

**Cardinal Health SkinHealth360™**

# Wound 101 Guide



# Contents

## Measure the wound

How to measure wound size	1
How to measure wound depth	1

## Types of wounds

Skin tears	2
Pressure	2
Arterial	3
Venous	3
Neuropathic/diabetic	4

## Pressure injury stages

Skin anatomy — three layers	5
Stage 1. Nonblanchable erythema of intact skin	5
Stage 2. Partial-thickness skin loss (or blister)	6
Stage 3. Full-thickness skin loss	6
Stage 4. Full-thickness skin and tissue loss	6
Unstageable — obscured full-thickness skin and tissue loss	7
Deep tissue pressure injury	7
Medical device related pressure injury	7
Mucosal membrane pressure injury	7

## Pressure points

Prone	8
Side-lying	8
Supine	8
Seated	9
Wheel chair	9
Foot	10
Sole of the foot	10

## Phases of wound healing

Inflammatory phase (1–4 days)	11
Proliferative phase (4–21 days)	11
Maturation phase (21 days–24 months)	11

## Principles of healing

The principles of effective wound care	12
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## Complications

Complications in wound healing	13
Does the resident have a disease that interferes with healing?	13
How is the resident's nutrition/hydration?	13
Is the resident exposed to moisture/incontinence?	14
How is the resident's circulation?	14
How old is the resident?	15
What is the resident's body type?	15
Is the resident exposed to mechanical stress?	15
Is there debris in the wound?	16
What is the temperature of the wound?	16
Is the wound bed dry (desiccated) or wet (macerated)?	16
Is the wound infected?	17
Is the wound exposed to chemical stress?	17
Is the resident on medication?	17

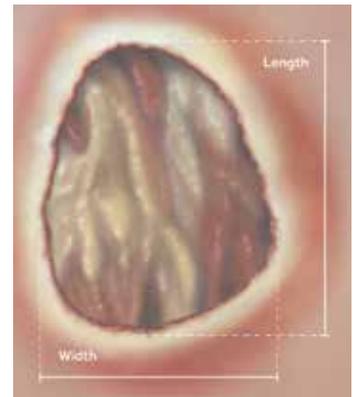
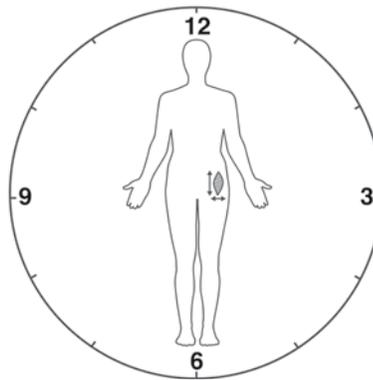
# Measure the wound

## How to measure wound size

Consistency is key. With the resident in a neutral position, use a disposable centimeter ruler to measure wound length and width.<sup>1</sup>

Using a clockface as reference, position the resident's head at 12:00 and their feet at 6:00. The width of the wound is then measured on the 3:00–9:00 axis. The length of the wound is measured using the 12:00–6:00 axis.

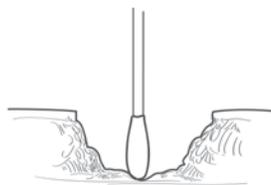
Measure the longest length of the ulcer head-to-toe and longest width side-to-side, perpendicular (at 90 degrees) to the length.



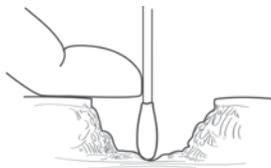
## How to measure wound depth

Measure the wound depth and areas of tunneling and undermining by gently inserting a premoistened (with normal saline or sterile water) cotton-tipped applicator to the point of resistance. Depth is always measured using the deepest part of the wound perpendicular to the surface of the skin.<sup>2</sup>

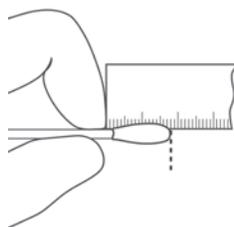
- 1 Insert a cotton-tipped, premoistened applicator.



- 2 Mark or grasp the applicator at the point it meets the skin level.



- 3 Measure against a centimeter ruler.



