# Nutrition and Wound Healing: From the Kitchen to the Pharmacy


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# Objectives

- Wounds 101
- Participants will understand the connection between weight loss, lean body mass, and wound healing
- Participants will know how to estimate protein, calorie, and fluid needs for patients with pressure ulcers
- Participants will be familiar with different nutrition interventions for wound healing and how to select the appropriate intervention

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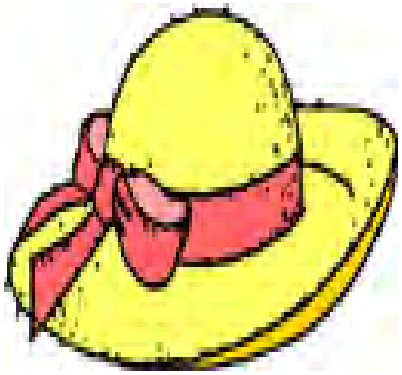
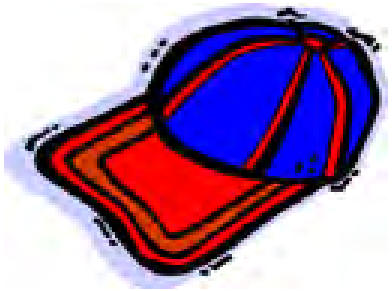
# Life of a Certified Dietary Manager





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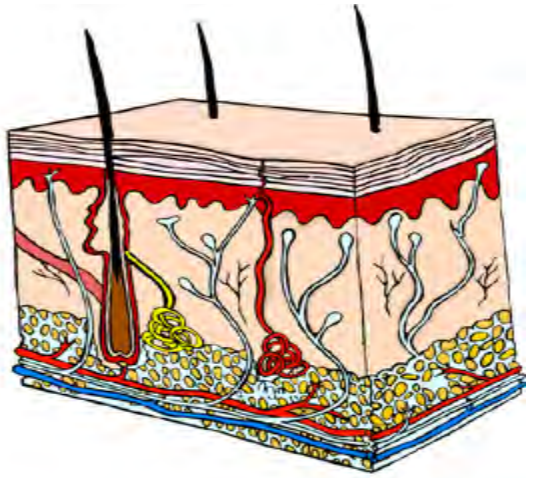
# The Skin

- Largest organ in the body
- Has several functions:
  - Protection
  - Temperature control
  - Metabolism
  - Sensation
  - Communication



# Types of Wounds

- Pressure ulcers
- Surgical Wounds
- Chronic Wounds
  - Diabetic ulcers
  - Ischemic ulcers
  - Venous ulcers

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# Types of Pressure Ulcers

- Pressure ulcers are “staged” based on severity
- The higher the stage, the more severe the wound
- Nutrition interventions change depending on the stage of the wound

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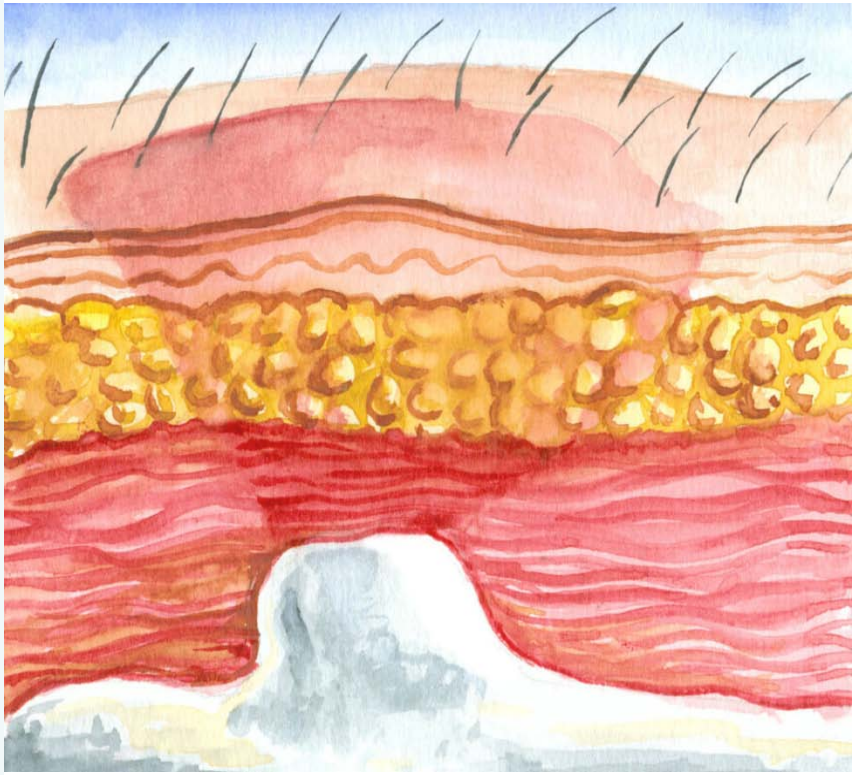
# Stage I



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.

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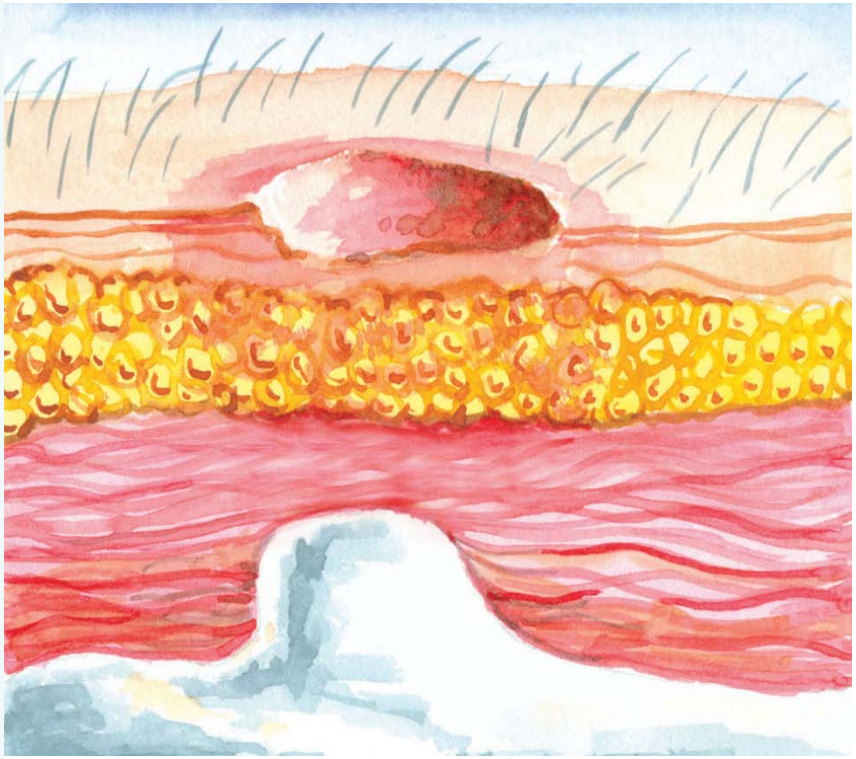
# Stage II



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.

