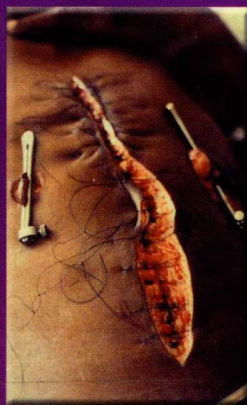


CLINICAL GUIDE TO

Skin & Wound Care

Seventh Edition



Cathy Thomas Hess, RN, BSN, CWO CN

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Preface

Welcome to the new edition of *Clinical Guide to Skin & Wound Care*! Your special contribution to wound care is always at the forefront of my efforts each time I revise this worldwide clinical reference and showcase the latest skin and wound care products. I continually strive to bring you the most up-to-date clinical product information and reference materials, and this seventh edition continues with that same tradition—to provide you with relevant information necessary to support the “delicate balance of art and science” in skin and wound care.

We all know that chronic wounds take an emotional toll on patients and their caregivers. As clinicians and physicians, we often feel frustrated and confused when faced with certain wound care options...whether attempting to choose an appropriate dressing to use on a specific wound type, deciding to change to another dressing to provide the best direction for the wound healing process, determining how to illustrate the wound's progress through appropriate documentation, or providing the best way to benchmark outcomes based on care practices. As dedicated professionals, we find ourselves looking for the best guidance, most reliable tools, and ready answers.

The answers, as it turns out, are commonly found through the delicate balance of art and science: *Art* as it refers to the skill and application techniques utilized when applying the preferred management modality, and *Science* as it refers to the health care team member's knowledge and understanding of the disease process and the preferred modality used in managing the patient. *Art and science*, the fundamental tools of skin and wound healing, directly impact the patient's clinical and financial outcomes.

In the first six chapters of this book, you'll find a review of the fundamental knowledge necessary to understand skin and wound care issues—a knowledge base focused on the importance of caring for the largest organ of the body, the skin, as well as the wound. Essential information on assessing and documenting wounds, differentiating and caring for chronic wounds, and implementing effective wound prevention strategies is included to support your knowledge and understanding of the principles of skin and wound care.

This edition also features several new resources for your wound reference, including new sections on lymphedema, clinical checklists, and the electronic medical record (EMR), as well as a new product category (Negative Pressure Wound Therapy), new and updated skin and wound care products, and evidence-based treatment pathways added to the appendix.

Lymphedema. A true chronic condition, lymphedema may produce significant physical and psychological morbidity. Increased limb size can interfere with mobility and affect body image, and pain and discomfort are common. Increased susceptibility to acute cellulitis and erysipelas can result in frequent hospitalizations and long-term dependence on antibiotics. In Chapter 4, “Best practices for managing the effects of lymphedema,” you'll find a full discussion of the risk factors, assessment techniques, and treatments required when caring for a patient with this chronic condition.

Clinical checklists. To complement the art and science of skin and wound care, I have integrated clinical checklists throughout this edition. Literature states that the development of well-designed checklists can improve outcomes. At the end of the day, it's all about the clinical, financial, and patient satisfaction outcomes. As you read each chapter and refer to the appendices, you'll find numerous indispensable checklists—key steps for compliance—to help guide your practice.

EMR checklists, compliance, and medical necessity. Today's health care facilities are rapidly moving to adopt EMRs. As detailed in the HITECH Act, the government's research concluded that using an electronic health record (EHR) would serve to improve patient care, increase patient safety, and simplify compliance in the U.S. health care system, as well as reduce costs in the long term, minimize errors, and increase productivity and administrative efficiency. This electronic evolution has revolutionized the way data is collected, collated, and delivered. Linking clinical, functional, and financial information for the patient's visit provides for quick data retrieval for work performed.

Chapter 6, "Harnessing technology: EMR checklists and operational compliance," focuses on the importance of using checklists for compliance and clinical success. This chapter includes need-to-know information on "meaningful use" and "meaningful data," clinical and patient documentation checklists for complete wound care documentation standards, compliance and auditing, and medical necessity.