# Types of wounds

## Skin tears

### Characteristics<sup>3</sup>

- Separation of the epidermis from the dermis (partial-thickness wound) or separation of both the epidermis and the dermis from underlying structures (full-thickness wound)
- Caused by application of shearing or friction forces on fragile skin — can also result from adhesive removal
- Risk of skin tears is increased by dehydration, poor nutrition, cognitive impairment, altered mobility, and decreased sensation

### Management

- Control the bleeding
- Cleanse the wound
- Approximate the skin flap
- Apply dressing that will promote and maintain a moist wound environment
- Implement interventions to minimize risk of recurrence



## Pressure

### Characteristics

- 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<sup>1</sup>
- Usually circular, but can vary greatly in size depending on location
- Viable or necrotic tissue can be present
- Drainage can vary from not present to heavy
- Often painful, where pain is typically greater with higher stages — pain is not often treated with analgesics<sup>1</sup>

### Management

- Remove pressure
- Maintain optimal moisture
- Control bioburden (infection risk)
- Remove necrotic, nonviable tissue
- Protect periwound skin



## Arterial

### Characteristics

- May be anywhere on the leg, but likely to occur on bony prominences like toes and heels on the foot
- Typically small, punched out, with well demarcated wound edges
- Wound is pale, non-granulating and often has a necrotic base<sup>4</sup>
- Minimal to no drainage<sup>4</sup>
- Edema not common<sup>4</sup>
- Ischemia can result in resting pain<sup>4</sup>

### Management

- Consider vascular consult if perfusion is not adequate (Ankle-Brachial Index <0.08, see page 11 of the Wound assessment booklet)<sup>4</sup>
- Follow protocol based on wound assessment and characteristics if perfusion is adequate



## Venous

### Characteristics

- Located in the ankle to mid-calf area of the leg
- Ulceration may be discrete or circumferential with an irregular, gently sloping edge<sup>4</sup>
- Ulcer bed is often covered with a fibrinous layer<sup>4</sup>
- Drainage is most frequently heavy to generalized weeping but may also present with scant when mixed etiology
- Pitting edema is often present and may predate the ulcer<sup>4</sup>
- Pain usually occurs as these injuries impact the nerve endings, and exudate levels may cause inflammation, irritation and stinging<sup>4</sup>

### Management<sup>4</sup>

- Compress the wound (Ankle-Brachial Index <0.08, see page 11 of the Wound assessment booklet)
- Remove nonviable tissue
- Control bioburden to reduce risk of infection
- Protect periwound skin
- Raise leg when resident is seated
- Ensure lower extremity skin care (moisturization)



# Types of wounds (continued)

## Neuropathic/diabetic

### Characteristics

- Neuropathic disease may lead to loss of sensation, which may also result in an open wound
- Occurs on the feet
- Wound margin is similar to arterial wounds, usually with a calloused edge
- Pale wound bed with a callous surrounding the periwound surface — little to no tissue growth
- Scant to heavy exudate depending on wound tissue involved
- Edema may be localized, usually no discoloration
- Due to nerve damage, pain may be absent or severe

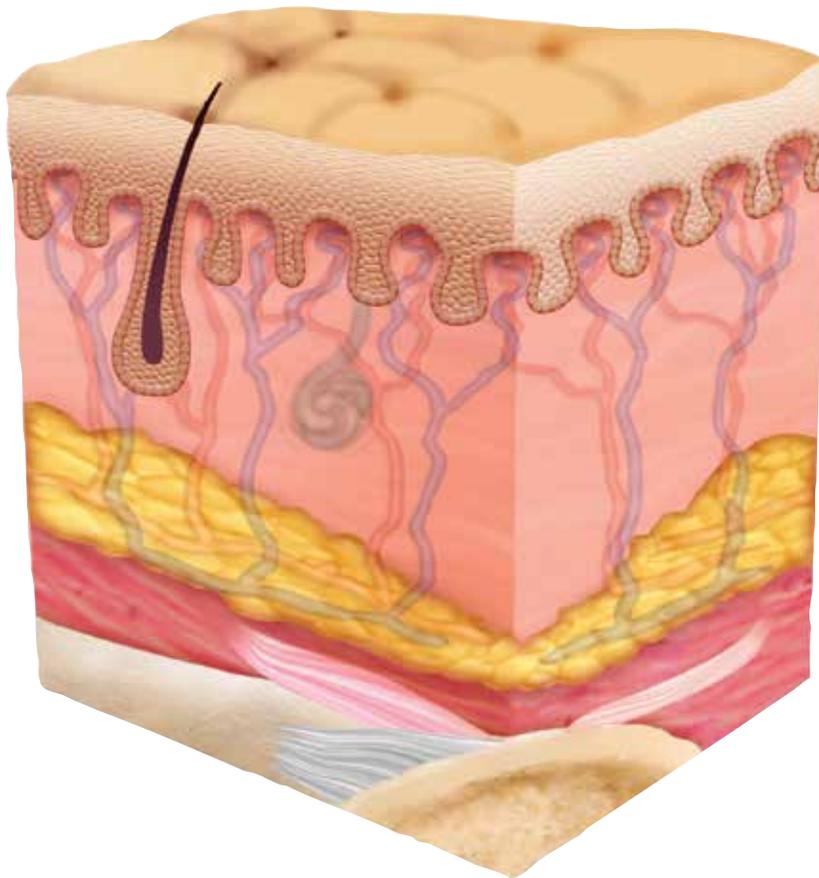
### Management

- Maintain optimal moisture
- Control blood glucose level
- Remove callous consistently (or repetitively)
- Control bioburden
- Offload surfaces impacted/at risk



