Pressure Injuries in Long-Term Care
A Toolkit for Clinical Staff

Pressure injuries and documentation are often among the most frequently cited survey deficiencies, and wound care is the subject of continuous research. Most recently, in April 2016, the National Pressure Ulcer Advisory Panel (NPUAP) approved revisions to its Pressure Injury Staging System.

Pressure Injuries in Long-Term Care: A Toolkit for Clinical Staff is full of evidence-based strategies and downloadable assessment tools and in-services to educate your staff about preventing, treating, and assessing pressure injuries. Long-term care is shifting its focus from volume to value, with an emphasis on star ratings that result in increased (or decreased) reimbursement. This resource will help staff overcome documentation problems and better assess wounds and infections, saving time in clinical practice and staff training while avoiding errors that could lead to noncompliance.

This book will help you:

• Provide evidence-based training and education to staff
• Understand the most up-to-date NPUAP pressure injury stages and staging instructions
• Establish or update your facility’s guidelines through sample policies and procedures
• Increase quality care and reimbursement
• Avoid survey deficiencies at F-tag 314
Pressure Injuries in Long-Term Care
A Toolkit for Clinical Staff

Barbara Acello, MS, RN
# Contents

- About the Author .................................................................................................................. vii
- Introduction ........................................................................................................................ ix
- Acknowledgments ................................................................................................................ xi
- Disclaimer ............................................................................................................................ xiii

## Chapter 1: Overview of Anatomy and Physiology of the Skin ........................................... 1
- The Integumentary System .................................................................................................. 1
- Aging Changes .................................................................................................................... 5
- Pressure Injuries ................................................................................................................. 6
- Wound Healing .................................................................................................................... 6

## Chapter 2: Pressure Injury Risk ....................................................................................... 9
- Important New Information ............................................................................................... 9
- Importance of Risk Factors ............................................................................................. 10
- Friction-Induced Skin Injuries—Are They Pressure Injuries? ........................................... 14
- Effects of Pressure on the Skin ......................................................................................... 14
- Tissue Tolerance and Pressure Injuries ........................................................................... 17
- Pressure Injuries on the Feet ............................................................................................ 21
- Elements of a Prevention Program ................................................................................... 24
- What to Do With This Information .................................................................................. 32
- Resources .......................................................................................................................... 33

## Chapter 3: Pressure Injury Assessment and Documentation ........................................... 35
- Pressure Injury Assessment ............................................................................................... 35
- Staging Pressure Injuries ................................................................................................. 43
- NPUAP Stages and Definitions ........................................................................................ 44
- The Kennedy Terminal Ulcer ............................................................................................ 49
- Palliative Care/Hospice Care ............................................................................................ 51
- Gangrene ............................................................................................................................ 54
- Necrotizing Fasciitis .......................................................................................................... 59
- Reverse Staging (Backstaging) ......................................................................................... 61
- Pressure Injuries and the MDS ......................................................................................... 62
Contents

Chapter 4: Immobility and Positioning Bedfast Residents.........................65
  Immobility ............................................................................................................65
  Bed Positions ......................................................................................................66
  Resident Refusals: Positioning and Repositioning .............................................69
  Residents With Mental Health Problems and Depression .....................................71
  Survey Observations of the Bedfast Resident ....................................................73
  Moving Residents ...............................................................................................75
  Bed Mobility .........................................................................................................81
  Foot Care .............................................................................................................82

Chapter 5: Pressure Relief in Chairfast Residents ........................................85
  Repositioning the Seated Resident and Using the 90-90-90 Position ..................86
  Measuring Wheelchairs to Fit Residents .............................................................91
  Wheelchair Mobility ............................................................................................93
  Resources ............................................................................................................95

Chapter 6: Support Surfaces.........................................................................97
  Importance of Support Surfaces ..........................................................................97
  Bottoming Out .....................................................................................................103
  Bariatric Support Surfaces ..................................................................................103
  Entrapment Concerns Associated With Replacement Mattresses and Overlays ....104
  Support Surfaces for Chair and Wheelchair Seating .........................................107
  Pressure Mapping ...............................................................................................109
  Final Words on the Subject ...............................................................................110
  Resources ...........................................................................................................110

Chapter 7: Lower-Extremity Wounds.......................................................111
  Lower-Extremity Wound Identification ...............................................................111
  Arterial (Ischemic) Ulcers ..................................................................................112
  Venous (Stasis) Ulcers .......................................................................................115
  Resident Teaching ...............................................................................................118
  Graduated Compression Stockings (GCS) ...........................................................118
  Additional Considerations ..................................................................................119
  The Unna Boot ....................................................................................................120
  Diabetic (Neuropathic) Ulcers ............................................................................122
  Other Types of Ulcers .......................................................................................124
  Malignant Ulcers ...............................................................................................125
  Resources for Atypical Ulcers ............................................................................126
  Preventive Plan of Care .....................................................................................127
Chapter 8: Nursing Strategy: The Plan of Care
for a Resident With a Pressure Injury

Ongoing Plan of Care
Planning Care
Care Plan Approaches and Practices for Preventing Wound Infection
Other Issues
Wound Pain

Chapter 9: Wound Dressings

Matching the Wound to the Dressing
Purposes of Wound Dressings
Red, Yellow, or Black
Pain During Treatment and Dressing Change
Wound Care Technique

Chapter 10: Treatment Options

Recommended Treatment Options
Procedure for Wound Care
Hydrotherapy, Cleansing, and Irrigating the Wound
Wound Irrigation
Pulsatile Lavage
Negative Pressure Wound Therapy Systems
Cadexomer Iodine
Debriding Agents
Silver
Other Antimicrobials
Honey in Wound Care
Older Treatments
Poor or Abnormal Healing
Delayed or Stalled Healing

Chapter 11: Wound Infection

Systemic Factors That Increase the Risk of Wound Infection
Definitions
Pressure Injury Colonization
Wound Infection
Cleansing With Normal Saline Versus Other Liquids
Toxins
Septic Conditions
Carbapenem-Resistant Enterobacteriaceae (CRE)
Contents

Antibiotic Treatment .................................................................................................................................................. 186
Osteomyelitis ............................................................................................................................................................ 188
Wound Culture .......................................................................................................................................................... 190
Risk of Tetanus in Pressure Injuries, Skin Tears, and Chronic Wounds ................................................................. 192
Immunization ............................................................................................................................................................ 193
Resources ................................................................................................................................................................. 194

Chapter 12: Biofilm Overview .................................................................................................................................. 197
What Are Biofilms? .................................................................................................................................................... 197
Biofilm Identification .................................................................................................................................................. 203
Biofilm Treatment ...................................................................................................................................................... 206
Biocides....................................................................................................................................................................... 210
Less Common Biocide Treatments .......................................................................................................................... 212
Selecting a Treatment ............................................................................................................................................... 213
Evidence-Based Care ............................................................................................................................................... 215

Chapter 13: Documentation ........................................................................................................................................ 219
What to Document .................................................................................................................................................... 219
What Not to Document .......................................................................................................................................... 220
CMS Study ............................................................................................................................................................... 220
Survey and Certification Issues ................................................................................................................................ 222
Half Truths or Outright Falsification ........................................................................................................................ 222
Fraud and Abuse ...................................................................................................................................................... 223
Guidelines for General Nursing Documentation .................................................................................................... 225
Changing Terminology on Medical Records .......................................................................................................... 226
AHRQ’s Safety Program for Nursing Homes: On-Time Prevention ......................................................................... 227
The Last Word .......................................................................................................................................................... 227

Appendices

Appendix 1: 10 Most Common Pathogens .................................................................................................................. 231
Appendix 2: Adult Immunization Schedule ................................................................................................................ 233
Appendix 3: Common Aerobic Microorganisms Seen in Wounds .............................................................................. 235
Appendix 4: Common Anaerobic Microorganisms Seen in Wounds .......................................................................... 237
Appendix 5: Antimicrobial Resistance Patterns for Healthcare-Associated Infections (HAIs)
Reported to the National Healthcare Safety Network (NHSN) .............................................................................. 239
Appendix 6: ESKAPE Acronym .................................................................................................................................... 241
Appendix 7: Essential Oils in Wound Care .................................................................................................................. 243
Appendix 8: Gram Stain Quick Reference .................................................................................................................. 245
Appendix 9: Overview of Wound Management ......................................................................................................... 249
Appendix 10: Nosocomial Infection Criteria ............................................................................................................. 251
Appendix 11: Tissue Tolerance Procedure ................................................................................................................. 253
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Introduction

The nursing profession has been laying the groundwork for evidence-based practice (EBP) since 1980. This job will never be done. It is a monumental undertaking that requires a great commitment. The nursing profession was established in 1854. It was a low tech job that provided comfort and care. Providing comfort and care continues to be an important nursing responsibility in today’s high-tech world. However, we are doing so in the context of what can be proven to be in the best interests of patients and residents.

Throughout time, nursing care has been given based on intuition, what is easiest, and what we have always done. We haven’t scratched the surface yet, and many existing practices require validation. Fortunately, a great deal of time and effort have been devoted to researching the nursing care and prevention of skin injuries. Although we have not arrived, we have a great deal of evidence to use. EBP integrates research and clinical practice. A descriptive label that accurately reflects the practice is assigned to each procedure. Nursing research has become a specialty in its own right.

The professional organizations that make skin care recommendations have collaborated with sister groups throughout the world. Research has been ongoing and peer reviewed. (Nurses who do the peer reviews are volunteers. They are called “stakeholders” when the organizations list their names in publications.) Members have asked questions and requested clarification about new information and practices. Responding to their queries has resulted in new, more accurate labels. This brings us to where we are today.

Breaks in skin integrity are a potentially serious problem in long-term care. They are painful, they allow microbes to enter, and increase the risk of a host of complications. Some of these are serious and potentially life-threatening. They require extra nursing time, increase the risk of legal exposure, and act as a red flag when surveyors visit the facility.
Introduction

If we want excellence in practice to be the standard of care, we must embrace evidence-based practice as the norm. Continuing to use a clinical practice despite research that shows that the practice is not helpful and may even be harmful to the residents is detrimental to their care and leaves the nurse vulnerable to legal action.

Practicing nurses are expected to remain up to date and integrate the results of nursing research into their practice. This involves ongoing monitoring of professional journals, inservices, books, the internet, and other sources of current information. In a perfect world, you would have time to do this. We know your time is at a premium. Our goal for this book is to provide a turnkey package of current, evidence-based information that we believe will help you and your colleagues learn and grow.

Nursing professionals and paraprofessionals are the largest group of healthcare providers in the United States. Because of our scope of practice and access to patients and families, we have both the privilege and the responsibility of providing compassionate, evidence-based care.

Your mission and responsibility are monumental, and the essence of quality care resides in the manner in which staff considers and relates to residents as individuals. Quality of life is the result of a culture of caring. When the facility has a culture of caring, quality of care flourishes. Nurses with a vision create this culture. Everyone benefits. Long-term care nursing is a calling. Don’t view it as a chore. We hope this book provides you with useful tools with which to further the process. Your work is sacred, and by providing quality care, you are making a difference. Believe in that, and believe in yourself!

Best wishes on your journey as a manager in long-term care. Thank you for choosing us to introduce you to this important subject matter.

