nurse must use to perform a thorough skin assessment on a patient with darkly pigmented skin. Why is the reliance on "redness" alone insufficient and potentially dangerous in this population?
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Part 4: Glossary of Key Terms

Term	Definition
Abrasion	A superficial wound with little bleeding, considered a partial-thickness injury involving plasma leakage from damaged capillaries.
Approximated	Closed wound edges, typically seen in surgical incisions healing by primary intention.
Blanchable Hyperemia	Redness that turns white (blanches) under pressure and returns when pressure is removed; indicates transient ischemia.
Braden Scale	A validated risk assessment tool consisting of six subscales used to identify patients at risk for pressure injuries.
Debridement	The removal of devitalized or necrotic tissue from a wound to enable healing.
Dehiscence	The partial or total separation of wound layers, commonly occurring 3 to 11 days after injury before collagen formation is complete.
Epithelialization	The process in the proliferative phase where epithelial cells migrate from the wound edges to resurface the wound.
Eschar	Black, brown, or tan necrotic tissue that must be removed before a wound can heal.
Evisceration	A medical emergency involving the total separation of wound layers and the protrusion of visceral organs through the opening.

Exudate	Fluid, such as pus or serum, that leaks out of blood vessels or capillaries due to inflammation or injury.
Fluctuance	A soft, wavy feeling upon palpation, often indicating fluid under the skin; its absence is noted in stable eschar.
Friction	The mechanical force of two surfaces moving across each other, causing superficial epidermal damage.
Granulation Tissue	Red, moist tissue composed of new blood vessels; its presence indicates the wound is progressing toward healing.
Hemostasis	The physiological process of controlling blood loss through vessel constriction and platelet gathering.
Induration	An abnormal firmness or hardening of the skin or tissue, often a sign of inflammation or wound deterioration.
Laceration	A jagged or torn wound that may bleed profusely depending on depth and location.
MARSI	Medical Adhesive–Related Skin Injury; skin abnormalities (tears, blisters, redness) persisting 30 minutes after adhesive removal.
MDRPI	Medical Device–Related Pressure Injury; tissue damage resulting from pressure or shear exerted by medical devices.
Nonblanchable Erythema	Visible skin redness that persists when pressure is applied, indicating structural damage to the capillary bed (Stage 1 PI).
Pressure Injury	Localized damage to the skin and underlying soft tissue, usually over a bony prominence, caused by intense or prolonged pressure.
Primary Intention	A healing process for wounds with approximated edges (e.g., surgical sutures) that heals quickly with minimal scarring.
Purulent	Thick wound drainage that may be yellow, green, tan, or brown, often indicating infection.
Sanguineous	Bright red wound drainage, indicating active bleeding.

Secondary Intention	A healing process for wounds with tissue loss; the wound remains open and fills with scar tissue.
Serosanguineous	Pale, pink, watery drainage; a mixture of clear and red fluid.
Serous	Clear, watery plasma drainage.
Shearing Force	Sliding movement of skin and subcutaneous tissue while the underlying muscle and bone remain stationary.
Slough	Soft yellow or white stringy substance attached to the wound bed; must be removed for healing to occur.
Tertiary Intention	A process where wound closure is intentionally delayed until risk of infection or inflammation is resolved.
Tissue Ischemia	A restriction in blood supply to tissues, causing a shortage of oxygen and nutrients needed for cellular metabolism.

Conceptual Breakdown of Ch.42:

The Nursing Student's Guide to Wound Healing Intentions

1. Introduction: The Biological Architecture of Repair

To master wound care, you must first understand the "canvas" the body works on: the skin. As a clinician, your assessment begins with recognizing the two primary layers that dictate how repair unfolds.

- **The Epidermis:** This is the thin outermost layer. Its surface, the **stratum corneum**, is a barrier of dead, keratinized cells that prevents dehydration and blocks pathogens. When injury is limited to the epidermis, the body focuses on *regeneration*—simply resurfacing the barrier.
- **The Dermis:** The inner layer provides tensile strength and mechanical support through connective tissue, blood vessels, and nerves. Damage here requires the body to restore structural integrity through scar formation.

Quick Fact: The Role of Fibroblasts Fibroblasts are the only distinctive cell type within the dermis. They are the "construction workers" of the skin, responsible for collagen formation, which provides the necessary strength for a healing wound.

Clinical Pearl: Assessing All Skin Tones The "so what?" of skin structure is assessment accuracy. In darkly pigmented skin, you cannot rely on seeing redness (erythema). You must use natural or halogen light—avoiding fluorescent lights that cast a bluish tint—to look for purple or maroon tones. Always palpate for "boggy" (mushy) or unusually firm consistency and changes in temperature (initially warm, then cool as tissue fails).

Understanding these layers helps us predict whether a wound will heal by simply replacing skin cells or by building a complex new landscape of tissue.

2. Comparing the Three Intentions of Wound Healing

The "intention" of healing is the clinical pathway the body takes to close a gap. This is determined by the depth of tissue loss and the presence of contamination.

Intention Type	Clinical Presentation	Healing Path & Scarring
Primary Intention	Wound edges are approximated (closed). Typical of clean surgical incisions held by sutures or staples.	Heals quickly via epithelialization with minimal risk of infection. Results in minimal scar formation .
Secondary Intention	Wound edges are not closed; there is significant tissue loss (e.g., burns, Stage 3/4 pressure injuries).	The wound stays open and fills with granulation tissue from the bottom up. Requires wound contraction; results in larger, permanent scars .
Tertiary Intention	Closure is delayed due to contamination or inflammation. The wound is left open for observation.	Once infection is resolved, edges are approximated. This is a hybrid path involving both granulation and later suturing.