Evidence-based treatment pathways. Published wound-healing models capture relationships between healing and treatment across a large population and history of wound treatment. To achieve the best possible wound care outcomes, while controlling costs, a comprehensive wound management system—one based on published evidence, validated protocols, and competency programs for staff members—should be established. In the appendices, you'll find new diabetic, venous, and pressure ulcer pathways for your review.

As in previous editions, Parts II and III of *Clinical Guide to Skin & Wound Care* focus on the importance of a complete skin and wound care formulary. The section on "Skin care products" covers skin cleansers, moisture barriers, antifungal/antimicrobial treatments, therapeutic moisturizers, liquid skin protectants, and other skin care products of interest. Separate sections on "Dressings and devices" and "Drugs" provide cutting-edge choices for formulary development. Numerous new products have been introduced within the wound care categories highlighted in these sections. Also debuting in this edition is "Negative Pressure Wound Therapy" as a separate category.

Part II includes hundreds of individual wound care product profiles and photos. Each profile describes the product in detail, including the product's form, available sizes, actions, indications and contraindications, and application and removal instructions. Photos are displayed on each page, whenever possible. HCPCS codes and sizes are also displayed, when available. Every attempt has been made to accurately detail the product's information. It remains the clinician's responsibility to review each product's insert prior to using the product to ensure accurate and timely information.

Part III presents additional dressings and products for effective skin and wound management. This section details compression bandage systems, as well as various gauze dressings, tapes, wound cleansers, and pouches. HCPCS codes and sizes are displayed, when available.

The book concludes with appendices, which serves you, the health care professional, in a number of ways. A comprehensive list of the manufacturer's websites is included, along with a detailed reference section.

Clinical Guide to Skin & Wound Care, Seventh Edition, continues to prove to be an essential skin and wound care reference for all team members. Use this book as either a "bedside" or "desk" reference when caring for your patients.

Acknowledgments

Life is simple; it's the choices we make that are sometimes difficult. My choice was to complete another edition of my book.

The following people graciously helped me achieve this goal while juggling life:

To my husband, Michael: Thank you for your constant love, support, sacrifices, and understanding. You are truly the only person who knows the commitment it takes to complete this "labor of love." Cheers!

To my children, Alex and Max: With manuscript in hand, I was able to work and still cheer you on during your baseball and basketball games. Keep your tenacity for learning. Nurture your spirituality. And, always, reach for the stars. You both rock! I love you.

To my parents, extended family, and friends: Thank you for your moral support. It is comforting to know you are there for me when I have the chance to come up for air! I am eternally grateful to have all of you in my life.

To my LWW family: Thank you for your guidance, moral support, and leadership. And, especially, your patience. These editions would not have been as successful without all of you.

To the contributors: Thank you to John MacDonald and Mary Jo Geyer for assisting in the review of the new chapter, *Best practices for managing the effects of lymphedema*. To Karen Lou Kennedy-Evans for assisting in completing the section on the Kennedy Terminal Ulcer. To Matthew Livingston for assisting me in gathering "data." And, thank you to all of the past contributors whose writing still lives on through this edition.

To all of the Manufacturers: A special thank you to all for your contributions; for continuing to work with me to provide your available dressings, drugs, devices, and products so caregivers can quickly and accurately make determinations for the best course of action for the patients they serve. Thank you. You make this edition the valuable resource that it is.

And, again, to my readers: Thank you for all of your gracious accolades (I do receive and read all of them!). You inspire me to continue to write.

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Mastering skin and wound care

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1

Skin care and wound prevention strategies

During the past several decades, major advances have been made in the practice of skin and wound care. Clinicians now closely monitor coordinated cellular and biochemical events that occur in skin and wound healing. Manufacturers of skin and wound care products are partnering with clinicians to identify materials that help manage simple and complex skin conditions and wounds. At the same time, standards for describing skin and wounds are being developed to help the clinician document skin and wound assessment. Now, more than ever before, a solid foundation of information exists to accelerate skin and wound healing. But despite these advances, the incidence and prevalence of chronic wounds—such as pressure ulcers, venous ulcers, and diabetic ulcers—in the United States has risen to epidemic proportions. (See *Fast facts about chronic wounds*, page 3.)