# Pressure injury stages

## Skin anatomy — three layers<sup>5</sup>



Epidermis is the outer layer and is water-resistant

Dermis is the inner layer and consists of living cells

Subcutaneous layer is a fatty layer, providing padding

Muscle

Bone

## Stage 1. Nonblanchable erythema of intact skin

### Assessment characteristics<sup>1</sup>

- Intact skin with nonblanchable 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
- The area may be painful, firm, soft, warm or cool compared to adjacent tissue

To detect Stage 1 pressure injury, inspect the resident's bony areas (hips, sacrum, coccyx, heel).



# Pressure injury stages (continued)

## Stage 2. Partial-thickness skin loss (or blister)

### Assessment characteristics

- Partial-thickness loss of skin with exposed dermis (the wound bed is viable, pink or red, moist and without slough)<sup>1</sup>
- May present as an intact or open/ruptured serum-filled blister<sup>1</sup>
- Edges are flat and distinct without undermining or tunneling
- Granulation tissue is not present; healing occurs through regeneration of dermis and epidermis

This stage should not be used to describe moisture-associated skin damage (MASD). Do not classify. Describe skin tears, tape burns, incontinence associated dermatitis (IAD), maceration or excoriation as Stage 2.<sup>1</sup>



## Stage 3. Full-thickness skin loss

### Assessment characteristics

- Full-thickness tissue loss — subcutaneous fat may be visible but bone, tendon or muscle are not exposed<sup>1</sup>
- Slough may be present but does not obscure the depth of tissue<sup>1</sup>
- May include undermining and tunneling<sup>1</sup>
- No regeneration of epidermis or dermis
- Healing occurs through granulation, contraction and epithelialization



## Stage 4. Full-thickness skin and tissue loss

### Assessment characteristics

- Full-thickness tissue loss with exposed bone, tendon or muscle<sup>1</sup>
- Depth varies by anatomical location (e.g., bridge of nose or ear may be shallow)<sup>1</sup>
- Slough or eschar may be present<sup>1</sup>
- Often includes undermining and tunneling<sup>1</sup>
- No regeneration of epidermis or dermis
- Healing occurs through granulation, contraction and epithelialization



## Unstageable — obscured full-thickness skin and tissue loss

### Assessment characteristics<sup>1</sup>

- Full-thickness tissue loss in which the base of the injury is covered by slough and/or eschar
- The true depth (stage) cannot be determined until enough slough and/or eschar is removed to expose wound base
- Stable (dry, adherent, intact without erythema or fluctuance) eschar on the heels serves as “the body’s natural (biological) cover” and should not be removed.<sup>1</sup>



## Deep tissue pressure injury

### Assessment characteristics<sup>1</sup>

- Intact or nonintact skin with localized area of persistent nonblanchable deep red, maroon or purple discoloration, or epidermal separation revealing dark wound bed or blood-filled blister
- Result of damage to underlying soft tissue from pressure and/or shear
- Compared to adjacent tissue, it may be painful, mushy, boggy, warm or cool
- May be difficult to detect in individuals with dark skin tones



## Medical device related pressure injury

### Assessment characteristics<sup>5</sup>

- Result<sup>5</sup> from the use of devices designed and applied for diagnostic or therapeutic purposes
- Generally conforms to the pattern or shape of the device
- Should be staged using the staging system.

## Mucosal membrane pressure injury

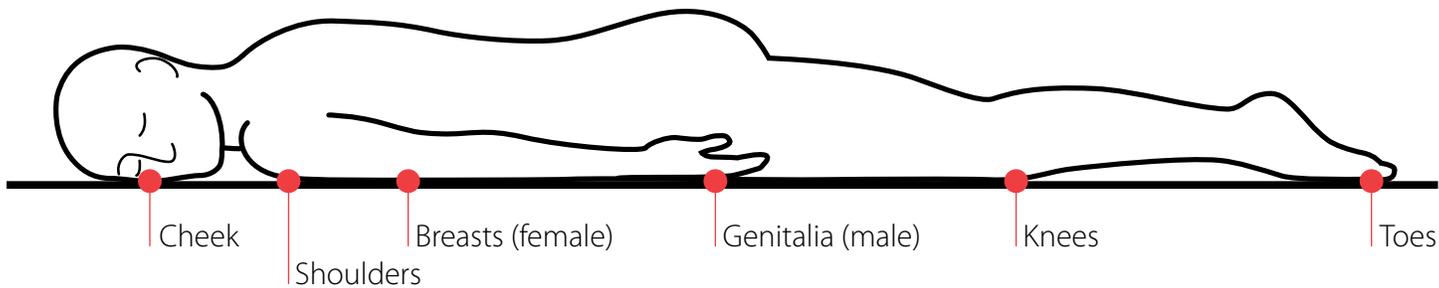
### Assessment characteristics<sup>5</sup>