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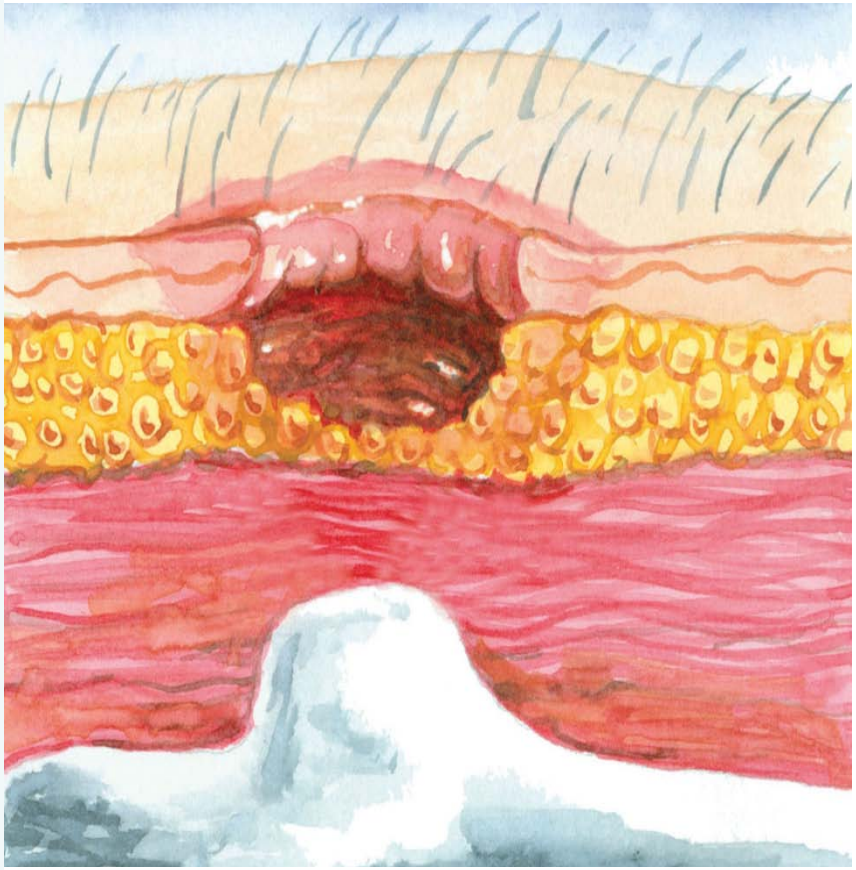
# Stage III



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

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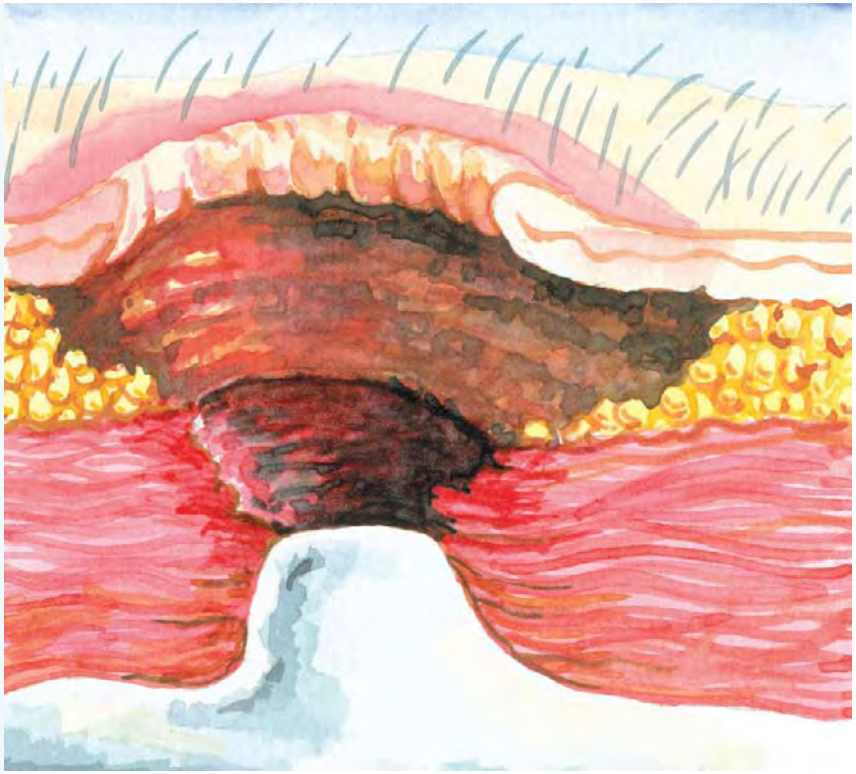
# Stage IV



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.

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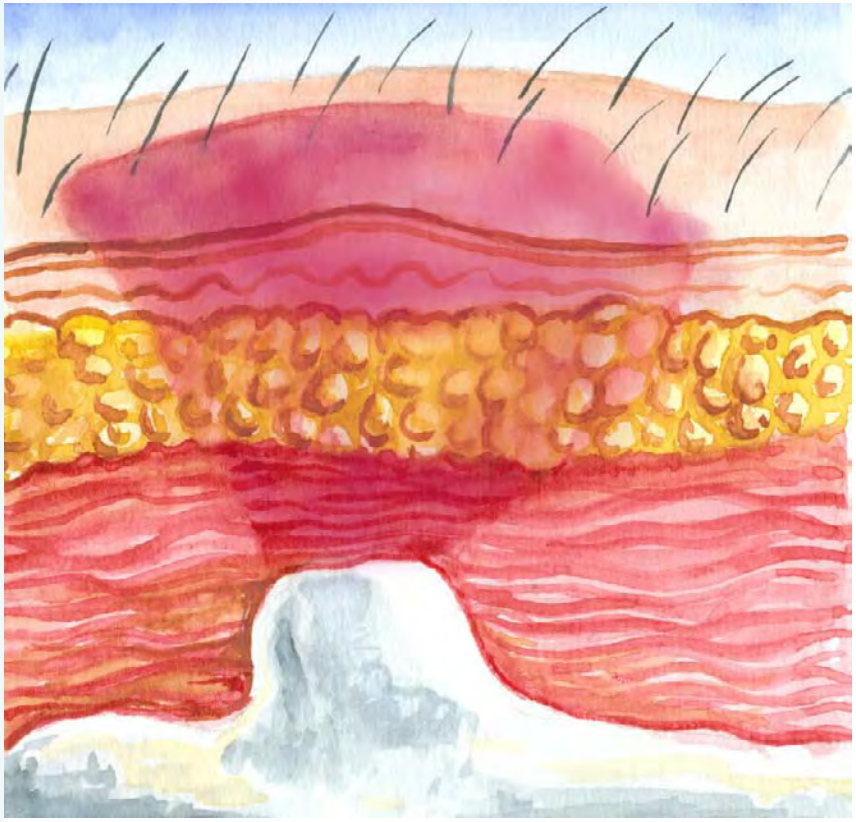
# Deep Tissue Injury



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.