Chronic wounds can exact an emotional, physical, and financial toll on the patient and his caregivers. Frustration and confusion continue to arise among clinicians when trying to determine a wound management pathway for a wound or skin condition, when to change to a different type of dressing or drug, how to document the progress of the wound or skin appropriately, and how to track outcomes based on care practices. (See Appendix E for more on best practices.)

Some solutions to these dilemmas can be found by understanding the delicate balance of art and science. Art refers to the team member's skill and application technique in using the preferred management modality for skin and wound care. Science refers to the team member's knowledge and understanding of the disease and of the preferred modality used in managing the patient's care. Art and science—the fundamental tools of skin and wound healing—directly affect clinical and financial outcomes for the patient.

Still, after decades of published clinical practice guidelines, research results, and documented best practices for skin and wound care, not to mention the advances in knowledge and available technology, one has to ask: Why are there so many chronic, nonhealing wounds?

Reviewing the fundamentals of skin and wound care will help you answer this question. A complete understanding of the anatomy and physiology of the skin, the phases of healing, the types of wounds, and the options for wound repair is essential for recognizing factors that may complicate or delay wound healing. Each consideration plays a key role in assessing and managing wounds of all types.

SKIN STRUCTURE

The skin is the body's largest organ, making up about 10% of our total body weight. The skin surface of an average adult covers about 2 square yards. Every day our skin is exposed to physical and mechanical assaults, which may or may not have permanent consequences.

Fast facts about chronic wounds

Wound type	Fast facts
Venous leg ulcers	<ul style="list-style-type: none"> ■ Affect about 1% of general population and 3.5% of those older than age 65 ■ Recurrence rate nearly 70% ■ Treatment cost estimated at more than \$40,000 per episode ■ Up to 2 million work days lost yearly
Diabetic ulcers	<ul style="list-style-type: none"> ■ Affect about 15% of those with diabetes ■ High recurrence rate ■ Responsible for more than half of diabetes-related lower-limb amputations
Pressure ulcers	<ul style="list-style-type: none"> ■ Reported occurrence rates vary widely ■ Revised staging system used (<i>See chapter 3</i>)

The skin is made up of two major layers—the epidermis and the dermis. Each layer is composed of different types of tissue and has different functions. (See *Layers of the skin*, page 4.) The dermis provides strength, support, blood, and oxygen to the epidermis.

Epidermis

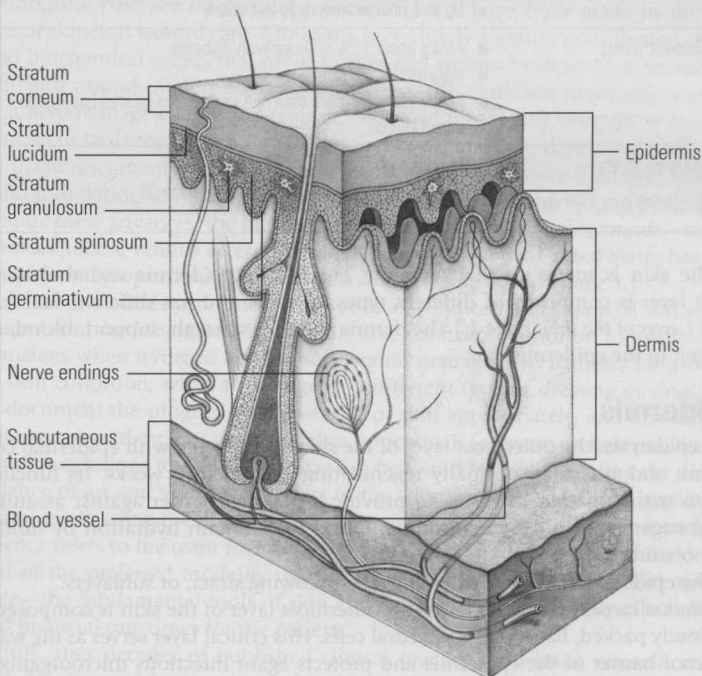
The epidermis, the outermost layer of the skin and covered with epidermal cells, is thin and avascular, normally regenerating every 4 to 6 weeks. Its functions are to maintain skin integrity, to provide a physical barrier against assault by microorganisms and the environment, and to maintain hydration by holding in moisture.