- Found on mucous membranes with a history of a medical device in use at the location of the injury

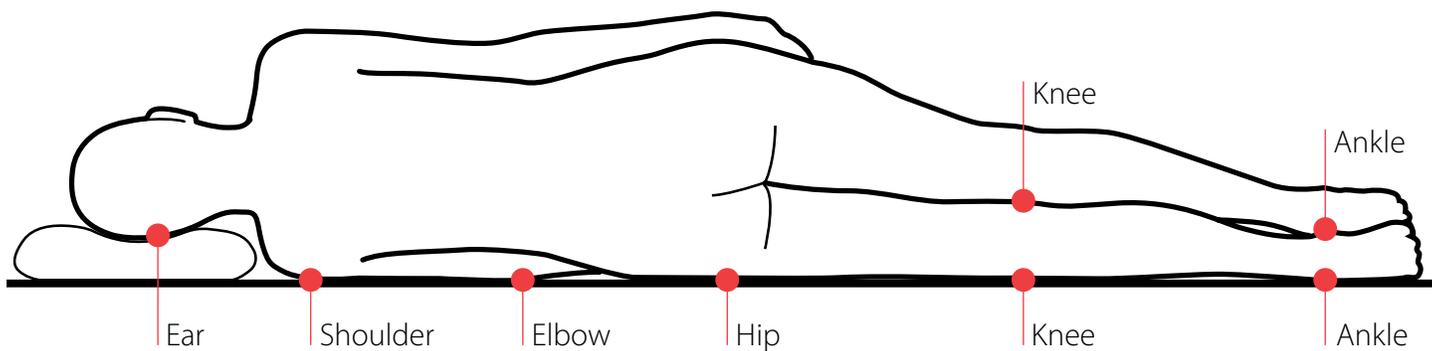
Cannot be staged due to the anatomy of the tissue.