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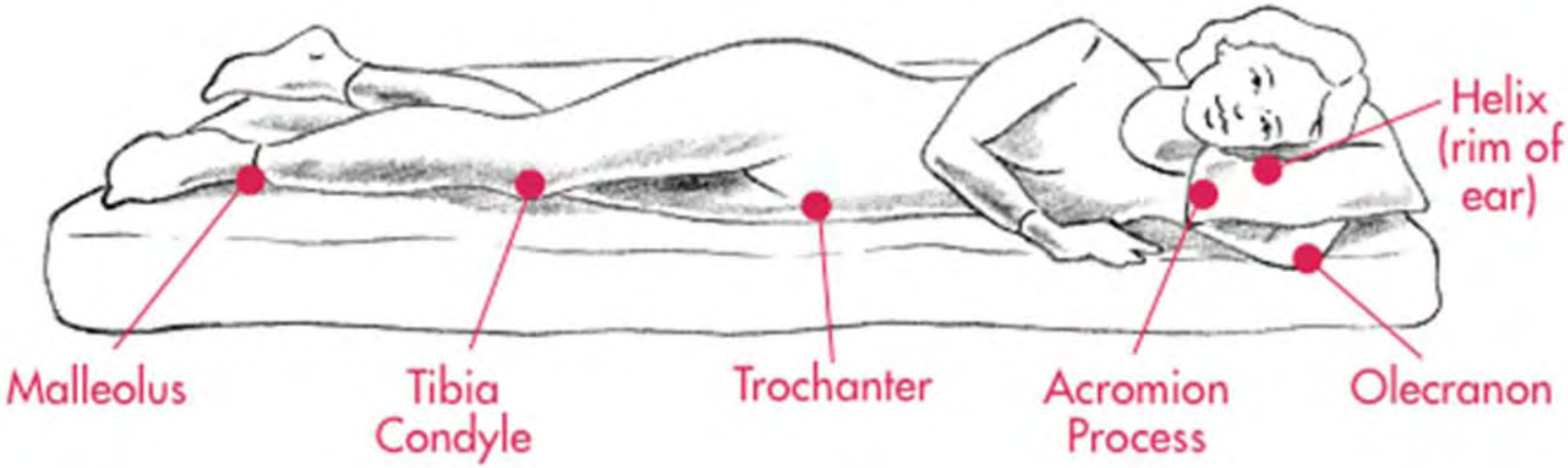
# Where Do Pressure Ulcers Develop?