The epidermis may be divided into the following strata, or sublayers:

- *Stratum corneum* (*horny layer*). This outermost layer of the skin is composed of closely packed, flattened, polyhedral cells. This critical layer serves as the waterproof barrier of the epidermis and protects against infectious microorganisms, harsh chemicals, dirt, and environmental pollutants.
- *Stratum lucidum*. This layer is a translucent line of cells found only on the palms and soles.
- *Stratum granulosum* (*granular layer*). This layer, two to three cells thick, contains select keratinocytes.
- *Stratum spinosum*. This layer is composed of keratinocytes that become larger, flatter, and contain less water as they travel to the surface of the skin.
- *Stratum germinativum–stratum basale* (*basal layer*). This innermost layer of the skin contains basal keratinocytes that grow and continually divide, differentiating into the other layers of the epidermis over time. These cells ultimately flatten and lose their nuclei, thereby forming the stratum corneum and eventually replacing select cells that migrate to the skin surface and are lost. Keratinocytes of the basal layer are anchored to the basement membrane zone, which in turn is anchored to the second, thicker layer of the skin, the dermis.

Layers of the skin

The skin is composed of two fused layers—the epidermis and dermis. As this illustration shows, the epidermis has five strata—stratum corneum, stratum lucidum, stratum granulosum, stratum spinosum, and stratum germinativum. Subcutaneous tissue, found beneath the dermis, is a loose connective tissue that attaches the skin to underlying structures.



The epidermis also contains melanocytes, which produce pigment, and Langerhans cells, which help the body respond to and process foreign antigens that penetrate the skin surface.

The outer layer of the epidermis, the stratum corneum, plays a key role in hydration. This layer is similar to a brick-and-mortar structure. The keratinocytes (the “bricks”) are held together by lipids and proteins (the “mortar”). The epidermis produces the lipids—oily substances that limit the passage of water into or out of the skin—which include cholesterol, ceramide, and fatty acids. If the barrier is deficient in these lipids, moisture can escape. With the loss of water, scales and cracks can develop on the stratum corneum, resulting in dry, flaky, itchy skin.

If the barrier integrity of the skin is altered, epidermal lipid synthesis increases. Cholesterol and fatty acid synthesis is increased first, followed by ceramide

synthesis. This process may be regulated in part by transepidermal water loss (TEWL), which is commonly used to measure the rate of passive diffusion of water from inside the body, through the stratum corneum, and into the external environment.

Healthy skin structure is evident when the epidermis is intact. The substance that helps to maintain an intact epidermis is called natural moisturizing factor (NMF). NMF can absorb water, so it helps to hydrate skin cells. It's found in the cells in the stratum corneum and is made of the breakdown products of proteins. NMF helps prevent individual skin cells from losing water and creates the smooth, nonflaky appearance of healthy, intact skin.

Dermis

The dermis contains blood vessels, hair follicles, lymphatic vessels, sebaceous glands, and eccrine (sweat) and apocrine (scent) glands. It's composed of fibroblasts, which form collagen, ground substance, elastin, and other extracellular matrix proteins. Ground substance, an amorphous substance composed of water, electrolytes, plasma proteins, and mucopolysaccharides, fills the space between cells and the fibrous components, making the dermis turgid. Collagen fibers, the major structural proteins of the body, give skin its strength. Elastin is responsible for skin recoil or resiliency. Thick bundles of collagen anchor the dermis to the subcutaneous tissue and underlying supporting structures, such as fascia, muscle, and bone.