Barbara Acello

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Good luck with your mission to provide quality pressure injury prevention and management. Geriatric care is my first love, and I sincerely admire those who work in the difficult financial and regulatory environment we call long-term care. I believe in you, support you, admire your commitment, and sincerely hope this information is useful to you. Please feel free to contact me through HCPro, Inc. or by email, if you have questions or comments.

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In addition to the care provided by physicians, some facilities are fortunate to have the services of advanced practice nurses (including nurse practitioners and clinical nurse specialists) and physician assistants. These well-educated and highly qualified individuals provide excellent care to residents in long-term care facilities. Collectively, we refer to these individuals as “health care providers” or “health care practitioners.” Occasionally, the term “physician” is used for brevity only. This is not intended to minimize the important work of advance practice nurses and physician assistants. When the reader is advised to notify the physician, facilities may also notify the advanced practice nurse or physician assistant, if available, and as permitted by state law and facility policies.

Every effort has been made to ensure that this material is timely and accurate at the time of publication, but pressure injury care involves evidence-based practices that change frequently. The author, editors, and publisher have done everything possible to ensure this book is current and in compliance with the standards of care. The author, editors, and publisher are not responsible for errors or omissions or for consequences from application of the book, and make no warranty, expressed or implied, in regard to the contents of the book. Neither the author or publisher or any other individual or party involved in the preparation of this information will be liable for any special, consequential, or exemplary damages resulting in whole or part from any individual’s use of or reliance upon this material. The practices described in this book should be applied in accordance with facility policies and procedures, state and federal laws, the nurse practice act for your state, professional standards of practice, and the individual circumstances that apply to each resident encounter and situation.
The Integumentary System

The integumentary system consists of skin, hair, nails, sweat glands, nerves, and oil glands. It is elastic, regenerates, and provides protection, thermoregulation, sensation, and elimination. These functions are essential for life.

The skin constantly interacts with the environment. Changes in its appearance relate to aging, abnormalities, or diseases. It has many functions that are critical to the body’s well-being, including the following:

- Protection—forms a continuous membranous covering for the body
- Storage—stores fat and vitamins
- Elimination—loses water, salt, and heat through perspiration
- Sensory perception—contains nerve endings that keep us aware of environmental changes

The skin tells us much about the body’s general health:

- If fever is present, the skin is hot and dry
- Cool and clammy skin accompanies certain cardiovascular problems
- Redness or flushing of the skin occurs when someone is embarrassed or after strenuous activity
- Many medical conditions cause pale skin, edema, or changes in skin color or texture
- The skin is cyanotic when oxygen content of the blood is low
Skin layers

The skin consists of three distinct but connected layers: epidermis, dermis, and subcutaneous tissue (Figure 1.1).

The epidermis, or top layer, is fastened to the dermis, or second layer, which consists of thick connective tissue. Persons with thin skin have a thin epidermis; those with thick skin have a fairly thick epidermis. The third layer of skin is the subcutaneous layer, which resides beneath the dermis and consists of areolar (minute spaces in tissue) and adipose (fat) tissues. This layer is firmly attached to underlying structures, and the top of it attaches to the dermis. Fibers from the dermis extend into the subcutaneous tissue, securing the layers together.

Each layer is made of different tissue and plays different roles in the body. The top of the epidermis consists of dead cells that shed continuously as new cells move upward from the dermis. This layer contains no blood vessels, so superficial injuries to the epidermis do not bleed. However, nerve endings are abundant. These receptors are in constant contact with the environment and provide information about heat, cold, pain, pressure, and temperature.

The epidermis consists of stratified squamous epithelial cells that are organized into either four or five layers, depending on location: The soles of the feet and palms of the hands have five...
layers and are approximately 7 mm thick (Figure 1.2A). Other areas of the body, which have less exposure to friction, have only four layers (Figure 1.2B), and the skin is much thinner and softer in these areas. In all areas, however, the epidermis has many jobs. It prevents dehydration of underlying tissues, keeps fluid and nutrients in the skin, responds to many stimuli, and protects the body from microbial invasion, toxins, light, and mechanical injury.

The dermis (corium) keeps the epidermis in place through attachment with connective tissue and elastic fiber. It is thick on the soles of the feet and palms of the hands and thin on the eyelids, penis, and scrotum. The dermis contains numerous blood vessels, nerves, lymph vessels, hair follicles, sweat glands, and sensory receptors.

The upper fifth of the dermis is the papillary layer, which has small, finger-like projections that extend deep into the surface of the epidermis. The remainder of the dermis is the reticular layer, which consists of connective tissue interwoven with bundles of collagenous and coarse fibers. Adipose tissue, hair follicles, nerves, oil glands, and the ducts of sweat glands reside between the fibers. The collagenous and elastic fibers provide skin strength, extensibility, and elasticity. Additionally, the dermis is very vascular—in fact, it is more vascular than any other organ system, and it assists with temperature regulation and provides oxygen and nutrients to the epidermis.

The subcutaneous (adipose) layer consists of adipose tissue and loose connective tissue. This layer stores water and fat. It provides insulation against heat loss, gives the body shape and form, provides a cushion against injury, supports other tissues, and provides a pathway for nerves and blood vessels.
Facts about the integumentary system

The skin is the largest organ in the body. In an adult of average size, total skin weight is about 6–8.8 pounds, and it covers an area of about 20 square feet. Each square inch of skin consists of approximately 19 million cells, 60 hairs, 90 oil glands, 20 blood vessels, 650 sweat glands, and 19,000 sensory cells. About one-third of the blood circulating in the body is used to nourish this large organ.

In addition to taking up so much space, the skin is constantly changing: It renews itself every 27 days. As part of that process, approximately 500 million skin cells fall off a person each day, totaling about a pound and a half per year. The average person has lost about 105 pounds of skin by age 70. All in all, we shed and regrow about 1,000 new skins in a lifetime.

The skin contains other kinds of cells as well, including melanocytes, or cells that produce skin color. Everyone has about the same number of these, and the amount of melanin that each melanocyte cell produces determines the color of a person’s skin. The skin also contains about 100,000 bacteria per square centimeter—in fact, 10% of human dry weight is attributed to bacteria. The skin’s normal flora provide a measure of protection from harmful pathogens.

In addition to its complex make-up, the skin has the ability to stretch, referred to as extensibility, such as in obesity, in response to edema, and during pregnancy. It also has the ability to contract after stretching, referred to as elasticity. Severe stretching may cause small tears. These are initially red in color, but over time, they lose the redness and remain visible as silvery-white streaks called striae (stretch marks).

Nails, which are extensions of the skin, are also part of the integumentary system. It takes a nail approximately six months to grow from base to tip. The fingernails grow more quickly than toenails and provide a permanent record of some illnesses and exposure to certain chemicals. Hair, too, is part of the integumentary system, and like nails, it maintains a record of chemicals, toxins, and other problems. There are more than 5 million hair follicles on the body, and although the average human has about the same amount of hair as other hairy primates, human body hair is short and fine. Scalp hair grows more quickly than other body hair, and the average scalp has about 100,000 hairs. Each hair lives about two to four years. The hair on the head grows at a rate of approximately 1 cm (0.3937 inches) per month. The average person loses approximately 50–100 hairs from the head each day.

Sweat glands are also part of this system, and there are 650 sweat glands in 1 square inch of skin. On its own, sweat from the underarm and genital areas is odorless. Unpleasant body odors
result from the action of bacteria on the sweat. The human body smell is distinctive, as individual as a fingerprint, and unique to family groups.

**Aging Changes**

The skin undergoes many changes as it ages, and many are visible. The skin’s ability to distribute pressure decreases with age. Changes in collagen synthesis negatively affect the mechanical potential of the tissue, which becomes stiffer and less able to withstand the effects of pressure. Muscle tone decreases, subcutaneous tissue is reduced, and inadequate nutrition (which is common in older persons) affects healing ability. Dehydration and inadequate fluid intake further reduce skin elasticity and increase the risk of injury. Other aging changes include the following:

- Subcutaneous fat and elastin diminishes
- The skin thins, loses elasticity, and develops wrinkles
- The skin becomes dry and fragile
- Blood vessels near the skin surface become more prominent
- Blood vessels that nourish the skin become more fragile with reduced capillary blood flow; senile purpura are common, and healing is delayed
- Blood supply to the lower extremities is reduced, increasing the risk of skin breakdown, gangrene, amputation, and related complications
- Sensitivity to pressure and temperature is reduced
- Age spots become evident
- Risk of injury increases; the skin bruises, cuts, tears, and breaks more readily
- A person may complain of feeling cold
- Risk of pressure, friction, and shearing injuries increases
- Glandular activity decreases
- Oil glands secrete less oil, causing the skin to dry and become pruritic (scratching may also cause injury)
- Perspiration decreases
- Thermoregulatory ability is impaired
- Veins dilate
- Risk of injury increases due to impaired sensation
- Melanin production is decreased; color is lost and hair turns gray
- Hormone production changes; females develop facial, chin, and upper lip hair
- Scalp, pubic, and axillary hair thins
Pressure Injuries

An ulcer is an open skin lesion in which the epidermis and upper dermis have been destroyed. Ulcers have many causes, including skin trauma, chemicals, parasites, tumors, and infections. Those caused by pressure often result in rapid, extensive tissue destruction. An ulcer always results in a scar. Once damaged, the skin never regains the strength and resiliency it had previously.

Unrelieved, sustained pressure limits blood flow and deprives skin of nutrients and oxygen, results in damage to the underlying tissues, and leads to an open area, or ulcer. Humans have more pain receptors than any other type of sensory nerve receptor. Even a small red area or break in the skin can be very painful.

Most skin ulcers occur over bony prominences and are staged to classify the degree of tissue damage that is observed or identified during the nursing assessment. Ulcers that are covered with eschar or large amounts of slough are considered unstageable, but these lesions do not necessarily increase sequentially in stage.

Although friction and shear are not primary causes of these injuries, they are some of the most important contributing factors to lesion development (Cuddigan, Ayello, Sussman, & Baranoski, 2001). Integumentary ulcers are largely but not 100% preventable (National Pressure Ulcer Advisory Panel, 2010), and they are much easier to prevent than they are to treat. They take a long time to heal, and even after healing, the tissue is weakened and the area is susceptible to future breakdown. In fact, a single open area is a good predictor of future breakdown anywhere on the body.

See Chapter 2 for important new information about pressure injuries.

Wound Healing

Partial-thickness wounds involve the epidermis and upper dermis and heal by regeneration. Function is not lost, and scar tissue does not form for most superficial injuries. Full-thickness wounds, in contrast, result from destruction of the epidermis, dermis, and subcutaneous tissue. Muscle and other structures may also be damaged. Such wounds heal by scar tissue formation,
which involves granulation, contraction (wound shrinkage), and epithelialization. A full-thickness ulcer can never revert to a partial-thickness wound. Healing occurs in three stages:

- **The inflammatory phase** occurs immediately after injury and lasts a brief time in partial-thickness wounds. The wound experiences an inflammatory response with heat, redness, pain, swelling, and impaired function. Vasoconstriction occurs within seconds after injury and lasts a few minutes. It is followed by vasodilation, which is caused by local stimulation of the nerve endings. The wound produces a serous exudate that forms a scab if allowed to dry. Inflammation usually lasts about three days.