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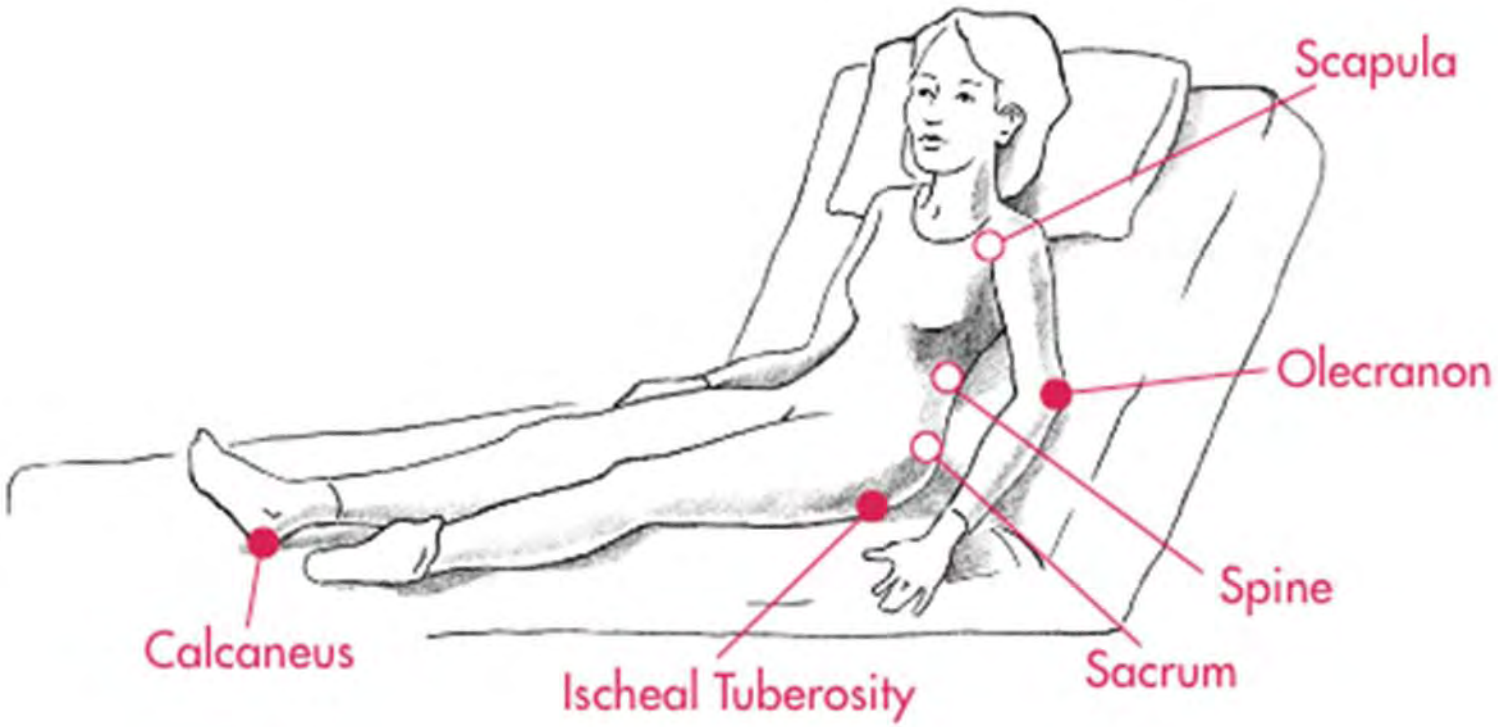
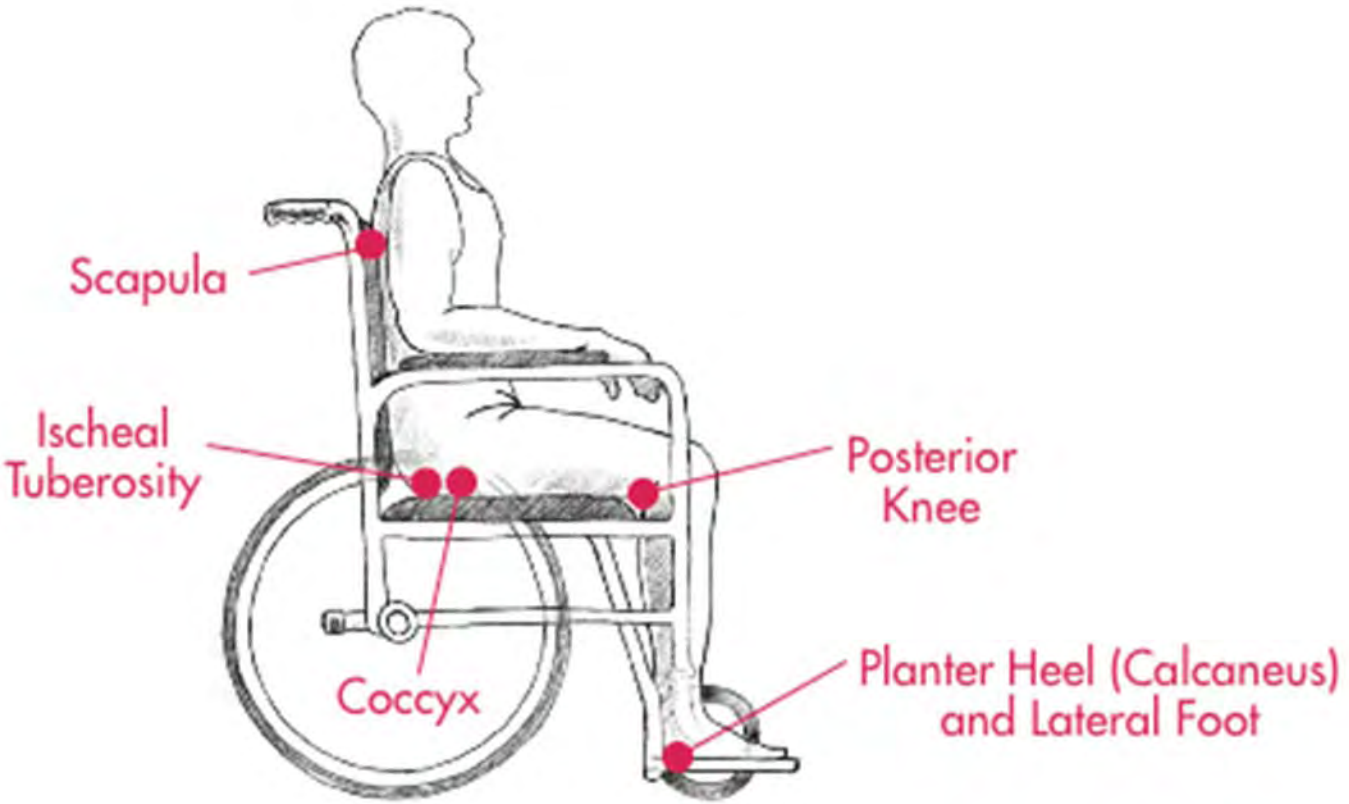
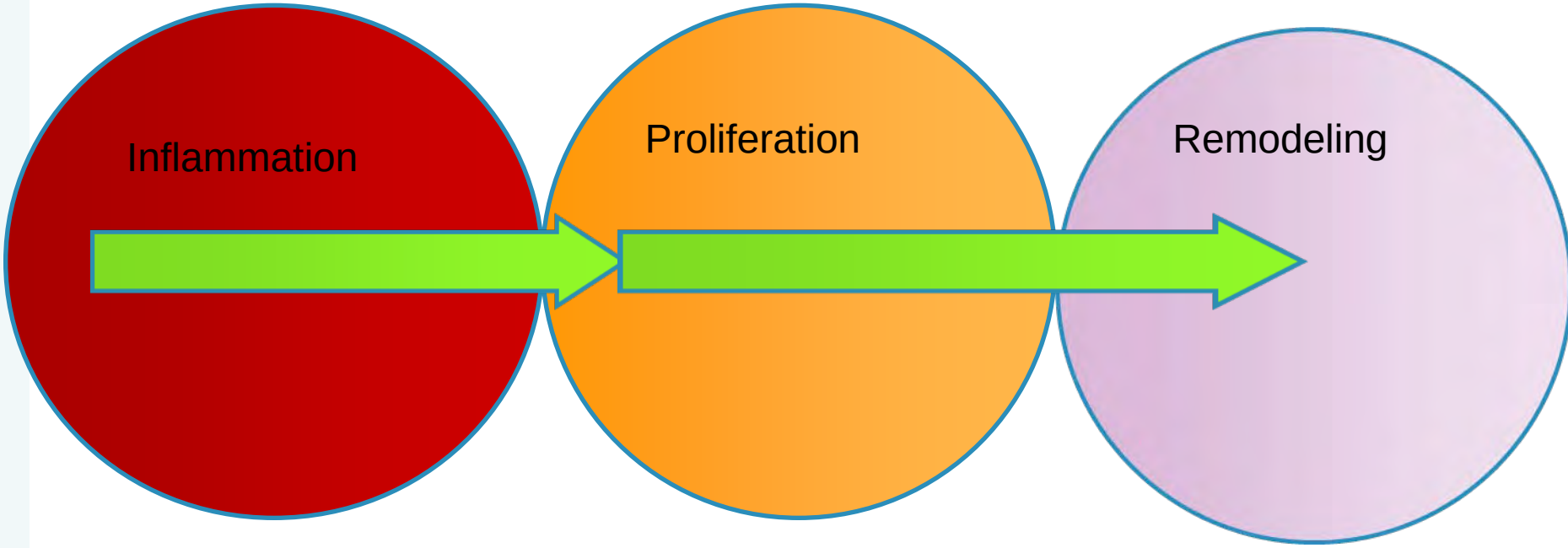
# Where Do Pressure Ulcers Develop?



# Where Do Pressure Ulcers Develop?



# Normal Wound Healing Process

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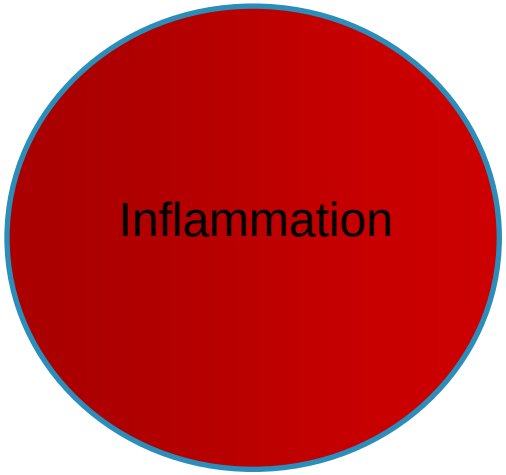
# Inflammation Stage

- Lasts 2-5 days
- Bacteria and debris are “phagocytized” and removed
- Healing process begins

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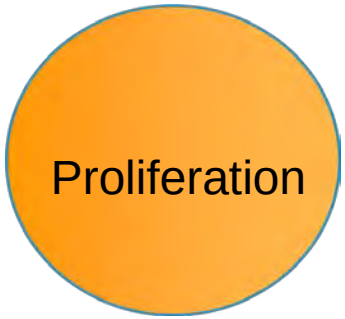
# Proliferation Stage