# Pressure points

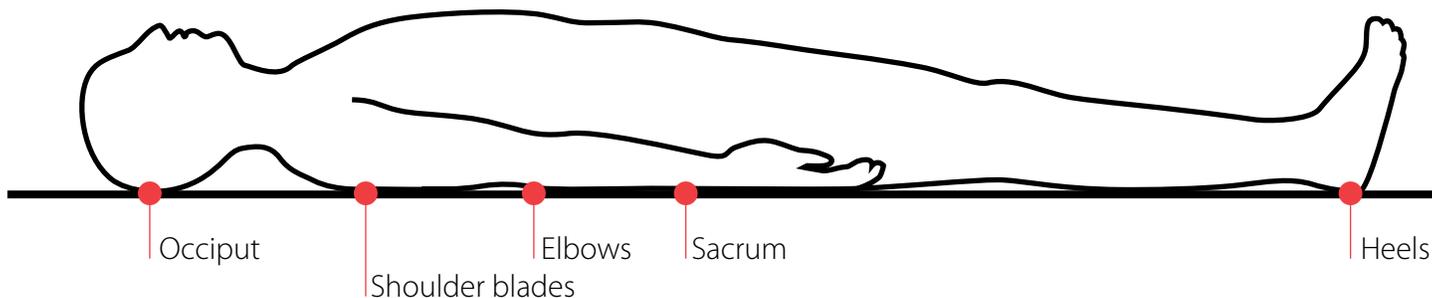
## Prone



## Side-lying

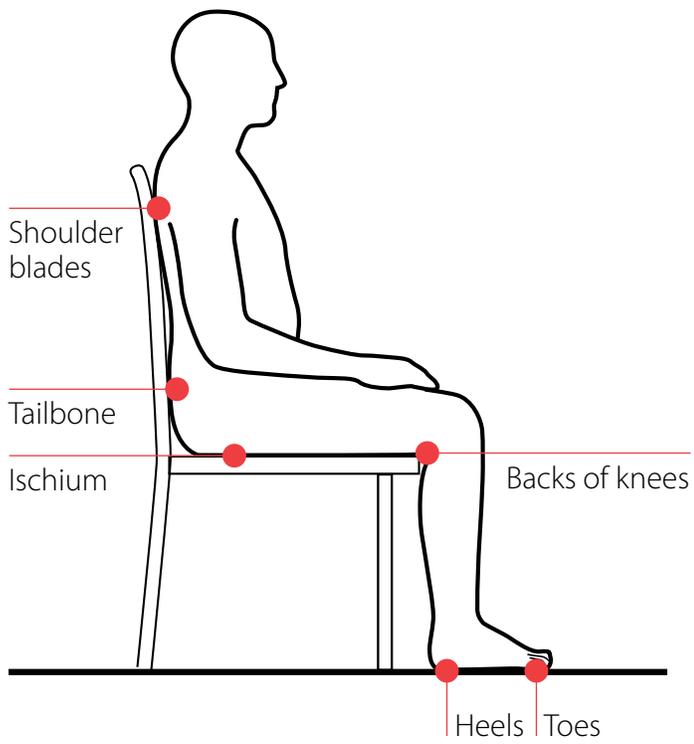


## Supine



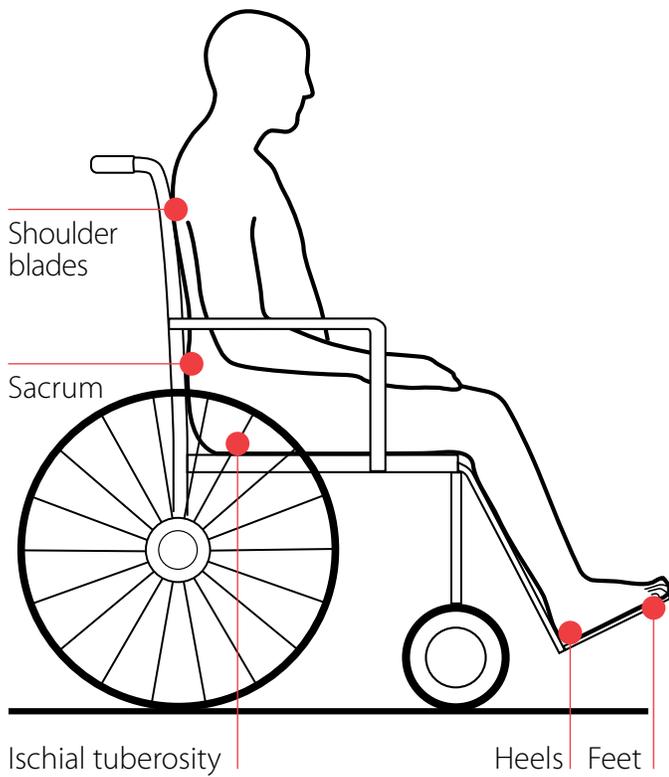
## Seated

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## Wheelchair

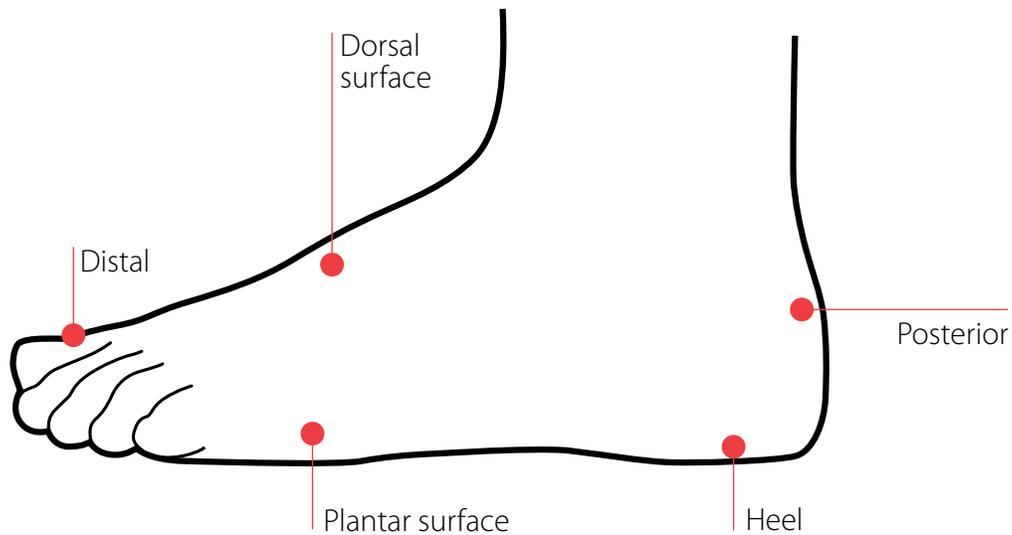
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# Pressure points (continued)