- **The proliferative phase** overlaps the inflammatory phase slightly and continues until the wound heals. This phase involves regrowth of the epidermis. (Epithelialization is part of this stage but actually begins within hours of injury, during the inflammatory phase.) Small partial-thickness wounds that have been left open to air will heal in about six to seven days; moist wounds will heal in about four days. With wounds involving loss of the epidermis and dermis, both layers are repaired simultaneously. In a superficial ulcer, by the ninth day, collagen fibers emerge in the wound bed. Collagen synthesis, which requires vitamin C, amino acid, and adequate nutritional intake, continues until about 10 or 15 days after the injury and continues to produce new connective tissue. Some experts theorize that cells surrounding hair follicles contribute considerably to dermal repair, accelerating healing in hairy areas of the body. In wounds with substantial tissue loss, granulation tissue contracts to close the area. Such tissue is a healthy, beefy red color that some nurses describe as “looking like fresh hamburger.” This contracture does not occur in wounds with little tissue loss.

- **The maturation phase** begins about three weeks after injury and may continue for years in chronic wounds. In this stage, the collagen that has been deposited in the wound is remodeled and reorganized, which strengthens the wound and makes it more like adjacent tissue. New collagen is deposited, which compresses blood vessels and flattens the scar (Figure 1.3). However, the area of a serious skin injury is never as strong as it was prior to the injury, and the scar

![Figure 1.3](image1.png)
will not sweat, grow hair, or tan in the sunlight. A newly healed ulcer lacks tensile strength, and stress on the wound must be minimized. If the resident is on a therapeutic bed, leave it in place through this stage, and continue implementing aggressive preventive measures to prevent recurrent breakdown in the area. A wound is healed when the skin surface is continuous and its strength is sufficient to support normal daily activities. The scar achieves maximum strength in about three months.

**Healing by primary intention**

Wounds that are cleanly incised with approximated edges can be sutured. When this method is used, the wound heals by primary intention (also called first intention). Very little granulation tissue is present, and a wound of this type usually heals rapidly, with minimal scar tissue. The stages of healing are the same as those for any other wound.

**Healing by secondary intention**

Wounds heal by secondary intention when they close naturally and are not sutured, such as when the wound margins are far apart and cannot be brought together. These wounds take longer to heal than those closed by primary intention. Granulation tissue helps fill the wound, and contraction and epithelialization occur, which usually results in considerable scar tissue. The tissue will always be at high risk of breakdown.

**REFERENCES**


National Pressure Ulcer Advisory Panel. (2010, March 3). Not all pressure ulcers are avoidable [Press release].
Important New Information

You may have noticed that the terms “pressure ulcer” and “pressure sore” were not used in the discussion of wounds in Chapter 1. These terms have been in use for many years and were designated to update older terminology, such as “decubitus ulcer.” Once again, we find nursing terminology in a state of flux as a result of research into evidence-based practices. Wound care has evolved into a specialty that is based on the strength of the evidence, and nursing terminology has been updated to reflect the evidence.

The National Pressure Ulcer Advisory Panel (NPUAP) is a professional organization that advocates for improved outcomes in prevention and treatment of injuries caused by pressure, friction, and shearing and other problems that are largely preventable with conscientious nursing care. NPUAP announced a number of important changes in terminology immediately after their annual meeting in April 2016. The response to changes has been positive. The Centers for Medicare & Medicaid Services (CMS) and The Joint Commission (TJC) have adopted the terminology and will introduce it in the near future. Other regulatory and professional organizations have also accepted the changes.

This book reflects the new terminology. Stages are based on the extent of tissue damage. Prior to the 2016 change, the staging system described Stage 1 ulcers and Deep Tissue Injury as injuries with intact skin, yet one was given a stage and the other was not. Stage 2–4 ulcers were considered open areas. This distinction caused confusion because the definitions were not consistent with the labels. One goal of the new changes is to ensure that they clarify which areas have open skin and which have intact skin.
A significant new change is that the term “pressure ulcer” has been replaced with “pressure injury.” This term more accurately describes the pressure-related tissue damage in all the wounds. According to the NPUAP, “a pressure injury is localized damage to the skin and/or underlying soft tissue, usually over a bony prominence or related to a medical or other device. The injury can present as intact skin or an open ulcer and may be painful. The injury results from intense and/or prolonged pressure or pressure in combination with shear.”

**Importance of Risk Factors**

Risk factors are conditions that indicate that a problem may develop or cause the resident’s health to worsen. However, the presence of one or more risk factors does not mean that pressure injuries are inevitable. Rather, identifying and addressing risk factors is a key part of the nursing process. Nurses identify the risk of developing complications during the assessment process, and then plan care to reduce that risk and prevent the complications. The plan is continuously evaluated to ensure that it is working. If it is, then the approaches continue. If it is not, then the plan is adjusted to improve its effectiveness.

Nurses have a different perspective on providing care than physicians do, and it starts with the definition of our professions. Physicians use the medical model of care to diagnose and treat illness, while nurses use the holistic model of care to diagnose and treat the human response to illness. A physician’s education focuses on identifying and managing disease, illness, or injury, whereas a nurse’s education concentrates on how that same disease, illness, or injury affects the person.

Nowhere is this approach more important than during the care planning process. Focus must be on the resident’s response to illness, environment, or circumstances affecting his or her life as you plan nursing care. Remember Maslow’s Hierarchy of Needs when determining how to prioritize care for resident problems (Figure 2.1).
Some of our most important tasks are to identify risk factors for changes in condition and then plan and implement various approaches to prevent declines. Pressure injuries are a response to illness, and prevention is essential to positive outcomes. In long-term care, risk factors are identified in many different ways, such as the following:

- Past history
- Physical findings
- Medical diagnoses
- The Minimum Data Set (MDS)
- Written risk assessments, such as the Braden Scale, to identify pressure injury risk
- Common sense
- Observation of the resident
- Information reported by others

Visit [www.bradenscale.com](http://www.bradenscale.com) to download the Braden scale and other useful tools.

The MDS places a great deal of emphasis on risk factor identification and pressure injury prevention. It may take quite some time before the terminology on the MDS is updated.
Specific risk factors

Risk factors for pressure injuries include but are not limited to the following:

- Higher acuity, initial severity of illness
- Comorbid conditions such as end-stage renal disease (ESRD), thyroid disease, diabetes mellitus, anemia, spinal cord injury, paralysis, cerebrovascular accident (CVA), multiple sclerosis, dementia, and any condition that causes altered sensation and others
- Impaired perfusion or localized blood flow (e.g., generalized atherosclerosis or lower-extremity arterial insufficiency)
- Increased blood viscosity due to medical conditions and dehydration
- Drugs such as steroids that may affect wound healing
- Aging changes in the skin and/or problems related to the condition of the soft tissue, having dry skin, or tissue that is thin, tears, bleeds, or bruises easily
- Hypotension (blood pressure < 100/60); when blood pressure is low, blood flow is shunted to vital organs, away from the skin
- Elderly, and/or residents of long-term care facilities
- Decreased mobility or immobility
- Posture and/or positioning, prolonged duration of pressure
- Use of positioning devices
- Decreased functional ability (e.g., inability to reposition independently in bed or in a chair)
- Resident refusal of some aspects of care and/or treatment
- Altered level of consciousness
- Decreased cognition/cognitive impairment
- Inability to communicate
- Depression contributing to immobility and withdrawal
- Mechanical load
- Body mass index
- Malnutrition (decreased plasma protein and serum albumin levels, decreased dietary protein and iron intake, negative nitrogen balance)
• Significant weight loss
• Oral eating problems
• Dehydration and fluid deficits
• Presence of moisture
• Microclimate (the temperature, humidity, pH and air movement between the skin and another surface)
• Fever, increase in body temperature
• Localized heat, edema, and/or induration
• Exposure to powder, chemicals, secretions, excretions, and other irritants
• Friction
• Shearing forces
• Exposure of skin to urinary and fecal incontinence
• Use of catheter
• Presence of an existing ulcer
• History of a healed ulcer
• Use of restraints
• Cigarette smoking/tobacco use

The most common medical conditions in which facility-acquired pressure injuries develop are as follows:

• Pneumonia
• Aspiration pneumonitis
• Congestive heart failure
• Urinary tract infection
• Septicemia

As you can see, some factors can be completely modified, others are potentially or partially modifiable, and some cannot be modified at all. Plan care to reverse or stabilize the underlying causes by using a team approach.
Friction-Induced Skin Injuries—Are They Pressure Injuries?

Friction is considered a risk factor for pressure injuries, but by itself does not cause pressure injuries. It can cause other skin injuries, such as “road burn,” or rubbing on clothing or another object such as a shoe.

However, friction definitely contributes to pressure injury development when combined with other risk factors—most commonly, shear force. Friction damages the tissue and contributes to pressure injury development when combined with shear strain.

All friction injuries should not be considered pressure injuries. If friction causes visible skin injury, such as a skin tear, then the wound is not a pressure injury. However, if the area is blistered and the surrounding skin is damaged, assess the situation further to determine whether it is a pressure injury (Antokal, S., et al., 2012). Either way, the plan of care should reflect approaches to prevent both friction and shearing.

Effects of Pressure on the Skin

Pressure injuries are an internal response to the external mechanical load on the skin. They are the tips of the iceberg: Damage is in deep tissues, where it is not visible.

Skin breakdown is affected by time, temperature, and pressure. Pressure on the skin that is greater than 32 mmHg will disrupt blood flow, causing tissue ischemia. Higher pressure requires less time than lower pressure to cause damage. For example, a high-risk resident can develop a pressure injury within two to six hours of onset of pressure, but a high mechanical load for a brief period or a low mechanical load for a prolonged period both increase the risk of skin breakdown. Because the pressure on the human body is not uniform, the risk for skin breakdown can never be eliminated completely, even if a therapeutic mattress or overlay is used. Nevertheless, consider using these tools in bed and chair to reduce risk for high-risk residents.

Most residents in the long-term care environment have thin, fragile skin (Figure 2.2) and are at risk for skin breakdown. Some, but not all, keys to identifying risk factors are built into the MDS. Residents who are at risk for pressure injuries should have a skin inspection at least once per day, such as by a nursing assistant who can report abnormal findings to the nurse for further assessment. Licensed nurses should check high-risk residents’ skin weekly or according to facility policy. Because their conditions are not static, pressure injury risk is variable. Accurate and complete documentation of risk assessments ensures continuity of care and forms the basis for the skin care plan.
Pressure Injuries in Long-Term Care: A Toolkit for Clinical Staff

Written risk assessment tools

A risk assessment–based treatment plan is the most proactive approach to an effective, comprehensive pressure injury prevention program. Each facility should have policies and procedures in place that include regular, structured skin assessments appropriate to the population and setting, areas to be targeted, and the timing of assessment, reassessment, and documentation. Following facility policies is essential for survey compliance and reducing your risk of legal exposure.

Most facilities use written assessment tools to identify a resident’s potential risk of developing pressure injuries. Many experts recommend using such tools in clinical practice, combined with sound clinical judgment. Used correctly, they can help nurses plan and prioritize care needs. Many such tools have good predictive value if they are appropriate to the setting (e.g., a tool used for operating room positioning is not appropriate for the long-term care facility) and nurses are educated in its use. For example, the Braden Scale has withstood the test of time and is widely used in long-term care. It was developed for long-term care elderly residents, has been extensively researched, and has proven reliable in accurately identifying risk. However, it is specific to pressure injury risk and is not designed for other skin conditions.