- Angiogensis (new blood vessels are formed)
- Collagen is deposited
- Granulation tissue is formed
- Epitheliazation occurs (cell growth)
- Wound contracts

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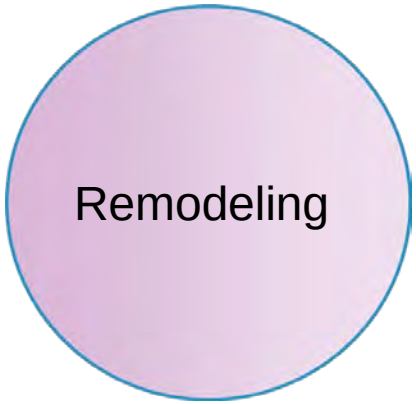
# Remodeling Stage

- Can take up to 24 months
- Collagen is remodeled
- Cells that are no longer needed are removed

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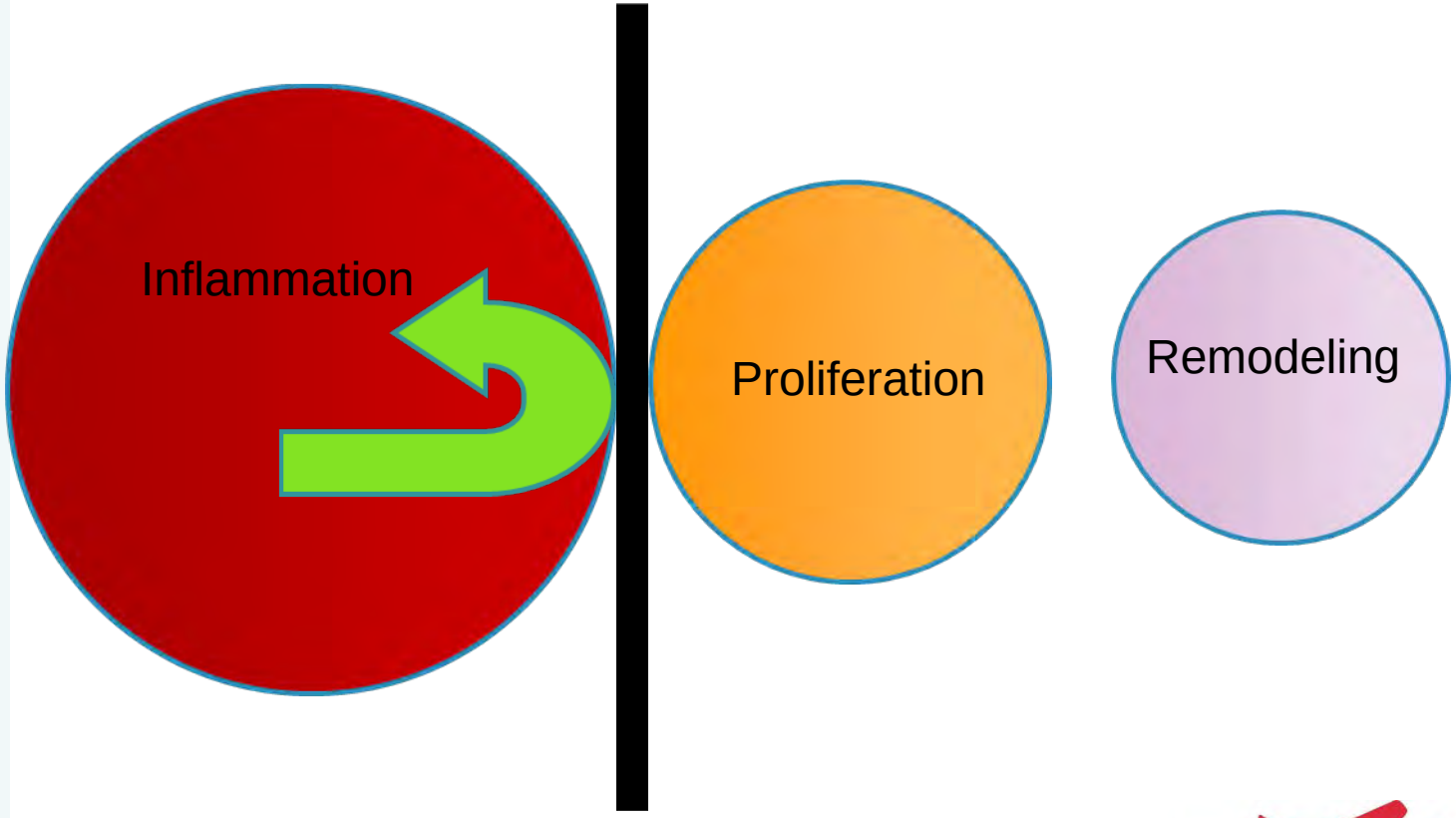
# Chronic, Non-Healing Wound