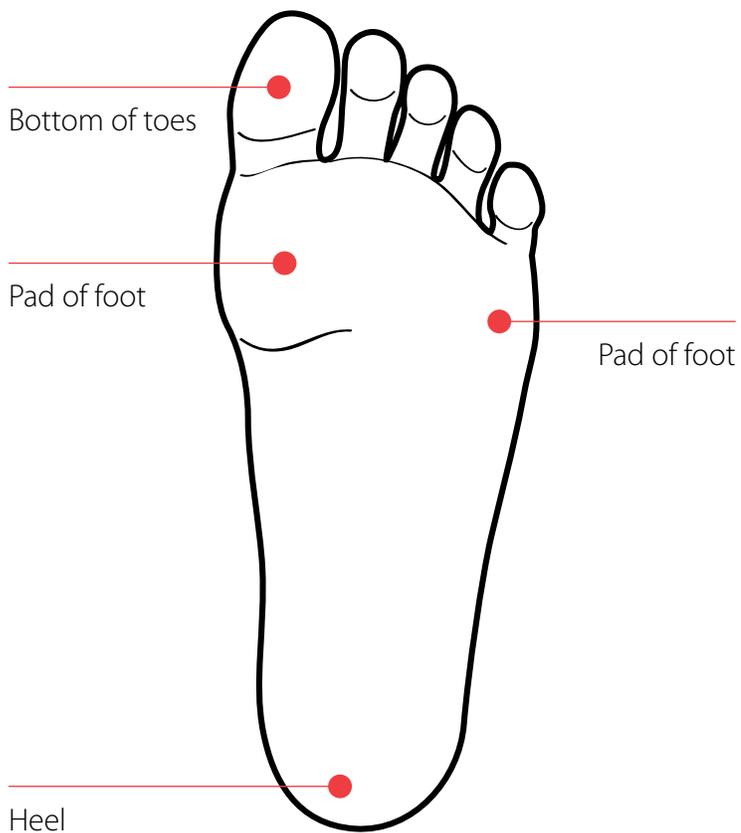
## Foot

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## Sole of the foot

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# Phases of wound healing

## Inflammatory phase (1–4 days)<sup>6</sup>

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- Tissue around wound may be red (erythema) and swollen (edema)<sup>7</sup>
- Tissue may feel hot or sore; This does not indicate infection<sup>7</sup>
- If inflammatory phase is impaired, wound healing may be slowed or halted<sup>7</sup>
- Wound exudate can be excessive during inflammatory phase<sup>7</sup>

## Proliferative phase (4–21 days)<sup>6</sup>

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- Phase initiated with a granulation process during which collagen/connective tissue is deposited (red and bumpy in appearance)<sup>7</sup>
- This is followed by epithelialization (thin, silver-colored layer)<sup>7</sup>
- Wound contraction occurs<sup>7</sup>

## Maturation phase (21 days–24 months)<sup>6</sup>

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- Tensile strength of the skin may take up to 12 months to recover<sup>7</sup>
- Healing process may be complete — protection of the healed area is important as this area may be at risk for further breakdown
- Post-maturation, healed wound tissue may be up to 20% weaker than it originally was<sup>8</sup>

# Principles of healing

## The principles of effective wound care

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Caring for a person with a wound must be based on a complete assessment of the resident and the wound, considering both intrinsic and extrinsic factors.

Consider these five principles when planning wound care<sup>9</sup>:

### 1 Is the wound healing?

**Yes**

Provide an optimal moist wound environment.

**No**

- Address issues of moisture
- Assess resident's nutrition
- Evaluate pressure, friction and shear
- Address presence of bacteria

### 2 Is there optimal moisture in the wound?

Research has demonstrated that wounds heal better, faster and with less scarring and pain in a moist environment.

**Yes**

Continue management to provide an optimal moist environment.

**No**

- If there is too much moisture, use an absorbent product to address the drainage
- If there is too little moisture, use a product that adds moisture to the wound bed

### 3 Is the periwound skin intact?<sup>9</sup>

**Yes**

Continue management of periwound skin and protect using a barrier wipe.

**No**

Evaluate dressing choice for optimal moisture management. Treat surrounding area with barrier wipes and avoid adhesion to periwound skin by considering a nonadherent product or increasing size of dressing.

### 4 Is the tissue necrotic?

**Yes**

Debridement is in order. Determine which method is consistent with the overall goals of the resident (see pages 14–16 of the Wound care document)

**No**

Take measures to maintain the living tissue, such as providing a moist wound environment.

### 5 Does the wound have depth?

**Yes**

Loosely fill the wound cavity to allow closure by secondary intention, or "from the bottom up."

**No**

A superficial or "flat" wound usually needs a cover dressing.