One study suggests that long-term care facilities need to specify assessment intervals to maximize prevention strategies and minimize ulcer development (Wipke-Tevis, et al., 2004). It revealed that long-term care facilities reassess 25% of low-risk residents too frequently, whereas twenty-five percent of high-risk residents are not reassessed frequently enough. Experts recommend that risk assessments occur at the following times:
• On admission
• Weekly for the first four weeks
• Monthly or quarterly thereafter
• Any time a resident’s condition changes

Risk assessment upon admission has proven highly predictive of pressure injury development and is even more so when the resident is reassessed within 48–72 hours after admission (Williamson, 2008). A major problem with written risk assessments is that many nurses view them as a means of paper compliance. (If you do not fit into this mold, congratulations! However, be aware that some nurses are not as conscientious as you are.) In fact, risk assessments are legal chart documents. If you fill one out, you are expected to do something with the information.

Beware the challenges that accompany completing these assessments, however. They are one of many assessments that the admitting nurse is expected to complete. Admissions inevitably occur at shift change, and the paperwork must be completed before the nurse leaves for the day. An admission nurse who hurriedly completes the tool may not have enough knowledge of the resident to ensure that it is accurate, which can cause problems. Once the tool is completed, it is filed in the chart and used only by the MDS nurse. Skin risk may not be reviewed again until the quarterly reassessment is completed, leaving the resident vulnerable for breakdown if the assessment is inaccurate. Avoid these pitfalls by leaving enough time before shift change to properly complete resident assessments and ensure accuracy by taking the time to look at the skin from head to foot, reviewing documentation from the previous facility (if applicable), and asking the resident about previous skin problems.

**Skin inspection is part of risk assessment**

A complete skin assessment should be a routine part of the risk assessment. Nurses must be proficient in procedures and techniques for performing skin assessments, including techniques for identifying the following:

• Visible red, open, or damaged areas
• Blanching; tissue response
• Localized heat
• Edema
• Induration (hardness)

These factors have all been identified as warning signs for skin breakdown. Stage I areas are easily missed in residents with darkly pigmented skin.

Monitor closely for pressure damage associated with tubes and medical devices. Medical devices, such as catheters, oxygen tubing, ventilator tubing, rigid and semi-rigid cervical collars, and others, may damage tissue. Studies have identified pain as a major symptom in persons with pressure injuries, so ask the resident to identify areas of discomfort, burning, or pain. The resident may feel a problem before you can see signs of tissue damage. Several studies strongly suggest that pain over the area is a precursor to skin breakdown.

Document all skin inspections and risk assessments accurately, including details of pain that suggest pressure damage. Accurate documentation is key to monitoring the resident’s progress, as well as facilitating communication among other team members, such as physicians, other nurses, therapists, and the dietitian.

**Tissue Tolerance and Pressure Injuries**

Facilities continue to search for ways to avoid adverse survey findings regarding inaccurate, underestimated, and non-resident-specific pressure injury risk assessments. Ineffective, inaccurate, and/or generic risk assessments may result in ineffective and generic care plan interventions, including the ever-popular “turn and reposition q 2 hours.” When every resident’s care plan includes the same turning and positioning frequency, a facility is hard-pressed to demonstrate resident-specific interventions. Additionally, it is an impossible task for the nursing assistant staff.

All nursing personnel should try lying in the same position without moving for two to four hours. It is uncomfortable, and at the end of two hours, you are ready to move. After three hours, it becomes painful. Most people move every six to 11 minutes while they sleep. They do not always change position, but the movement keeps them comfortable and relieves pressure on problem areas. Although elderly persons do not move as often as younger persons do during sleep, they are not immobile, and their joints may become sore from lack of movement.

Turning residents every two hours is a rule of thumb only, and surveyors frown on such impersonal approaches unless specific evidence validates the need for the two-hour time frame. Some
residents must be turned more frequently; others can tolerate longer periods of time without turning, especially when using some support surfaces. Doing a tissue tolerance test provides you with the specific frequency needed to plan individualized care.

**Tolerance to pressure**

Because the intensity and duration of pressure have such a profound impact on pressure injury risk, we must have a means of determining each resident’s skin tolerance, which is one factor that affects whether time and pressure are sufficient to cause breakdown. Tissue tolerance is the ability of the skin and underlying structures to withstand the effects of pressure without developing complications.

Complications become visible, showing as red areas 30 minutes after pressure is relieved. Initial redness, called reactive hyperemia, is a transient increase in blood flow that occurs following a brief episode of tissue ischemia. After such an episode, there is a shortage of oxygen and accumulation of metabolic waste. The red color appears when pressure is relieved and blood rushes into the area. Some residents complain of a brief burning sensation during that process.

If the tissue is not damaged, it will blanch when pressure is applied to the red area. When pressure is released, it becomes red again. If tissue is damaged, it will not blanch, indicating that the skin is not receiving enough oxygen and nutrients. Some experts believe that reactive hyperemia results from Raynaud’s phenomenon, in which vasospasms of blood vessels cause ischemia and tissue necrosis. A subsequent increase in blood flow (when pressure is relieved) removes accumulated waste products and cellular debris, at which point undamaged skin should blanch normally. The results of one study suggested that using nonblanchable erythema as a guide to beginning preventive measures leads to a marked decrease in persons requiring preventive care without resulting in an increase in pressure injuries (Vanderwee, et al., 2007).

Everyone’s tolerance to pressure is different because there are so many individual variables that affect it, as described previously. With repeated pressure on the same area of the body, tissue recovery becomes limited, increasing the risk of cumulative tissue damage, which can lead to a pressure injury. You may have heard of a “tissue tolerance test” for pressure injuries to help measure this variable, but there is no standardized, evidence-based test—the resident’s reaction to pressure is determined by many individual factors. The tissue tolerance test identifies the point at which nonblanchable erythema appears, and this information helps set the frequency for turning and positioning, but measures that only affect tissue tolerance are supportive measures. Although they can reduce the risk, it is believed that tissue tolerance as an independent factor will not prevent pressure injuries in high-risk residents. Therefore,
nurses must use their clinical judgment and the nursing assessment of the resident’s skin condition to help identify risk factors and prevention strategies.

Nevertheless, all comprehensive skin assessments should include an evaluation of tissue tolerance. Inspect the skin carefully before beginning. Consider testing high-risk residents in both bed and chair (two separate tests, assessing tissue integrity in both locations). Also, consider individuals who are bedfast and/or chairfast to be at risk for pressure injuries.

Check tissue tolerance for residents:

- On admission
- With existing skin breakdown
- With a past history of pressure injuries
- Who are dependent and unable to reposition themselves in chair and/or bed, including those who need extensive assistance and those who are totally dependent
- Who have the physical ability to move but will not move and reposition themselves regularly without cues and reminders
- Who are completely bedfast
- Who develop new or recurrent skin breakdown
- Who have experienced a change in condition

Example tissue tolerance procedure

Supplies:

This procedure does not require supplies.

Procedure:

1. Identify resident.
2. Verify orders.
3. Explain procedure to resident.
4. Perform hand hygiene according to facility policy/protocol.
5. Don personal protective equipment as appropriate for procedure.

6. Inspect the resident’s skin for red or open areas. Note your findings.

7. Position the resident in chair or bed (note position on side or back) for one hour.

8. After an hour has elapsed, reposition the resident off the area. Note and document red areas.

9. If a red area is present, ensure that it remains pressure free. Return and recheck the area in 30–45 minutes.

10. If the redness persists after 30–45 minutes, stop the test. The area is a Stage I pressure injury. The nurse will inform the physician and obtain a treatment order. The resident requires repositioning at an interval shorter than one hour.

   **If there is no persistent redness, continue the test:**

11. Position the resident in chair or bed (same location as used above) for an interval of an hour and a half.

12. After an hour and a half has elapsed, reposition the resident to relieve pressure from the area. Note and document red areas.

13. If a red area is present, ensure that it remains pressure free. Return and recheck the area in 30–45 minutes.

14. If the redness persists after 30–45 minutes, stop the test. The area is a Stage I pressure injury. The nurse will inform the physician and obtain a treatment order. The resident requires repositioning at an interval of no more than one hour.

   **If there is no persistent redness, continue the test:**

15. Position the resident in chair or bed (same location as used above) for a two-hour interval.

16. After two hours has elapsed, reposition the resident off the area exposed to pressure. Note and document red areas.

17. If a red area is present, ensure that it remains pressure free. Return and recheck the area in 30–45 minutes.
18. If the redness persists after 30–45 minutes, stop the test. The area is a Stage I pressure injury. The nurse will inform the physician and obtain a treatment order. The resident requires repositioning at an interval of no more than 1½ hours.

19. If there is no persistent redness, the resident requires repositioning at an interval of every 2 hours.

20. Document the results of the test.

After completing the test:

21. Develop an individualized turning and repositioning schedule.

22. List individual approaches and the specific turn times on the care plan. List specific positions to avoid, if any.

23. Continue monitoring of tissue tolerance and skin integrity.

24. Perform hand hygiene according to facility policy/protocol.


26. Take appropriate actions for abnormal findings or observations.

High-tech tools

Some facilities have purchased ultrasound scanning devices that can detect skin integrity issues that are not evident during a visual skin assessment (Osman & Kernodle, 2007; Lyder, 2007; Georgia Tech Research News, 2006). Using ultrasound enables the facility to initiate aggressive measures early, preventing further tissue destruction. The skin remains intact, reducing the risk for a host of problems, including resident pain and facility time and expense.

Pressure Injuries on the Feet

Pressure injuries on the feet can have devastating consequences for older adults, including pain, loss of mobility, gangrene, and lower-extremity amputation. The heel is very vulnerable to high pressure when it rests on a surface. Aging changes reduce the heel’s capacity to absorb and reduce shock, increasing the risk for skin breakdown if the resident is ambulatory (Smith, 1984). Tightly tucked bed
linen may further increase pressure on the heels, increase contracture risk, and reduce mobility. Loosening the bed linen is a simple and effective method of preventing downward pressure on the feet.

Note that many support surfaces (such as overlays and mattresses) reduce pressure to the torso, but few reduce pressure to the heels and feet. Heel protectors effectively prevent friction and shearing, but most do not eliminate pressure. Appliances, casts, splints and orthotics, and other devices attached to the feet may further increase pressure. Proper fitting and padding will decrease but not eliminate the risk. If a pressure-relieving device is applied to the feet, monitor it regularly. Residents may accidentally or deliberately remove or dislodge the device.

Still, many excellent pressure-reducing devices are available. Fortunately, the heels are the easiest bony prominence from which to relieve pressure. Pressure-relieving devices should transfer pressure off the heels and onto the calves. Elevating the resident’s calves on pillows will suspend the heels over the surface of the bed, relieving pressure.

In fact, several studies suggest that using a pillow in this manner is more effective than many specialty products (De Keyser, et al., 1994; Tymec, et al., 1997; Williams, 1993). The most effective pressure-relieving boots are those in which the heels “float” inside the boot (Figure 2.3).

If the resident refuses other interventions, consider a small commercial beanbag (microbead) pillow. Fluff the pillow periodically, and change the pressure to various areas of the foot. Make sure that the pillow has a cover that can be removed for washing—putting an entire pillow in the washer and dryer may lead to disastrous results.