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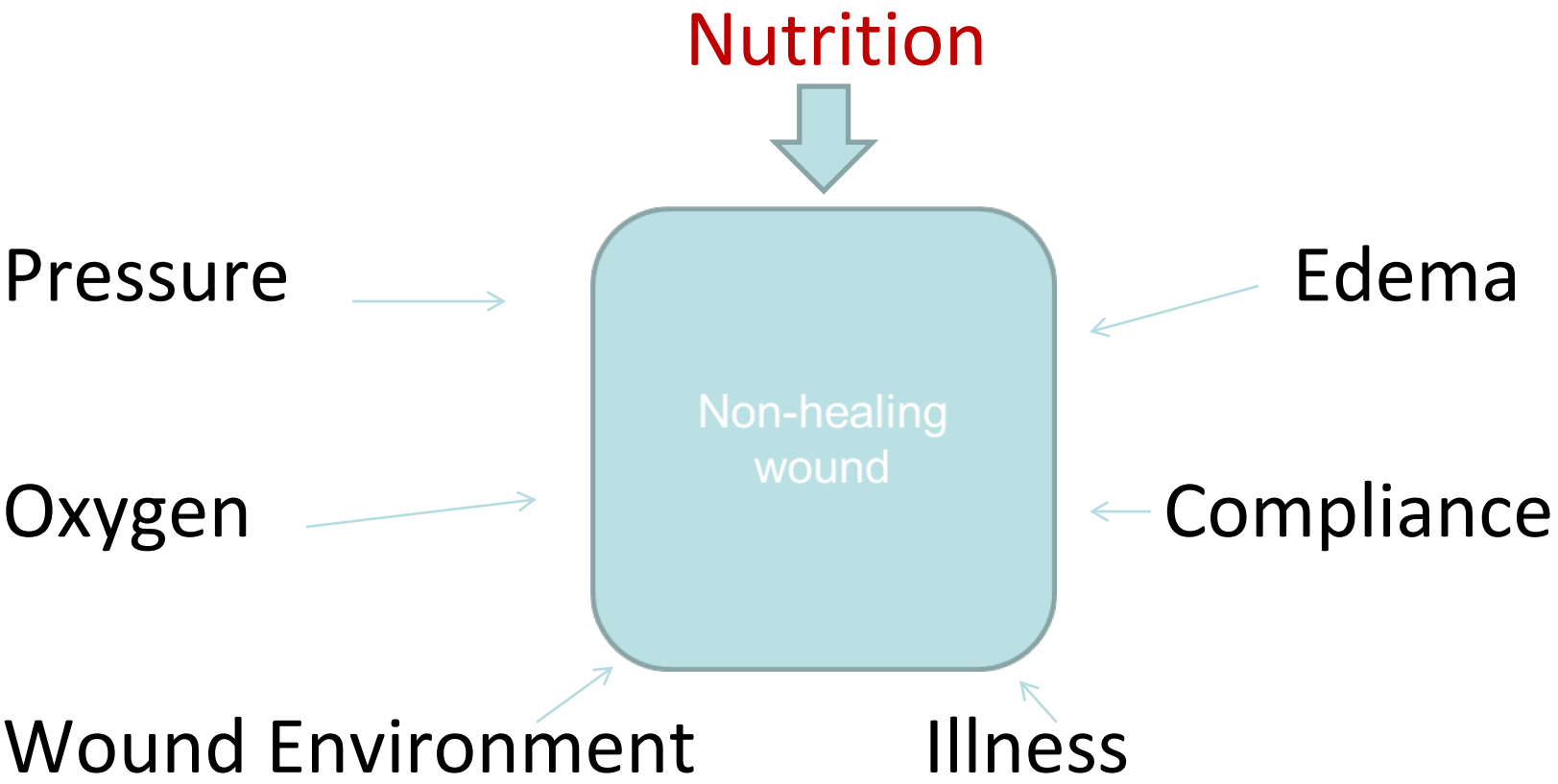
# Factors That Affect Wound Healing

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# Why The Focus on Nutrition?

- Nutritional status is perceived as “fixable”
- In lawsuits, non-healing wounds are linked to malnutrition
  - It isn’t as simple as adding a protein drink and a vitamin supplement?

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# Nutrition and Wound Healing

- Nutritional problems can decrease lean body mass (LBM), making wound healing challenging
  - Weight loss 
  - Protein-energy malnutrition (PEM) 
  - Physiological stress related to underlying illness

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# Lean Body Mass

- Made up of
- Smooth muscle
- Skeletal muscle
- Bone
- Water

Used for energy when the diet lacks protein

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# Fat Mass

- Pure energy source
- Metabolically inactive
- Contracts if you use more calories than you eat
- Expands if you eat more calories than you use

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# Lean Body Mass

Many patients who are described as cachexic, anorexic, or below IBW have lost lean body mass

Demling RH. Nutrition, Anabolism, and Wound Healing Process: An Overview. Eplasty, Feb 3, 2009
http://www.medscape.com/viewarticle/711879

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# Complications Related to Loss of Lean Body Mass

| % Loss of Total LBM | Complications | Associated Mortality (%) |
|---|---|---|
| 10 | Decreased immunity, increased infections | 10 |
| 20 | Decreased healing, weakness, infection | 30 |
| 30 | Too weak to sit, pressure ulcers, pneumonia, no healing | 50 |
| 40 | Death, usually from pneumonia | 100 |

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# Effects of LBM Loss on Wound Healing


Demling RH. Nutrition, Anabolism, and Wound Healing Process: An Overview. Eplasty. Feb 3, 2009.
http://www.medscape.com/viewarticle/711879

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# Weight Loss

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# Insidious Weight Loss

| | |
|---|---|
| Sept 1 | • 120 pounds |
| Oct. 1 | • 117 pounds (30 days = 2.5% loss) |
| Nov. 1 | • 115 pounds |
| Dec. 1 | • 113.5 pounds |
| Jan. 1 | • 111 pounds |
| Feb. 1 | • 110.5 pounds |
| Mar. 1 | • 109 pounds (160 days = 9.2% loss) |

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# Track Insidious Weight Loss

- Keep a spreadsheet of all residents weights over one year period
- Look for slow weight loss when doing quarterly assessments
- Refer those with slow weight loss to RD

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# Significant Weight Loss

| % of weight loss | Time Frame |
|---|---|
| 5% or greater | 30 days (1 month) |
| 7.5% or greater | 90 days (3 months) |
| 10% or greater | 180 days (6 months) |

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# Body Mass Index (BMI)

| BMI = (weight in kg) / height in M)$^2$ | |
|---|---|
| less than 20 | = underweight |
| 20 – 25 | = normal |
| 25 – 30 | = overweight |
| greater than 30 | = obese |

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# Body Composition vs Body Weight

- Total body weight is made up lean body mass and body fat
- Overweight and obese patients often have issues with body composition
  - Example: sarcopenic obesity

A patient can be overweight but depleted of lean body mass

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# Is Weight Loss Desired in Overweight Patients with Wounds?

- Probably not (unless the patient wants to lose weight)
- Weight loss may mean patient is not eating well, so a wound will not heal

Even if a patient is above their ideal body weight (IBW), weight loss may not be desired

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# Protein Energy Malnutrition (PEM)

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# What is PEM?

- Patient is not eating enough protein and energy (calories)
- Body uses lean body mass (usually muscle) to meet calorie needs
  - Usually body uses stored fat for energy
- PEM Results in a loss of lean body mass

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# Identifying PEM

- Lab values (albumin, prealbumin) are not good indicators of PEM
  - Negative acute-phase reactants
  - Rise and fall in response to inflammation

Albumin and Prealbumin don't automatically improve with nutrition intervention

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# Identifying PEM

- Evaluate diet for protein and energy intake
- Dietary recalls, food frequencies
- Short nutrition assessment questionnaires
- Weight  history/weight loss
- Physical signs and symptoms
- Mid arm circumference

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# Effects of PEM

- The body uses protein stores for energy instead of fat stores
- Body loses LBM (muscle tissue)
- Calories and protein needed for wound healing compete with those needed to meet the body's basic needs
- Wound doesn't heal

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# Treating PEM

- Dietary protein and calories can maintain LBM
- Targeted nutrition therapy may help maintain LBM

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# Underlying Stress

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# Results of Prolonged Stress

- Catabolism
  - A progressive loss of lean body mass in response to any significant insult, physiological or psychological
- Hyper-metabolism
  - An increase in energy demands that accompanies any significant physiological and/or psychological insult
- Immune Deficiency

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# A Body Under Stress

- Uses more calories
- Needs more calories
- Can’t fight off infection as easily

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# Important Issues for Wound Healing

- Weight loss, PEM, and stress can all cause a loss of lean body mass
- Chronic, non-healing wounds may be caused in part by loss of lean body mass
- Loss of lean body mass can make wound healing difficult