# Complications

## Complications in wound healing<sup>5</sup>

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### Wound characteristics<sup>2</sup>

- Mechanism of onset (i.e., surgical vs. insidious)
- Time since onset
- Wound location
- Wound dimensions
- Temperature
- Wound hydration
- Necrotic tissue or the presence of foreign bodies
- Infection

### Local factors<sup>2</sup>

- Circulation
- Sensation
- Mechanical stress
- Chemical stress

### Systemic factors<sup>2</sup>

- Age
- Nutrition/hydration
- Comorbidities/diseases
- Medication
- Behavioral risk-taking

## Does the resident have a disease that interferes with healing?

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### Diseases that delay wound healing<sup>2</sup>

- Peripheral vascular disease (perfusion disorder)
- COPD (oxygenation disorder)
- Diabetes mellitus
- Immune deficiencies
- Collagen vascular diseases
- Cancers (chemotherapy)
- Lifestyle choices (e.g., alcohol abuse or smoking)

## How is the resident's nutrition/hydration?

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### Malnourished residents have an increased incidence of wound complications.<sup>2</sup>

Include a gastrointestinal system and nutritional assessment in the systems review of all residents with, or at risk for, open wounds.

### Helpful hints

- Encourage fluids unless restricted
- Nutritional support may be appropriate
- Supplements specific for wound care should include proteins (cellular repair), carbohydrates (energy source), vitamins and minerals

# Complications (continued)

## Is the resident exposed to moisture/incontinence?

Too much moisture will delay wound healing and can cause the periwound to become macerated.<sup>2</sup>

### Helpful hints

- Tend to incontinent episodes quickly and gently.
- Clean area with nondrying, nonirritating cleansers.
- Use moisture barriers to protect the skin.
- Use absorbent products (such as incontinence pads) to wick away moisture.

## How is the resident's circulation?

Good blood flow is necessary for delivery of oxygen and nutrients for wound healing.<sup>2</sup>

### Helpful hints

- If consistent with the plan of care, encourage activity and mobility
- Refer to blood flow studies

Causes of impaired circulation	Recommended interventions
Impaired macro/microcirculation	<ul style="list-style-type: none"><li>• Vascular consult</li><li>• Medical management</li></ul>
Cold	<ul style="list-style-type: none"><li>• Blankets</li></ul>
Fear	<ul style="list-style-type: none"><li>• Explain interventions and provide rationale if resident can comprehend.</li><li>• Distraction</li><li>• Provide nonthreatening environment</li><li>• Anti-anxiety medications</li></ul>
Pain	<p>Explain interventions and provide rationale if resident can comprehend</p> <ul style="list-style-type: none"><li>• Distraction</li><li>• Pain medication</li><li>• Biofeedback</li></ul>

## How old is the resident?

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**Age-related changes increase skin fragility, risk of injury, risk of infection and may decrease rate of healing.<sup>2</sup>**

As the resident ages, there is:

- A decrease in immune and inflammatory response
- Slower creation of new blood vessels
- Slower epithelialization
- A decrease in sweat and oil gland number and activity
- Slower scar formation

## What is the resident's body type?

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**The resident's BMI may impact the rate of healing.**

Body build	Risk
Obese residents	<ul style="list-style-type: none"><li>• Impairments of cutaneous wound healing</li><li>• Total wound failure</li><li>• Fascial dehiscence<sup>10</sup></li><li>• Decreased capacity to fight infection, decreased collagen synthesis</li><li>• Decreased ability to support the necessary mechanisms of the healing cascade due to the poor vascularity of adipose tissue<sup>10</sup></li></ul>
Thinner residents	<ul style="list-style-type: none"><li>• Additional injury due to less "cushion"</li><li>• Delayed healing due to lower nutritional storage (less adipose tissue)</li></ul>

## Is the resident exposed to mechanical stress?

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**Mechanical stress such as friction, shear or pressure can increase the risk of skin breakdown.<sup>1</sup>**

- Friction is the force resisting the relative motion between two bodies
- Shear is the force that is applied parallel to the skin surface, which can result in small blood vessel tears
- Pressure is the normal force per unit of surface area

### Helpful hint

Reduce mechanical stress by using appropriate support or offloading devices.<sup>1</sup>

# Complications (continued)

## Is there debris in the wound?

**Epithelial cells can only migrate over viable tissue, so wound debris is an impediment to wound healing.<sup>2</sup>**

Examples of debris in the wound that can delay healing:

- Necrotic tissue (slough or eschar)
- Foreign bodies
- Dressing residue
- Retained sutures

## What is the temperature of the wound?

**Maintaining a normothermic wound environment (98.6-100.4 degrees Fahrenheit) has been shown to improve wound healing.<sup>2</sup>**

At these temperatures:

- The vasculature dilates
- Tissues are less vulnerable to infection
- Tissue oxygen levels increase

### Helpful hints

- Wound temperature drops during every dressing change and can take more than three hours to return to the preprocedural temperature.<sup>11</sup>
- Maintain normothermic temperature within the wound by maintaining intact wound dressing. Avoid daily dressing changes if possible.