**Medical conditions that increase the risk of foot and heel ulceration**

The Braden Scale is an excellent tool for predicting pressure injuries on the heel. Residents with a Braden score of 15 or less are at high risk. Persons with certain chronic diseases and those who have experienced recent trauma or surgery are also at high risk due to their underlying medical
problems. Use common sense. Regardless of the Braden score, be aware that residents with the conditions listed below are at high risk for skin breakdown (and other complications) on the feet. Develop a preventive plan of care on admission, and use the nursing process to maintain the plan for residents who are bedfast, who need physical assistance for bed mobility and transfers, and those with the following:

- Recent hip fracture or hip surgery, such as joint replacement (pain and immobility may also be contributing factors)
- Any orthopedic conditions
- Multiple sclerosis, post-polio syndrome, Huntington’s disease, Lou Gehrig’s disease, or any other progressive neurological disorder
- A recent cerebrovascular accident (CVA)
- Recent major surgery
- Poor or very limited mobility
- Poor-quality popliteal, ankle, or foot pulses
- Absence of foot/ankle pulses (the posterior tibial and dorsalis pedis should be palpable manually)
- Doppler/ultrasound test results on the chart indicating narrowed blood vessels and reduced blood flow to the feet
- Diabetes mellitus
- Spasticity
- Neuropathy (loss of sensation in feet)
- Peripheral vascular disease
- Peripheral arterial disease
- Arterial occlusive disease
- Paralysis, including hemiplegia, diplegia, paraplegia, and tetraplegia (quadriplegia)
- Unconsciousness
- Contractures or other deformities of the feet or lower legs
Elements of a Prevention Program

The first step in pressure injury prevention is a complete nursing assessment at the time of admission. Evaluate pressure injury risk using a validated measure, such as the Braden Scale. Use common sense and identify other factors, such as those listed above, that increase the risk of lower-extremity ulcers. Immediately develop and implement a preventive plan of care—do not wait for MDS completion.

As mentioned earlier, consider all bedfast and/or chairfast residents to be at risk of pressure injury development, and implement a plan of care. Skin breakdown can occur rapidly, especially with low-risk residents who get sick. These are usually ambulatory and reasonably independent residents who require little care but suddenly become ill and remain in bed for several days. Because the residents are usually at low risk, there is no preventive plan in place, but an alert staff will recognize the potential danger and initiate a plan promptly. Prevention eliminates unnecessary pain, unnecessary costs, and the risk of litigation.

Identifying each resident’s individual risk in this way is the first element of a prevention program. Other components include the following:

- Skin assessment and inspection
- Tissue tolerance testing
- Nutritional assessment (including hydration)
- Preventive skin care
• Proper positioning
• Use of support surfaces
• Accurate documentation
• Education

**Care plan approaches for pressure injury prevention**

Your primary focus is the management of pressure, friction, shear, moisture, and other identifiable risk factors. Select only the approaches that are appropriate to the resident’s needs from the list that follows. Do not overwhelm the staff by listing unnecessary care. The care plan for the at-risk resident should accomplish the following:

• Observe the resident’s skin daily (nursing assistant) for evidence of pressure injuries, with careful attention to the bony prominences. Complete a full skin assessment weekly (licensed nurse), or more often if necessary, and document the results of this assessment.

• Systematically inspect the skin, with particular attention to bony prominences. Document your findings. If skin is clear and intact, documentation of the daily/weekly skin inspections may be done by initialing a flow sheet.

• Monitor for pain and medicate as appropriate (pain promotes immobility).

• Keep the resident moving. Consider a restorative program to improve the resident’s mobility status.

• Turn/reposition the resident at least every two hours and more often as necessary.

• Encourage residents who can move to reposition themselves frequently. Repositioning contributes to the resident’s comfort, dignity, and functional ability.

• Keep heels elevated off the bed or, for bedfast residents, hanging over the end of the mattress. Remember that heel protectors do not relieve pressure. Use seamless foam heel protectors to prevent shearing or boots in which the heel is suspended and pressure-free. Avoid doughnut-type devices.

• Consider placing a sheepskin on the lower part of the bed for residents who move the legs actively and/or frequently.

• Apply a transparent film dressing to the heels of residents at high risk due to friction.
• Apply socks if the resident can be trusted not to get up in stocking feet.

• Make sure that antiembolism (TED) hose is applied correctly and not twisted. Use a tape measure to ensure correct fit. Monitor the circulation at a specified frequency. (List on the care plan.) Remove hose at regular intervals.

• Avoid positioning directly on the trochanter. Use the semi-supine and semi-prone positions whenever possible. These positions are comfortable and relieve pressure on all major bony prominences.

• Avoid positioning the resident on open areas or nonblanchable erythema.

• Maintain the head of the bed at the lowest degree of elevation possible (consistent with the resident’s medical condition, physician orders, need for tube feeding, and other restrictions). Avoid elevation over 30° as much as possible. Elevating the head of the bed increases pressure on the sacrum, coccyx, and buttocks. If the head of the bed must be elevated for any reason, encourage or assist the resident to reposition frequently. Avoid prolonged periods of elevation.

• The turn schedule/frequency of repositioning must also be individualized to the resident based on individual variables (tissue tolerance, level of activity and mobility, meal schedule, general medical condition, overall treatment objectives, skin assessment, and skin condition) and support surface being used. Consider the resident’s preferences and comfort. Consider the location, duration, and magnitude of pressure on the resident’s body.

• One study demonstrates the importance of considering the support surface. In this study, persons who were using viscoelastic mattresses (e.g., memory foam) were turned every four hours. This group had fewer pressure injuries than persons on regular hospital mattresses who were turned every two or three hours (Defloor, et al., 2005).

• Consider the pressure-redistributing qualities of the mattress and the results of the tissue tolerance test when planning the turning schedule.

• Prevent friction and shearing when moving the resident.

• Friction is when the skin rubs across another surface, usually bed linen. It commonly occurs when the resident is being dragged rather than lifted up in bed.

• Friction causes abrasions and can cause redness and a burning sensation. It also weakens the skin and reduces the amount of pressure needed for pressure injury formation.
• Pressure injuries commonly develop over bony prominences and areas where body parts rub and cause friction.

• Follow the care plan. If it states that the resident needs two persons to move or transfer, caution nursing assistants not to try to do it alone.

• Use moving and transfer aids to reduce friction and shear.

• Avoid pulling a brief or incontinent pad from beneath the resident. Teach nursing assistants to remove it by turning the resident from side to side.

• Shearing is stretching in which the skin moves in one direction while the underlying bone, muscles, and tissue remain stationary (in a fixed position) or move in the opposite direction. It increases the risk for undermining and tunneling and enlarges necrotic skin.

• The potential for shearing is high during position changes, when residents slide down in the bed or chair, and when a staff member is moving a resident up in bed.

• Avoid boosting or pulling on a resident who has slipped down in the bed or chair. Use a device such as the TLC pad (Figure 2.4) or a sling to move the resident, lift and reposition the resident, or stand the resident and reseat him or her.

• Position the resident in good body alignment.

• Shearing may also cause skin tears, which are painful, serve as a portal of entry for infection, and often result in further breakdown and pressure injuries.

  – Avoid turning the resident onto a body surface that is still reddened from a previous episode of positioning. (Redness suggests that the skin has not recovered and requires further respite.)

• Position residents correctly to prevent pressure from tubes and devices. Monitor the skin for pressure damage.

• Keep the bed crumb- and wrinkle-free.

• Use preventive devices, such as special mattresses or pads, pillows, or props, to relieve pressure. Avoid doughnut-type devices and exam gloves filled with water (which are sometimes used under heels).
• The most common pressure-relieving devices are made of foam. Previously, sheepskin was thought to relieve pressure. Studies have shown that sheepskin prevents friction and shearing but does not relieve pressure.

• Use props and positioning devices to keep bony prominences from direct contact with one another. If a resident is positioned in bed with knees, ankles, and other bony areas touching each other, place a bath blanket, pillow, or other positioning device between his or her legs.

• Avoid massaging or rubbing skin that is red (acutely inflamed) where there is the possibility of damaged blood vessels or fragile skin. (Massage can be painful, and rubbing the skin can also cause tissue destruction or provoke an inflammatory reaction, particularly in elderly persons.)

• Keep the resident clean and dry through regular bathing and incontinent care.

• Perineal cleansers and pH-balanced products are kinder to the skin than soap and water.

• Avoid very hot water.

• Initiate an incontinence management or retraining program as appropriate.

• Consider absorbent briefs or pads. Use a good product that wicks moisture away from skin.

• Use an external catheter if necessary.

• Use an indwelling catheter only as a last resort.

• Provide adequate nutrition.

• Monitor lab values for nutritional deficit:
  – Hemoglobin < 12 mg/dl  
  – Serum albumin < 3.5 mg/dl  
  – Total lymphocyte count < 1800 mm3  
  – Total protein < 6.0 mg/dl

• Assess the need for vitamin/mineral supplements, such as multivitamin with minerals, vitamin C, and zinc, or those recommended by the dietitian.

• Monitor the resident’s intake and weight on an ongoing basis.

• Provide sufficient fluids.

• Notify the dietitian of the resident’s at-risk status on his or her next regular visit. The dietitian may request lab tests to evaluate nutritional factors, dehydration, fluid balance, and other factors affecting pressure injury risk.
• Apply the principles of standard precautions in the care and treatment of all pressure injuries and open skin wounds.

• Prop the resident’s calves up on pillows so that the heels are elevated from the surface of the bed, or position the resident so that the heels hang over the end of the mattress with the soles of the feet against a footboard. Note: A heel suspension boot is a better option than heel protectors.

• When evaluating the heels, gently palpate the tissue. A mushy or boggy feeling suggests that breakdown will soon follow.

• Use emollients to hydrate dry skin to reduce risk of skin damage. (Dry skin appears to be a significant and independent risk factor for pressure injury development.)

• Apply moisturizers after bathing to trap water in the upper layers of the skin, reducing dryness and itching.

• When choosing a moisturizer, look for products containing petrolatum, mineral oil, lanolin, ceramides, dimethicone, or glycerin.

• Avoid products containing alcohol, which is drying and irritating.

• Minimize environmental factors leading to damage due to moisture or drying.

• Apply a drying barrier cream (such as Triad™ Hydrophilic Paste) to protect the skin from maceration and exposure to excessive moisture, which cause skin damage. (The mechanical properties of the skin are altered in the presence of moisture and as a function of temperature.) Please note that this type of barrier should be applied in a thin layer. Avoid scrubbing it to remove it. Use mineral oil, baby oil, or olive oil.

• Avoid powder or cornstarch, which can be irritating.

• Many excellent barrier and protective products are available to maintain skin integrity. Individualize the plan of care to the resident’s needs. Products to consider are zinc oxide preparations, petrolatum and silicone-based ointments and creams, liquid-forming products, adhesive dressings, fluid managers, skin cleansers, and moisturizers.