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# Nutrition Interventions for Wound Healing

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# Nutrition Interventions for Wound Healing

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# Goals of Medical Nutrition Therapy for Wound Healing

- Meet energy (calorie) needs
- Meet protein needs
- Provide adequate fluids
- Provide vitamin and mineral supplements, if needed
- Provide other nutrition therapy if needed
- Maintain LBM

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# Interventions Begin in the Kitchen

- Use food first
  - Visit patient to update food preferences
  - Add large portions or snacks if patient is eating well
  - Provide favorite beverages with meals

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# Interventions Continue in the Pharmacy

- Provide more specialized interventions as needed
  - Protein supplements with med passes
  - Amino acid supplements
  - Vitamin/mineral supplements

Work with your RD to discontinue or change interventions as needed

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# Nutrition Requirements

| | General population | Protein calorie malnutrition (PEM)* | Seriously ill or injured* |
|---|---|---|---|
| Calories **kcal/kg/day** | 25 - 30 | 30 - 35 | 35 - 40 |
| Protein **g/kg/day** | 0.8 | 1.5** | 1.5** |
| Fat | < **30% kcals** | < **30% kcals** | < **30% kcals** |
| Fluid Intake | Method 1: 30 mL/kg body weight<br><br>Method 2: 1 mL/kcal | Method 1: 30 mL/kg body weight<br><br>Method 2: 1 mL/kcal | Method 1: 30 mL/kg body weight<br><br>Method 2: 1 mL/kcal |

**Supplement may be needed to meet needs
Assess renal function

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# Nutrition Requirements for Pressure Ulcers

- Provide sufficient calories
  - 30-35 kcal/kg body weight for individuals under stress with a pressure ulcer

- Provide adequate protein for positive nitrogen balance
  - 1.25-1.5 grams protein/kg body weight
  - Assess renal function

The Role of Nutrition in Pressure Ulcer Prevention and Treatment: National Pressure Ulcer Advisory Panel White Paper

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# Nutrient Needs in Real Terms

125 pound (57 kg) woman with Stage 3 wounds

- 1995 kcal/day (35 kcal/kg)
- 74-86 grams protein/day (1.3-1.5 g/kg)
  - 10- 12 ounces of meat per day (3, four-ounce servings)
- 1710-1995 mL fluid/day (30-35 mL/kg)
  - About 7-8 cups per day

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# Interventions from the Kitchen

- Increase caloric density of meals
  - Use super cereals and mashed potatoes
- Honor food preferences
- Provide culturally-appropriate foods
- Individualize diet

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# Interventions from the Kitchen

- Supplement if food intake is poor
  - Try varied forms
    - Juice
    - Pudding
    - Bars
    - Shakes
    - Cookies
    - Ice cream

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# Choosing Nutrition Supplements

- Avoid flavor fatigue
- Creamy versus juice
- Liquid vs powder
- Meal trays vs snacks/med passes
- Does the patient tolerate supplement?
- Cost
- Protein source

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# Monitor Supplement Intake

A supplement isn't effective if it isn't consumed!

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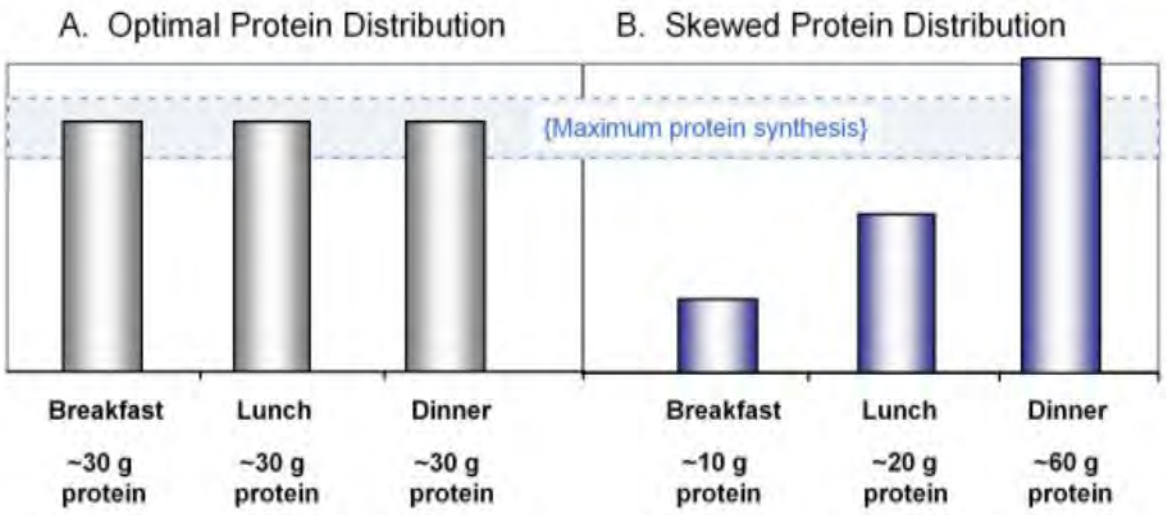
# Meal Distribution

Research suggests that protein intake should be evenly distributed throughout the day

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Paddon-Jones D, Rasmussen BB. Dietary Protein recommendations and the Prevention of Sarcopenia. Curren Opin Clin Nutr Metab Care 2009, 12(1):86-90.

# Vitamin and Mineral Supplements

- If wounds are draining, nutrient loss could be significant

- If meal intake is poor, supplements may be needed

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# Vitamins and Minerals

- Vitamin A
  - enhances cell proliferation
  - stimulates collagen synthesis
- Vitamin C
  - enhances collagen synthesis
  - increases formation of blood vessels
  - supports immune function

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# Vitamins and Minerals

- Vitamin E
  - Stabilizes cellular membranes

- Zinc
  - DNA synthesis
  - protein synthesis
  - cellular proliferation

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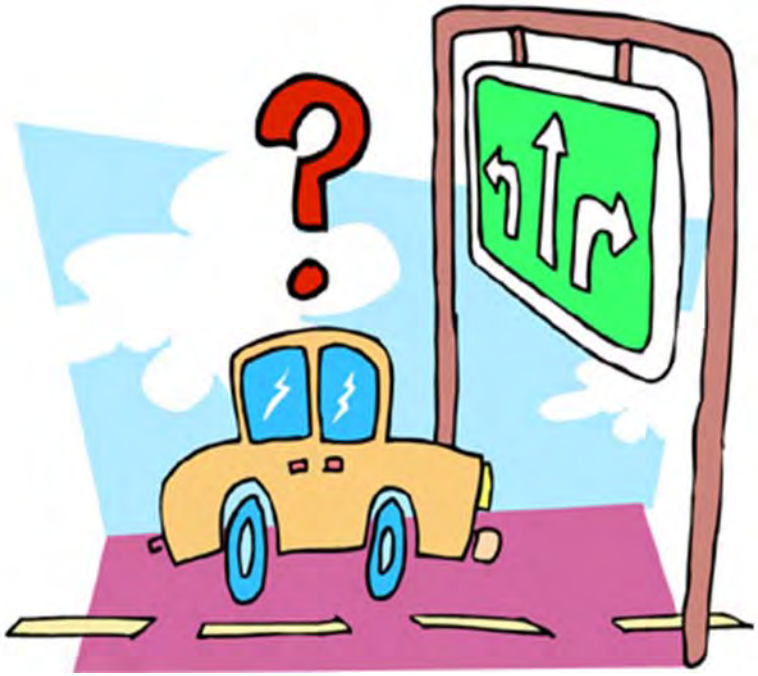
# Should You Suggest a Vitamin Supplement?