Subcutaneous tissue

The subcutaneous tissue is composed of adipose and connective tissue, as well as major blood vessels, nerves, and lymphatic vessels. The thickness of the epidermis, dermis, and subcutaneous tissue varies from person to person and from one part of the body to another.

SKIN FUNCTION

The skin has six functions:

- **Protection.** Skin acts as a physical barrier to microorganisms and other foreign matter, protecting the body against infection and excessive loss of fluids. The outer layer (stratum corneum) is slightly acidic, creating resistance to pathogenic organisms.
- **Sensation.** Nerve endings of the skin allow us to feel pain, pressure, heat, and cold.
- **Thermoregulation.** Skin regulates body temperature through vasoconstriction, vasodilation, sweating, and excretion of certain waste products, such as electrolytes and water.
- **Metabolism.** Synthesis of vitamin D in skin exposed to sunlight activates the metabolism of calcium and phosphate, minerals that play an important role in bone formation.
- **Body image.** The skin performs important body image roles with regard to appearance (cosmetic), individual attributes (identification), and ability to convey meaning through expression (communication).
- **Immune processing.** The skin is a portal to the immune system with resident immune cells in both the epidermis (Langerhans cells) and the dermis (dermal dendritic cells).

Skin pH: Essential to function

The skin's pH is acidic, ranging from about 4.2 to 5.6, depending on the area of the body and whether or not the skin is occluded. Skin should be kept in the acidic pH range for several reasons. After an injury to the skin, its barrier function recovers faster when the skin pH is more acidic, rather than more alkaline (less acidic). An acidic environment prevents premature desquamation, or shedding, of dead skin cells. Also, people with an acidic skin pH have less of a tendency toward sensitive skin, which is typically more alkaline.

The pH of the skin helps regulate some of the functions of the stratum corneum, including its permeability, defense against bacteria and fungi, and the integrity and cohesion of skin cells. Skin flora, or the microorganisms that live on or infect the skin, grow differently based on the skin pH. Normal flora grow better at an acidic pH, whereas pathogenic organisms, such as staphylococci, streptococci, and yeast, grow better at a neutral pH. Skin products with a higher pH are thought to promote bacterial growth.

SKIN CONDITIONS

Age-related changes

As we age, the overall function of the skin declines or slows. Obvious changes in skin structure and function occur, including the following:

- The epidermal–dermal junction flattens, contributing to a decrease in the overall strength of the skin, leaving us at greater risk for skin tearing or blistering.
- Langerhans cells and melanocyte cells shrink, putting us at greater risk for allergic reactions and increased sensitivity to sunlight, respectively.
- The vascular response is reduced, leading to decreased skin temperature and pallor, or paleness.
- Decreased production of excess sebum and the sweat that moisturizes the skin contribute to skin dryness and flaking.
- Reduced subcutaneous tissue, especially fat, lessens the body's natural insulation or padding and increases the risk of skin breakdown.
- A decline in generalized physical condition, including an altered immune system, puts us at greater risk for a skin or wound infection.
- The reproduction of the stratum corneum slows, which may lead to the skin's inability to absorb topical medications.

Xerosis and pruritus

A comprehensive assessment of the skin may reveal evidence of skin conditions such as xerosis (dry skin) and pruritus (itching), which are among the most common complaints encountered in nursing homes.

Xerosis affects 59% to 85% of persons older than age 65. More than 70% of hospitalized patients and 90% of nursing home residents over age 65 have dry skin. Many factors contribute to dry skin, including the environment (low humidity, sheets, gowns, elastic stockings or hose), habits (smoking, alcohol, poor diet), diseases (allergies, heart disease, diabetes), medications (diuretics, antibiotics), and skin cleansers (soaps that leave the skin dry, ineffective lotions). (See *Skin moisturizing products*, page 7).