• Ask the resident to identify areas of pain or discomfort suggesting skin damage. Studies have identified pain as a major factor for individuals with pressure injuries. Some studies suggest that pain over the site is a precursor to skin breakdown.
• Institute an aggressive contracture prevention program. Involve other professionals (physical therapy, occupational therapy, and restorative nursing), as appropriate. Be aware that there is a close relationship between contractures and pressure injuries. Contractures cause capillary occlusion in bony prominences. It is estimated that 60% of all wounds involve some sort of unattended contracture, which can begin within four days of immobility and inactivity. After 15 days, the resident begins to lose range of motion (Anderson, 1998).

• Healing a pressure injury is much more difficult when circulation is compromised by a contracture.

• Carefully and accurately document bed and chair repositioning and pressure-relieving activities. Specify the frequency and position used, and consider documenting an evaluation of the outcome of the repositioning for high-risk residents.

• Refer to the preventive care plan approaches for ulcers of the feet and lower legs in Chapter 7.

**Bed positioning:**

• Follow the “rule of 30”:
  – The head of the bed is elevated to 30° or less.
  – Position the torso in a 30° laterally inclined position when positioned on the sides.
  – Position the hips and shoulders tilted 30° from supine.
  – The semi-prone and semi-supine positions provide the 30° tilt. Use pillows or wedges to maintain position, and avoid pressure over the trochanter or sacrum.

• Use the prone position if the resident can tolerate it and his or her medical condition allows.

• Avoid positions that increase pressure, such as the 90° side-lying position or the semi-Fowler’s position.

• When the resident is in a side-lying position, hold the shoulder forward. Avoid pressure on the shoulder joint.

• Head elevation increases pressure, friction, and shearing. Be sure that the resident is in good alignment and not slouching in bed.

• If sitting in bed, avoid the semi-Fowler’s and high Fowler’s position, if possible.

• If sitting is necessary, move the resident as often as possible, and do not exceed two hours in this position.
Chair positioning:

- Align the resident’s body so as to maintain his or her full range of activities.
- Select a position that is comfortable and acceptable to the resident and reduces the pressure and shear exerted on the skin.
- Position the resident in the 90-90-90 position (Chapter 5). This means the following:
  - Feet and ankles are at a 90° angle to the lower legs.
  - Lower legs are at a 90° angle to the thighs.
  - Hips are at a 90° angle to the torso.
  - Position the feet on the floor, footstool, or footrest. Never leave the legs dangling. (Good positioning begins with the feet.)
  - When the feet are not supported, the body slides forward.
  - Adjust the footrest height so that the pelvis is slightly flexed forward by positioning the thighs slightly lower than horizontal.
  - If the knees are higher than the hips, the resident needs more space. Try adding a cushion to the chair to elevate the torso or lengthen the leg rests on the wheelchair.
- Limit the time a resident spends seated in a chair without pressure relief.
- If the resident uses a wheelchair, apply a cushion and leveling pad to reduce the hammocking effect of the seat. Residents should never spend the day sitting in a wheelchair. Transfer them to a regular chair as soon as they arrive at their destination.
- Be sure that the chair and wheelchair are wide enough to comfortably accommodate the person’s hips.
- Teach the resident pressure-relieving activities.
- Cue, prompt, or assist with repositioning as needed. The TLC pad works well for repositioning a chairfast, dependent resident (Figure 2.4).

Using an assistive device such as a TLC pad reduces the risk of friction and shearing for the resident and makes the task safer for staff. Courtesy of Skil-Care Corporation, Yonkers, NY, 800/431-2972.
Myths and facts about foot care

There are many myths and facts surrounding preventive foot care. Nurses should review current literature and bring their practices in line with it. Professional literature is replete with examples that show that certain practices thought to aid in the prevention of heel wounds may actually contribute to their development. For example, many nurses fill a latex glove with water and prop the heel on it to reduce pressure. Studies have shown that this creates a higher pressure than if the heel were resting on the bed. Interface pressure between the heel and the water-filled glove in 40 residents averaged 144.6 mmHg, whereas interface pressures between the heel and the bed averaged 126.5 mm Hg (Williams, 1993). Suspending the heels off the surface of the bed is a much more effective strategy.

Select a heel protector to meet the resident’s needs, but do not depend on this measure alone for preventive care. Remember that there is no panacea for prevention of foot and heel pressure injuries. The solution lies with initial and ongoing nursing and risk assessment, an individualized plan of care, and diligent positioning of the resident.

What to Do With This Information

Avoid looking at risk factors in isolation. Use them as part of the bigger picture consisting of all the information you have gathered. Knowledge of risk factors will help you determine whether a pressure injury will develop, but they provide only a partial picture. Because risk factors do not affect the degree and duration of pressure and/or shearing force, nurses must give some thought as to how each preventive measure used (or planned) will affect the overall risk. Implement those measures that you believe will reduce the total risk. Consider downloading the NPUAP Pressure Injury Prevention Points list. You can easily incorporate the list into your care plan by circling the numbers that are appropriate to the residents. This handout was created in 2016 and includes up-to-date, comprehensive prevention techniques. Refer to http://www.npuap.org/wp-content/uploads/2016/04/Pressure-Injury-Prevention-Points-2016.pdf.

The most effective preventive measures affect the cause of pressure injuries. They help reduce the incidence of skin breakdown only if they eliminate or reduce causative factors in one of three ways:

1. Reducing or relieving duration and intensity of pressure.
2. Eliminating shearing force through proper lifting and moving. In areas where the skin is very thin, most of the external pressure is passed on to the underlying tissue. Pressure also increases markedly over bony prominences.

3. Modifying the effects of pressure and shearing on individual tissue tolerance.

Remember that as an independent factor, tissue tolerance cannot cause pressure injuries. Pressure and/or shearing force are also needed. Tissue tolerance is but one variable factor (Defloor, 1999). The presence of shearing, degree of pressure, and length of time needed for breakdown to occur depends on the resident’s individual tissue tolerance. If shearing occurs, lower pressure may cause breakdown to occur. Think globally, and plan care with the big picture in mind.

**Resources**


- Prevention Plus: Home of the Braden Scale for Predicting Pressure Sore Risk© (and evidence-based programs of pressure ulcer prevention): [www.bradenscale.com](http://www.bradenscale.com)

- Several risk assessments and other resources are available at: [http://www.npuap.org/resources/educational-and-clinical-resources/](http://www.npuap.org/resources/educational-and-clinical-resources/)


REFERENCES


Pressure Injury Assessment

All pressure injury care begins with accurate wound assessment and healthcare provider notification. The assessment is the basis for measuring progress and selecting the initial treatment product, so accuracy is critical. Consistency in assessment is important as well.

First, determine whether the area is related to pressure or another cause. To do this, you must look at the whole person:

- Complete nursing assessment, including history and physical examination.
- Determine presence or absence of complicating conditions.
- Complete these assessments:
  - Nutritional assessment (dietitian consult)
  - Hydration assessment (nursing assessment immediately pending dietitian evaluation)
  - Pain assessment
  - Psychosocial assessment
- Consider input and output monitoring and calorie count to gather data if nutrition/hydration problems are suspected.
- Consider whether other factors affect skin condition, including the following:
  - Nutrition, hydration
  - Underlying diseases, conditions, age-related changes
– Special problems that may interfere with healing, including behavior and noncompliance
– Past history of injuries
• Conduct labs.
• Review medications.
• Identify problems that may interfere with healing.
• Identify potential or actual complications.
• Review written risk assessment tools, such as the Braden Scale.
• Position the resident in a consistent (neutral) position each time you assess and measure
  the pressure injuries.
• Check for damage associated with tubes and medical devices.
• Use a uniform, consistent method for measuring wound length and width.
• Use a disposable measuring device or a cotton-tipped applicator.
• Determine longest length head to toe and greatest width of each area.
• Measure the deepest part of the pressure injury. If using a sterile applicator, mark the
distance on the applicator, then compare it with a centimeter ruler.
• Use only metric measurements (for length x width x depth). Avoid mixing types of
measurements, such as “3 cm x 1/2 inch.”

**Metric conversions**

<table>
<thead>
<tr>
<th>1 inch = 2.54 cm</th>
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</thead>
<tbody>
<tr>
<td>1 cm = 0.3937 inches</td>
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</tbody>
</table>

Assess the resident for the following:
• Vital signs
• Anatomical location of wound
• Age of wound

Assess the injury initially and weekly, and document the following:
• Location.
• Overall appearance.

• Shape (round, oval, irregular, etc.).

• Stage.

• Size.

• Length—measurement in head-to-toe direction (axis).

• Width—measurement in hip-to-hip direction (axis).

• If the wound is large or irregularly shaped, document that the measurements were taken at the longest and widest parts of the wound.

• Depth—measurement of deepest visible portion of wound bed.

• To measure depth, moisten a sterile applicator with normal saline. Place the cotton tip of the applicator in the deepest part of the wound bed. Measure the distance to the skin level. If the depth is uneven, measure several areas and document the deepest part.

• Condition of the wound base (e.g., beefy red, fibrotic, necrotic).

• Draw a picture of the wound, and mark its features and measurements in your notes.
  
  – Some nurses use a clear plastic bag for this purpose. Place the bag over the wound and trace the shape on the surface with a permanent marker. Carefully remove the bag and cut the top (clean) layer free. Tape the upper surface to your notes.

  – Avoid contaminating environmental surfaces with the bottom (contaminated) portion of the bag. Avoid contaminating the upper surface of the bag and marker with your gloves. Asking a second nurse to trace the wound is the best way to avoid contamination.

• Presence of sinus tracts (tunneling) or undermining.
  
  – Undermining involves only the edges of the wound. The upper edges appear to be detached from the lower margins, usually as a result of destruction of subcutaneous tissue, infection (less common), or shearing. An older name for this phenomenon is rimming.

  – Tunnels are passages of varying lengths under the skin. They usually cannot be seen from the skin surface. The only opening is on the inside of the wound. The passageway extends within and beyond the wound walls or base.

  – Measure tunnels with a sterile cotton applicator, if possible.
– Sinus tracts are small tunnels. They have a very tiny opening that may be too narrow to measure. Avoid forcing the applicator into the sinus tracts, as doing so causes pain and may result in further injury.

– Use the clock system to document location (e.g., “tunnel at 3:00”).

– Deep tissue structures visible or palpable.

– Condition of the wound base (e.g., beefy red, fibrotic, necrotic).

– Overall appearance of wound and wound bed.

• Exudate and unusual drainage. Note the type of drainage:
  – Sanguineous—thin, bright red
  – Serosanguineous—thin, watery, pale red to pink
  – Serous—thin, watery, clear
  – Purulent—(pus-like) thick or thin, commonly yellow, but may be opaque tan to yellow
  – Foul purulent—thick opaque yellow to green with offensive odor

• Odor.
  – Odor may or may not suggest infection
  – An odor can be detected at most dressing changes; certain dressings are associated with odors
  – Odor can be caused by poor containment of drainage and saturated dressings
  – Fecal-smelling odors are often associated with Gram-negative bacteria
  – Fruity odors are usually associated with Staphylococcus and Pseudomonas
  – Strong, foul odors are often associated with anaerobic organisms
  – If you identify an odor when a dressing is removed, cleanse the wound, and then reassess the odor
  – If an odor is present, look for signs or symptoms of localized or systemic infection (see Chapter 12 for more information)

• Amount of drainage:
  – None—the wound tissue is dry
  – Scant—no measurable drainage, but the wound tissue is moist
- Small—the wound tissue is very moist, with drainage on <25% of the dressing
- Moderate—the wound tissue is wet, with drainage involving 25%–75% of the dressing
- Large—the wound tissue is filled with fluid and involves >75% of the dressing
- Copious—the wound tissue and dressing are saturated; the dressing does not contain the drainage and may be leaking

- Presence or absence of necrotic tissue (describe). Refer to Table 3.1 for a more complete description and characteristics of necrotic tissue:
  - Necrotic tissue is dead tissue. Wounds will not heal until the necrosis has been removed. Wounds cannot be staged if covered with necrotic tissue.
  - Eschar is commonly dark (black, brown, deep red) in color but may be tan. It typically is thick, leathery, and hard; note whether it is loose or adherent. Note whether the area surrounding the eschar is reddened, dry, moist, macerated, inflamed, etc. If the wound is various colors, describe the wound’s appearance by using percentages (e.g., “40% red, 60% black”).