The "intention" we observe at the bedside is the outward manifestation of a precise, four-stage physiological timeline.

3. The Physiological Timeline: Full-Thickness Wound Repair

While partial-thickness wounds (like Stage 2 pressure injuries) heal by **regeneration** (cells reestablishing normal thickness), full-thickness wounds (Stage 3 and 4) require a more intensive **repair** process resulting in scar formation. Note: Scar tissue never regains 100% of the original tissue's tensile strength.

1. Hemostasis (Coagulation)

- **Primary Actor:** Platelets
- **Clinical Synthesis:** Platelets create a **fibrin matrix** that serves as a framework for repair. **Watch out:** Patients on anticoagulants or with liver disease may have a compromised "foundation" due to impaired clotting.

2. Inflammatory Phase

- **Primary Actors:** Neutrophils and Macrophages
- **Clinical Synthesis:** Think of Macrophages as the "site cleaning crew." They perform phagocytosis to clear debris and release growth factors.
Watch out: Steroid use can "fire" the cleaning crew too early, while infection keeps them there too long, both of which derail the timeline.

3. Proliferative Phase

- **Primary Actor:** Fibroblasts
- **Clinical Synthesis:** This phase fills the wound with **granulation tissue** (fragile, red, moist tissue) and collagen. The wound contracts to "shrink" the defect before epithelial cells migrate to resurface the site.

4. Remodeling and Maturation

- **Primary Actor:** Collagen Fibers
- **Clinical Synthesis:** This stage can last over a year as collagen reorganizes. Scar tissue usually lacks the original number of melanocytes, appearing lighter in light skin or potentially more highly pigmented in dark skin.

4. Factors That Promote or Impede Healing

A wound's progress is only as good as the "fuel" and "environment" provided by the patient's body.

Factor	Role in Healing	Clinical Significance
Calories	Fuel for cell energy.	Prevents "protein breakdown" for energy; essential for metabolic demands.
Protein	Angiogenesis & collagen formation.	Essential for tissue repair; monitored via prealbumin levels.
Vitamin C/A	Collagen synthesis & epithelialization.	Vit C supports capillary integrity; Vit A can reverse steroid-induced delays.

Zinc	DNA & protein synthesis.	Critical for cell proliferation and collagen cross-linking.
Tissue Perfusion	Oxygen delivery.	Oxygen is the "fuel" for cellular function. Chronic hypoxia (diabetes/PVD) stops healing.
Age	Physiological response time.	Older adults have a diminished inflammatory response and slower epithelialization.

When these factors are absent, we move from healthy healing to clinical complications.

5. Identifying Red Flags: Wound Complications

As a nurse, you are the first line of defense against complications. Vigilance is a safety priority.

- **Hemorrhage:** Look for internal hematomas (swelling/discoloration) or external saturated dressings.
- **Infection:** Watch for purulent drainage, odor, periwound warmth, and systemic fever.
- **Dehiscence:** The partial or total separation of wound layers. **Nurse's Alert:** An unexpected increase in **serosanguineous drainage** in the first few days is a major warning sign of impending dehiscence.
- **Evisceration:** A surgical emergency where visceral organs protrude. **Immediate Action:** Place sterile, saline-soaked gauze over the tissue, maintain **NPO status**, observe for signs of shock, and call the surgical team immediately.

Nurse's Alert: Wound Drainage (Exudate) Types

Type	Appearance	Clinical Significance
Serous	Clear, watery plasma	Normal in early stages.
Purulent	Thick; yellow, green, or brown	Sign of infection; contains WBCs and bacteria.
Serosanguineous	Pale, pink, watery	Normal post-op; sudden increase suggests dehiscence.
Sanguineous	Bright red	Indicates active bleeding/vascular damage.

6. Clinical Application: Pressure Injury Staging as a Map

Pressure injuries (PIs) provide the best real-world example of healing intentions:

- **Stage 1 PI:** Intact skin with **nonblanchable erythema**. In dark skin, look for purple/maroon tones and feel for "bogginess." This is handled as a top-down, superficial injury.
- **Stage 2 PI:** Partial-thickness loss with exposed dermis (often a serum-filled blister). Heals by **regeneration** (secondary intention).
- **Stage 3 & 4 PI:** Full-thickness skin and tissue loss. These require the full four-phase repair process (secondary intention) and will result in permanent scar tissue.

Summary: Unstageable Wounds If a wound is obscured by **slough** (stringy yellow/white tissue) or **eschar** (black/brown necrotic tissue), it is **Unstageable**. You cannot determine the intention or the depth until the wound is debrided, as the necrotic tissue masks the true extent of the damage.

7. Final Summary Checklist for Nursing Practice

When performing your head-to-toe assessment, use this checklist to guide your clinical judgment:

- [] **Check the Edges:** Are the edges approximated (Primary) or is there a gap requiring granulation (Secondary)?
- [] **Identify the "Actors":** Do you see red, moist granulation tissue? If you see yellow slough, the proliferative phase is stalled.
- [] **Assess for Warning Drainage:** Is there a sudden increase in serosanguineous fluid (Dehiscence risk) or purulent odor (Infection)?
- [] **Inspect Darkly Pigmented Skin:** Have you checked for purple/maroon discoloration, changes in temperature, or bogginess?
- [] **Verify the "Fuel":** Has the patient had an unintentional weight loss? Check prealbumin to ensure they have the protein needed for repair.
- [] **Check the Hardware:** Have you inspected the skin under oxygen tubing, catheters, casts, or masks for "pattern-shaped" injuries (MDRPIs)?