## Is the wound bed dry (desiccated) or wet (macerated)?

**Creating a moist wound environment facilitates all three phases of wound healing, and if maintained, may result in less scarring.<sup>2</sup>**

### Helpful hints<sup>2</sup>

- Wound dressings should provide an optimal environment for wound healing
- If the wound is too wet, the dressing should absorb excess moisture
- If the wound is too dry, the dressing should add moisture
- Wound dressings should also provide thermal insulation, maintaining wound bed temperature between 98.6-100.4 degrees Fahrenheit

## Is the wound infected?

### Infection<sup>2</sup>

- Prolongs inflammation
- Promotes wound dehiscence
- Increases scarring
- Slows wound healing

### Helpful hints<sup>2</sup>

- Four keys to preventing infections in open wounds are:
  - Hand washing
  - Personal protective equipment
  - The appropriate use of clean or sterile technique
  - Proper wound care procedures
- If consistent with the overall plan of care, antimicrobial therapy, debridement, or a combination of the two are interventions which can be used to reduce the wound's bioburden

## Is the wound exposed to chemical stress?

**Chemicals can be toxic to fibroblasts (cells that build collagen and granulation tissue). While they may kill bacteria, they can also kill cells responsible for epithelialization.<sup>2</sup>**

- Prolongs inflammation
- Promotes wound dehiscence
- Increases scarring
- Slows wound healing

### Helpful hints

Some chemicals impacting wound healing rates may include but are not limited to:

- Chemotherapy and radiation
- Alkylating agents (e.g., cyclophosphamide, melphalan)
- High concentrations of antiseptics
- Some COX-2 type inhibitors, which may slow fracture healing

## Is the resident on medication?

**Certain medications are known to impair wound healing.<sup>2</sup>**

### Helpful hints

- Steroids at doses >30–40 mg/day impair all phases of wound healing<sup>2</sup>
- Chemotherapeutic drugs are most likely to interfere with repair due to their impact on rapidly dividing cells<sup>2</sup>
- Systemic antibiotics can result in more frequent and more severe adverse reactions and the development of resistant bacterial strains<sup>2</sup>
- Anticoagulants will alter the clotting cascade

**References:** 1. Haesler, E. *Prevention and Treatment of Pressure Ulcers: Clinical Practice Guideline*. 2nd ed. Osborne Park, Western Australia: Cambridge Media; 2014. 2. Myers, B. *Wound Management: Principles and Practices*. 3rd ed. Tulsa, OK: Pearson; 2014. 3. LeBlanc K, et al. Skin tears: state of the science: consensus statements for the prevention, prediction, assessment, and treatment of skin tears. *Adv Skin Wound Care*. 2011 Sep;24(9):2-15. 4. Grey JE, Harding KG, Enoch S. ABC of wound healing: venous and arterial leg ulcers. *BMJ*. 2006;332(7537):347-350. 5. NPUAP Pressure Injury Stages. National Pressure Ulcer Advisory Panel Web site. <http://www.npuap.org/resources/educational-and-clinical-resources/npuap-pressure-injury-stages>. Accessed March 10, 2017. 6. Orsted H, Keast D, Forest-Lalande L, Mégie MF. Basic principles of wound healing. *Wound Care Canada*. 2011;9(2):4-12. 7. Wound Care Module. Australian Government Department of Veterans' Affairs Web site. <https://www.dva.gov.au/sites/default/files/files/providers/woundcare/woundcaremodule.pdf>. Published October 2016. Accessed March 10, 2017. 8. Understanding the healing stages of wounds. Advanced Tissue Web site. <http://www.advancedtissue.com/understanding-healing-stages-wound>. Published August 27, 2014. Accessed March 10, 2017. 9. Yuska C, Kehoe K. Principals of effective wound care. *Nursing & Patient Care*. <https://www.medline.com/media/assets/pdf/Principals%20of%20Effective%20Wound%20Care.pdf>. Published May 2010. Accessed March 10, 2017. 10. Pierpont YN, et al. Obesity and surgical wound healing: A current review. *ISRN Obes*. 2014;(2014):638936. 11. McGuinness W, Vella E, Harrison D. Influence of dressing changes on wound temperature. *J Wound Care*. 2004;13(9):383-385.