<table>
<thead>
<tr>
<th>Table 3.1</th>
<th>Types of necrosis</th>
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<tbody>
<tr>
<td><strong>Eschar</strong></td>
<td><strong>Slough</strong></td>
</tr>
<tr>
<td>Black or brown, occasionally red or purple</td>
<td>Soft, soggy</td>
</tr>
<tr>
<td>Firm, hard</td>
<td>Soft, stringy Occasionally tough and leathery</td>
</tr>
<tr>
<td>Leathery</td>
<td>Yellow/tan or brown in color</td>
</tr>
<tr>
<td>Soft, soggy</td>
<td>Mucinous</td>
</tr>
<tr>
<td>Thick or thin</td>
<td>Loosely attached clumps; tough, leathery Slough may be firmly attached</td>
</tr>
<tr>
<td>Attached base</td>
<td>Base firmly attached</td>
</tr>
<tr>
<td>Adherent, very firmly attached</td>
<td>Adherent, very firmly attached</td>
</tr>
</tbody>
</table>
• Slough is usually lighter in color, usually yellow:
  – Slough that is yellow and stringy suggests that subcutaneous fat has died.
  – Slough that is thick and yellow suggests muscular degeneration.
  – Nonadherent slough separates easily from the wound and is mucous-like, thin, and watery.
  – Loosely adherent slough is stringy and thick and may appear as clumps of debris attached to the wound.
  – Slough can be thick, tough, and very difficult to remove (Figure 3.1).
  – Slough is a proteinaceous, fibrinous tissue that may contain pus. It is believed to be an indication of bacterial activity in a wound that was previously clean. This is significant because it promotes colonization and inhibits healing.

• Presence or absence of fluctuance (Figure 3.2):
  – Fluctuance is the movement of fluid you feel under the skin when palpating a wound. It suggests the presence of pus in an infection. It typically occurs under eschar (especially on the heels).
  – Fluctuance is a mushy/boggy feeling that is usually surrounded by induration. It suggests that breakdown will follow.
  – Fluctuant lesions usually need to be drained because the pus interferes with penetration of the surrounding tissue by antibiotics.

![Figure 3.1 Slough](image1.png)
Although this slough appears shiny and soft, it is actually very tough, fibrous, and resistant to sharp debridement.

![Figure 3.2 Fluctuance (sole of foot)](image2.png)
The fluid is palpable under the skin.
- Obtain a culture and sensitivity when the wound drains.

- Presence or absence of granulation tissue:
  - Granulation tissue is usually beefy red, granular, and bubbly in appearance
  - Differentiate granulation tissue from a smooth red wound bed

- Describe color of tissue (pale pink to dusky red):
  - Red tissue may be difficult to identify; accurately describing the wound’s appearance is helpful if you are unsure about the identity of red tissue

- Presence of hypergranulation tissue:
  - The tissue in the wound bed rises above the surrounding skin and appears red or purplish and moist, and it may bleed when rubbed.
  - It may have sticky, yellow drainage.
  - Hypergranulation tissue is seen in wounds that are being treated. It is believed to be an inflammatory response to occlusive dressings. It is not harmful, but it delays healing.

- Presence or absence of epithelialization:
  - The epithelium is a membranous tissue made up of one or more layers of cells that contains very little intercellular substance.
  - Epithelialization is a necessary process in which the epithelium grows over a wound. It is a sign that the wound is healing.
  - Epithelialization can be deep pink, and then progress to pearly pink/light purple from the edges in a full-thickness wound. It may form islands in the base of a superficial wound.
  - Describe granulation tissue and epithelialization using a percentage or clock system.

- Note signs of infection, such as the following:
  - Erythema, inflammation, cellulitis
  - Edema/fluctuance (see above)
  - Induration
  - Warmth
  - Suspicious drainage
  - Crepitus
• Tissue damage such as skin tears (see Chapter 11) or abrasions from previous dressings.

• Tension, hardness/softness, feeling of area on palpation.

• Temperature of area and surrounding tissue on palpation (hot, cool, normal skin temperature).

• Appearance of wound margins:
  – Firmness
  – Intactness or non-intactness
  – Presence or absence of edema
  – Color
  – Undermining, margins attached or not attached

• Note whether wound margins:
  – Are well defined or diffuse.
  – Appear as if the edges are rolling under.
  – Appear to have new skin growth.
  – Hyperkeratotic wound margins (hyperkeratosis) usually appear gray, scarred, callus-like, and dry; scaling may be present.
  – Macerated edges are soft and mushy from remaining wet or from exposure to excessive drainage. They may appear wrinkled, like dishpan hands.

• Assess (and document) the periwound skin. This is the area immediately surrounding the wound margins. Describe the following:
  – Overall appearance, color, discoloration, whether area is erythematous
  – Condition (intact, breaking down/extending, inflamed, soft, firm, etc.)
  – Temperature
  – Other abnormalities, such as rashes, inflammation, pain, or irregular borders

• Structures below the skin surface that can be identified by visualization or palpation, such as subcutaneous fat, tendon, muscle, and/or bone.

• Exposed muscle appears smooth, with a pink to red surface.

• Presence of pain and complete pain assessment.
• Note no pain, pain present on palpation, pain present all the time, or pain present only when caring for the injury.

Report all of the following to the healthcare provider:

• Issues of concern, including the following:
  – New onset or increase of nonviable tissue
  – Current treatment and a review of past treatment, as appropriate
  – Area is deteriorating
  – Has not made progress in two to three weeks with current treatment
  – Sudden onset, odor, or increase in drainage (assess odor after dressing removed and wound cleansed)
  – Sudden onset of pain
  – Erythema, induration, warmth, or crepitus of edges; other signs of infection
  – Friable granulation tissue
  – Fever
  – Change in mental status
  – Increase in wound size that is not secondary to debridement
  – Be prepared to report a comparison of previous and current measurements

**Staging Pressure Injuries**

Pressure injuries are staged to reflect the extent of tissue damage in a wound. The stage is identified by completing an assessment of the injury, and then determining the classification or stage based on the wound characteristics, anatomic depth of soft tissue damage, and underlying structures that are visible or palpable. See the website of the National Pressure Ulcer Advisory Panel (NPUAP), a panel of experts in pressure injury prevention, management, and care, for updated information and current clinical practice guidelines: www.npuap.org.

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**NPUAP 2016 changes**

Please note that the 2016 NPUAP changes affected only terminology. Although the descriptions are more precise, stages have not changed. A Stage I ulcer is now a Stage 1 pressure injury. A Stage II ulcer is now a Stage 2 pressure injury, etc. Recommended treatments have not changed.
NPUAP Stages and Definitions

In 2007, the NPUAP published revised definitions of the pressure injury stages that had been used for many years. It also added two previously undefined categories for unstageable injuries and deep tissue injury. In 2016, the NPUAP changed the terminology and clarified the stages, and although the language has changed, the stages have not. The staging information in this book has been taken from NPUAP’s website and reflects the 2016 changes, including:

**Pressure Injury:** A pressure injury is localized damage to the skin and/or underlying soft tissue, usually over a bony prominence or related to a medical or other device. It can present as intact skin or an open ulcer and may be painful. The area develops in response to intense and/or prolonged pressure or pressure in combination with shear. The tolerance of soft tissue for pressure and shear may also be affected by microclimate, nutrition, perfusion, co-morbidities and condition of the soft tissue.

**Deep Tissue Pressure Injury:** Persistent non-blanchable deep red, maroon or purple discoloration of intact or non-intact skin with localized area of persistent non-blanchable deep red, maroon, purple discoloration (Figure 3.3) or epidermal separation revealing a dark wound bed or blood filled blister. Pain and temperature change often precede skin color changes. Discoloration may appear differently in darkly pigmented skin. This injury results from intense and/or prolonged pressure and shear forces at the bone-muscle interface. The wound may evolve rapidly to reveal the actual extent of tissue injury, or may resolve without tissue loss. If necrotic tissue, subcutaneous tissue, granulation tissue, fascia, muscle or other underlying structures are visible, this indicates a full thickness pressure injury (Unstageable, Stage 3 or Stage 4). Do not use DTPI to describe vascular, traumatic, neuropathic, or dermatologic conditions.
Stage 1 Pressure Injury: Non-blanchable erythema of intact skin with a localized area of non-blanchable erythema, which may appear differently in darkly pigmented skin. Presence of blanchable erythema or changes in sensation, temperature, or firmness may precede visual changes (Figure 3.4). Color changes do not include purple or maroon discoloration; these may indicate deep tissue pressure injury.

Stage 2 Pressure Injury: Partial-thickness loss of skin with exposed dermis (Figure 3.5). The wound bed is viable, pink or red, moist, and may also present as an intact or ruptured serum-filled blister. Adipose (fat) is not visible and deeper tissues are not visible. Granulation tissue, slough and eschar are not present. These injuries commonly result from adverse microclimate and shear in the skin over the pelvis and shear in the heel. This stage should not be used to describe moisture associated skin damage, including incontinence associated dermatitis (IAD), intertriginous dermatitis (ITD, also MAST), medical adhesive related skin injury (Marsi), or traumatic wounds (skin tears, burns, abrasions).

Stage 3 Pressure Injury: Full-thickness loss of skin, in which adipose (fat) is visible in the ulcer (Figure 3.6A) and granulation tissue and epibole (rolled wound edges, refer to Figure 3.6B) are often present. Slough and/or eschar may be visible. The depth of tissue damage varies by anatomical
location; areas of significant adiposity can develop deep wounds. Undermining and tunneling may occur. Fascia, muscle, tendon, ligament, cartilage and/or bone are not exposed. If slough or eschar obscures the extent of tissue loss this is an Unstageable Pressure Injury.

Stage 4 Pressure Injury: Full-thickness skin and tissue loss with exposed or directly palpable fascia, muscle, tendon, ligament, cartilage, or bone in the ulcer (Figure 3.7). Slough and/or eschar may be visible. Epibole (rolled edges), undermining, and/or tunneling often occur. Depth varies by anatomical location. If slough or eschar obscures the extent of tissue loss this is an Unstageable Pressure Injury.

Unstageable Pressure Injury: Obscured full-thickness skin and tissue loss in which the extent of tissue damage within the ulcer cannot be confirmed because it is obscured by slough (Figure 3.8A) or eschar (Figure 3.8B). If slough or eschar is removed, a Stage 3 or Stage 4 pressure injury will be revealed. Stable eschar (i.e. dry, adherent, intact without erythema or fluctuance) on an ischemic limb or the heel(s) should not be removed (Figure 3.8C).