Skin moisturizing products

Category	Function
Antimicrobial	■ Lowers bacterial count
Emollient	■ Soothes and softens skin ■ Holds and retains moisture
Humectant	■ Attracts, holds, and retains moisture
Preservative	■ Protects products from spoilage by microorganisms
Skin protectant	■ Protects injured or exposed skin from harmful stimuli
Surfactant	■ Cleans

Xerotic skin may appear rough, cracked, fissured, and scaly, and it usually occurs on the lower legs, hands, and forearms. Skin flaking can be seen when a patient removes compression hose; fissuring or cracks can be seen in a patient's heels. Although medications or chronic illnesses can trigger xerosis, it isn't usually associated with a dermatologic condition or systemic disease.

Xerosis is associated with a wide spectrum of clinical findings, from normal-looking skin showing no abnormal dryness to extreme conditions such as ichthyosis, in which the skin becomes dry, thick, and scaly. Xerosis can be classified as acquired, congenital, or inherited.

Pruritus, caused by xerosis in up to 85% of cases, is itchy skin, and it can cause the patient to rub or scratch the affected area. Scratching can cause excoriations, which may progress to secondary eczema or become infected. Pruritus can be caused by many dermatologic and systemic illnesses. It can occur with or without skin lesions.

Low humidity, cold temperatures, frequent bathing, and application of irritants to the skin can worsen pruritus. The condition is most commonly seen in the moisture-depleted skin of elderly people because their sebaceous and sweat gland activity is decreased.

Urinary and fecal incontinence

Incontinence is the inability to retain or control urine or feces, or both, until an appropriate time and place for elimination. Urine and stool may contain substances that irritate the epidermis and may make the skin more susceptible to breakdown. Loss of skin integrity leaves the patient at greater risk for skin breakdown. Some of the factors that may cause incontinence are:

- delirium
- diabetes
- diuretics
- environmental barriers
- fecal impaction
- high-impact physical activities
- immobility, in chronic degenerative disease
- impaired cognition

- low fluid intake
- morbid obesity
- medications
- neurologic conditions
- pelvic muscle weakness
- psychological conditions such as dementia
- smoking
- stroke
- toileting behaviors, such as reduced motor skills, difficulty using equipment, and so on.

Incontinence affects patients in all settings. A recent estimate of the direct costs of caring for persons of all ages with incontinence is \$11.2 billion annually in the community and \$5.2 billion in nursing homes. Given the magnitude of the problem, it is imperative to understand the types of incontinence and the products used to effectively manage this problem.

Fecal incontinence

Fecal incontinence is the loss of normal control of the bowels, leading to stool leaking from the rectum (the last part of the large intestine) at unexpected times. Fecal incontinence is a greater risk factor for pressure ulcer development than urinary incontinence. It affects as many as 1 million Americans and is more common in women and in the elderly of both sexes. The types of fecal incontinence include:

- stool (also called feces)—waste that passes from the rectum in solid, soft, or liquid form
- gas—air that comes from the breakdown of food.

Urinary incontinence

The patient with urinary incontinence can't control the passage of urine. This condition may range from occasional leakage to a complete inability to hold any urine. Urinary incontinence affects about 13 million Americans. More than 50% of nursing home residents experience some degree of urinary incontinence. The different types of urinary incontinence include:

- *stress incontinence*: associated with an impaired urethral closure that allows small amounts of urine leakage when intra-abdominal pressure on the bladder is increased by sneezing, coughing, laughing, lifting, standing from a sitting position, climbing stairs, and so on
- *urge incontinence*: associated with detrusor muscle overactivity
- *overflow incontinence*: associated with leakage of small amounts of urine when the bladder has reached its maximum capacity and has become distended
- *functional incontinence*: occurs in those who can't remain continent because of external factors even though their urinary tract function is intact
- *transient incontinence*: temporary episodes of urinary incontinence that are reversible once their cause is identified and treated
- *mixed incontinence*: combination of stress and urge incontinence.

Combined urinary and fecal incontinence

In the presence of both urinary and fecal incontinence, fecal enzymes convert urea to ammonia, raising the alkalinity of the skin pH. Irritation or maceration resulting from prolonged exposure to urine and stool may hasten skin breakdown.