# What Does Your Facility Do?

# Vitamin Supplements

- A daily multivitamin (100% of the RDI) may be indicated for patients with wounds if intake is poor or a deficiency is confirmed or suspected
- Offer supplements of other vitamins/minerals (Vit A, Vit C, Zinc) if intake is poor or a deficiency is confirmed or suspected
- MVI's, tube feedings, and liquid supplements contain vitamins/minerals

Dorner B, Posthauer ME, Thomas D. The Role of Nutrition in Pressure Ulcer Prevention and Treatment: National Pressure Ulcer Advisory Panel White Paper 2009 NPUAP

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# Use Zinc Supplements Carefully

- Potential for zinc overload (above 40 mg/day)
- Interferes with copper and iron absorption and metabolism
- Limit time frame for zinc dose, especially for high doses
- Consider other sources of zinc
  - Tube feedings, liquid supplements

Dorner B, Posthauer ME, Thomas D. The Role of Nutrition in Pressure Ulcer Prevention and Treatment: National Pressure Ulcer Advisory Panel White Paper 2009 NPUAP

# Targeted Nutrition Therapy

- Certain amino acids may be needed during times of stress
- Targeted nutrition therapy with amino acids may help patients with chronic, non-healing wounds
- Meet energy and protein needs first

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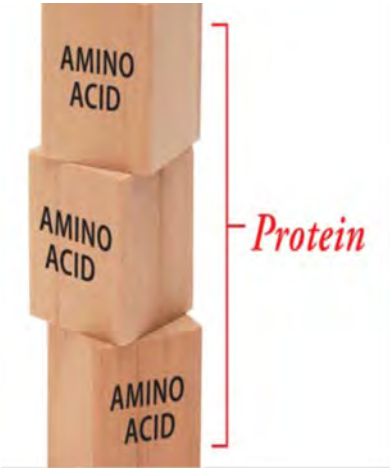
Litchford M. The Advanced Practitioner's Guide to Nutrition and Wounds. Greensboro, NC: Case Software and Book

# Amino Acids

- The building blocks of protein
- Body manufactures some amino acids
- Some amino acids are needed in the diet

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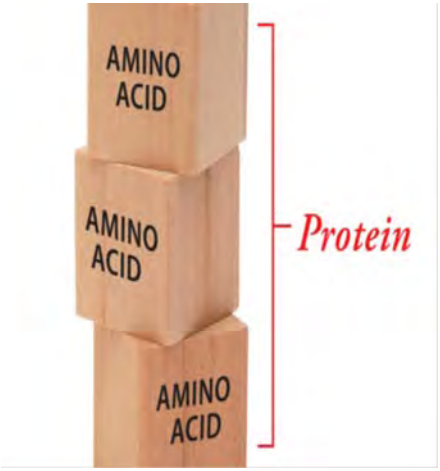
# Amino Acids




- Indispensable Amino Acids (IAA)
  - Essential Amino Acids
- Dispensable Amino Acids (DAA)
  - Non-Essential Amino Acids
- Conditionally Indispensable Amino Acids (CIAA)
  - Needed by the body in times of stress

Arginine, Cysteine, Glutamine, Glycine, Proline, Tyrosine

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# Targeted Nutrition Therapy

- Amino Acids
  - Arginine
  - Glutamine

- Beta-Hydroxy-beta- methyl buterate (HMB)

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# Arginine

- Conditionally essential amino acid
- Improves muscle integrity
- Precursor to proline
- Helps support immune function
- Increases nitric oxide production
- Activates macrophages
- Improves vasodilation
- Increases collagen formation

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# Glutamine

- Conditionally essential amino acid
- Improves muscle integrity
- Improves protein synthesis
- Reduces protein breakdown
- Acts as a precursor to cell growth and replication
- Improves immune function
- Maintains gut integrity
- Helps support protein/collagen synthesis

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# ß-Hydroxy ß methylbuterate (HMB)

- Metabolite of amino acid leucine
- Reduces muscle protein breakdown
- Helps maintain muscle membrane integrity
- Enhances muscle function
- Helps support immune function
- Serves as a precursor for the manufacturing of cholesterol, preserving muscle cell integrity

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# ß-hydroxy ß methylbuterate (HBM)

- Increases protein synthesis by:
- Stabilizing the muscle cell membrane
- Modulating protein degradation
- Up-regulating protein synthesis
- Helps prevent and/or reverse loss of LBM

Available in some liquid protein supplements and also in targeted therapy for wound healing

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# Targeted Therapy with Arginine, Glutamine, and HMB

- Ingredients work together to prevent protein breakdown (catabolism) while supporting protein synthesis (anabolism)
- Ingredients enhance collagen synthesis in healthy elderly adults, increasing wound repair.
- Use on stage III and IV wounds

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# Best Practices for 2010 and Beyond

- Assess patient's nutritional status
  - Weight history
  - Food and fluid intake
- Prescribe nutrition interventions, from the kitchen to the pharmacy
- Monitor and evaluate progress
- Change nutrition interventions as needed

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# Best Practices for 2010 and Beyond

- Maintain optimal body weight and body composition
- Meet elevated nutrient needs
- Use food and supplements to meet each patient's preferences and unique nutritional needs

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# Wounds 411.com

- Wound care information for patients and professionals
- Free resources you can download, safe, print, and change to meet your needs


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# Thank You For What You Do

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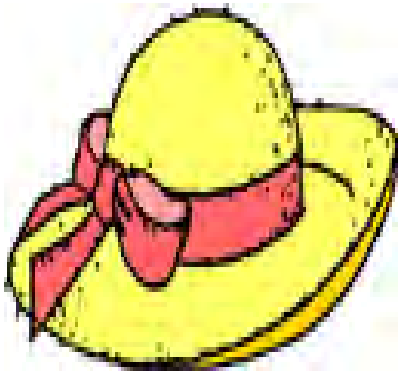
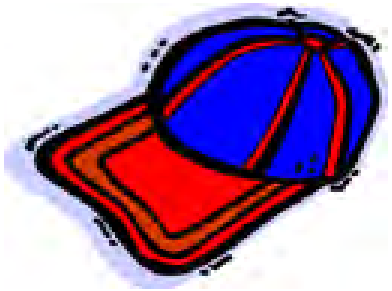
# And For All the Hats You Wear





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