Additional related conditions

Medical device–related skin injury (MDRSI): This describes an etiology. Medical device–related pressure injuries result from the use of devices designed and applied for diagnostic or therapeutic purposes. The resultant pressure
injury generally conforms to the pattern or shape of the device (Figure 3.9). The injury should be staged using the staging system.

Medical adhesive-related skin injury (MARSI): This also describes an etiology. The cause of this injury speaks for itself: Skin is removed along with the tape. Adhesive and island dressings may also remove skin. This injury can be quite severe (Figure 3.10). Prevent MARSI by doing the following:

- Very careful, slow removal of all dressings and tape. If the resident reacts during dressing removal, stop to be sure that the skin is intact.
- Use of a barrier product

Accurate staging is not possible because the wound is covered with eschar.

This eschar should not be removed.

This resident sat on his catheter all day, obstructing the lumen so it could not drain. Urine leaked around the catheter, and this is the result. He has an open area due to the Foley, and severe Moisture Associated Skin Damage from sitting wet all day. The tissue is swollen and the skin is denuded because of prolonged exposure to concentrated urine.

The wound at the bottom is the original wound. The large, serious area at the top resulted from pulling paper tape off.
• Use a tape with a silicone backing. Note that one of the tapes pictured is a paper tape. Many nurses believe that paper tape is indicated for sensitive skin, but in fact, paper tape is sometimes difficult to remove. Proceed with caution.

• Rolls of Opsite™ and Tegaderm™ transparent film enable you to cover awkward areas of the body and cover dressings and tubes. The film is waterproof, reduces the risk of contamination, and helps keep the area dry. The acrylic adhesive reduces the risk of skin damage on removal, especially after long periods of wear, which makes it a good alternative to paper tape.

• Holding dressings in place with Kerlix, stretch net or stockinette, or clothing.

**Injuries that are not staged**

Mucosal membrane pressure injury:
Mucosal membrane pressure injury is found on mucous membranes with a history of a medical device in use at the location of the injury. These injuries cannot be staged due to the tissue’s anatomy.

Moisture-associated skin damage (MASD):
Wounds need water to heal. On the other hand, too much water is as damaging to the skin as too little water. Very moist wounds cause maceration of the surrounding skin, causing the wound to enlarge. MASD is inflammation and erosion caused by prolonged exposure to various sources of moisture, such as urine, stool, perspiration, wound exudate, mucus, or saliva. It is likely that chemical content and pH of the source of moisture, potential exposure to pathogens, and mechanical factors such as friction and shear may also contribute to the problem. The most common types of MASD are as follows:

• Incontinence-associated dermatitis—Inflammation and erythema caused by prolonged exposure to urine and stool (Figure 3.11). Skin may be eroded or denuded.

• Intertriginous dermatitis—Inflammation and erythema in and adjacent to the skin folds, caused by chronic perspiration. Skin may be eroded or denuded. This condition can be
painful or burn, and it may have a unique odor (Figure 3.12). The area may be painful for several days before the redness appears on the skin.

- Periwound moisture-associated dermatitis—Inflammation and erythema within 4 cm of the wound margins (Figure 3.13A). Skin may be eroded or denuded due to infection, exposure to wound exudate, and traumatic removal of dressings or adhesive materials.

- Peristomal moisture-associated dermatitis—Inflammation of the skin surrounding stoma. May be accompanied by denudation related to exposure to urine or stool that has been trapped under the pouch (Figure 3.13B).

**The Kennedy Terminal Ulcer**

Karen Kennedy-Evans, RN, CS, FNP, the person who first published information about this phenomenon (Kennedy, 1989), wrote the following definition. The definition has been updated to be congruent with NPUAP, but it is otherwise unchanged from Kennedy’s original definition.
A Kennedy terminal ulcer (KTU) (Figure 3.14), whose significance was first identified at a nursing home in Indiana, is a pressure injury that some people develop as they are dying. Many experienced long-term care nurses have seen this phenomenon but are unaware that it has a name and is associated with dying residents. Further research is needed to determine how and why this injury occurs. Unlike changes in other failing organs, skin changes are visible, and a KTU appears rapidly. Its usual location is the sacrum or coccyx, but it can appear in other areas, and it is often shaped like a pear, horseshoe, or butterfly. It is seen primarily in geriatrics and in those receiving hospice care.

The heralding sign of the KTU is little black dots on the skin, which have been described as looking like the following:

- BBs
- Specks of dirt
- Particles of matter
- Dots drawn with a permanent marker
- Blood blisters
- Abrasions

Nurses have tried to wash the spots off only to find that they are under the skin and cannot be removed. The skin is usually intact, with irregular borders.

The lesion progresses rapidly in size and depth. Within a few hours, the dots increase to about the size of quarters. At this point, the lesion(s) may look like a blister or Stage 2 wound but rapidly progresses to Stage 3 or Stage 4. The blister is very fragile, and the wound continues to increase in size. The periwound tissue may be soft or loose beneath the skin surface. The injury starts to change color as it worsens and becomes deeper. Initially, the areas are red and progress to yellow and then black. Drainage is minimal.
The 3:30 syndrome

The following is an example of the discovery of a Kennedy terminal ulcer:

A nursing assistant provides AM care and finds that the resident’s skin is clear. The person naps at about 3:30 p.m. During the nap, the assistant observes the black spots for the first time and informs the nurse, who has a hard time believing that an area of this magnitude was not noted sooner. She questions the nursing assistant, who swears that the spots were not visible earlier in the day. The time frame from onset to death may be as brief as eight to 24 hours, but these wounds can develop from six weeks to two to three days before death. Although the injury is considered a terminal phenomenon, some residents have recovered when aggressive life-sustaining measures were implemented.

The KTU is classified as unavoidable. For additional information, refer to the following:

- www.kennedyterminalulcer.com
- www.o-wm.com/content/understanding-kennedy-terminal-ulcer
- http://nursing.advanceweb.com/Features/Articles/Pressure-Ulcers-Skin-Failure.aspx
- https://www.advancedtissue.com/caring-for-kennedy-terminal-ulcers/

**KTU documentation**

Staging and documentation are essentially the same as for any other pressure area. However, facilities may want to keep a photographic history of this lesion because of its unique appearance and rapid increase in size. Documentation that supports factors associated with the dying process may affect how surveyors interpret this documentation. See the 35-minute video on MDS section M at www.youtube.com/watch?v=Ix6qoV0If0Y&feature=youtu.be.

**Palliative Care/Hospice Care**

Many facilities have residents receiving palliative care, hospice care, or both. Although most provide pressure injury treatment, they avoid aggressive measures designed to heal the wounds. They rationalize that aggressive care increases discomfort and that the wounds were likely unavoidable and/or will not heal because of poor nutrition and other factors associated with terminal illness.
Definitions of palliative care

According to the World Health Organization (WHO), “Palliative care is an approach that improves the quality of life of patients and their families facing the problem associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial and spiritual” (WHO, n.d.).

This simple explanation is provided by GetPalliativeCare.org: “Palliative care is provided by a specially-trained team of doctors, nurses and other specialists who work together with a patient’s other doctors to provide an extra layer of support. It is appropriate at any age and at any stage in a serious illness, and it can be provided along with curative treatment” (“Frequently Asked Questions,” 2017).

There is no time limit on palliative care. It can be provided at any stage of illness, even if death is not anticipated. Palliative care is designed to provide relief from physical and emotional pain and to enrich the quality of life for both living and dying residents and their families, without hastening death or prolonging life.

This information is important to know. If a resident is receiving palliative care, avoid assuming that the wounds were unavoidable or that they will not heal. Obtain an accurate history, and assess the resident frequently. Involve the resident and family members of his or her choice in care planning. Clarify exactly what the goals are for this resident, and be sure that all staff are on the same page.

Definition of hospice care

Hospice care is designed to provide supportive care to people in the last stage of a terminal illness. The emphasis is on providing comfort and quality of life, instead of on a cure, and pain management is an important part of it. Most hospice programs focus on comfort rather than aggressive disease abatement. Persons in hospice decline aggressive life-prolonging treatment, which enables them to get the most out of the time they have left, without the unpleasant side effects associated with life-sustaining treatments.

There are many more hospice programs than palliative care programs. A person must be considered to be within six months of death to receive Medicare hospice benefits. There is no penalty if he or she outlives this time frame.
Semantics

Many health professionals use the terms “palliative care” and “hospice care” interchangeably. As you can see, however, the philosophies of care are similar but not identical. Some mistakenly believe that the terms are synonyms because they do not understand the differences in the philosophies of care. Unfortunately, others know that there is a difference but believe that substituting the term “palliative care” for “hospice care” is more aesthetically acceptable. If they use the term “hospice,” they believe, then they must deal with the family’s reaction when they realize that their loved one is dying, and the eventual prognosis is not as obvious when the term “palliative care” is used. Using words in this way, however, means that someone else will have to deal with the fallout when the resident or family find out.

Resident care

There are so many variables in residents’ conditions that it is impossible to list standardized guidelines. The best advice is to do the best you can. Body systems begin to shut down approximately two weeks prior to death. One study revealed that the majority of pressure injuries occur during this time as the integumentary system is slowly shutting down (Weissman, 2005). Careful and frequent assessment is essential.

To help avoid such injuries, implement as many preventive measures as possible. Turn and position the resident as often as he or she allows. Provide a therapeutic mattress if possible. Position the resident at least every four hours if he or she is using a therapeutic mattress and at least every two hours if he or she is using a regular bed.

Pain management is essential. Pressure injuries are painful, and pain medication is generally ineffective if the person is lying on the wound. Therefore, relieve pain through a combination of medication and positioning. Evaluate your treatment to ensure that it is not creating pain. Premedicate and/or apply topical anesthetics according to protocol and as permitted.

Take measures to prevent wounds from worsening and new wounds from developing. Provide good nutrition and hydration if possible. Apply the principles of standard precautions, and use good infection control practices. Infected wounds are generally more painful, and a frail resident does not need additional comorbidities.

The treatment plan should promote quality of life and a sense of well-being. If it does not, change it. Ensure that the resident and family caregivers agree with the plan of care. No standards are available to guide the care of hospice and palliative care residents, so use common sense in keeping with the resident’s goals. Be mindful of pain and the need for the highest quality of life possible.
Gangrene

Gangrene ([www.webmd.com/skin-problems-and-treatments/guide/gangrene-causes-symptoms-treatments](http://www.webmd.com/skin-problems-and-treatments/guide/gangrene-causes-symptoms-treatments)) is the death of body tissue as a result of loss of blood ([www.webmd.com/heart/anatomy-picture-of-blood](http://www.webmd.com/heart/anatomy-picture-of-blood)) supply due to illness, injury, or infection. Unfortunately, the incidence of gangrene is higher in elderly persons than it is in younger adults due to changes to the circulatory system as a result of aging and difficulty performing ADLs. It is seen most commonly in the feet and lower extremities of long-term care facility residents. However, it can develop anywhere in the body, may be internal or external, and may progress to sepsis and death. Gangrene is a medical emergency that requires immediate attention. See Table 3.2 for an overview of the most common types of gangrene seen in long-term care facility residents.

<table>
<thead>
<tr>
<th>Figure 3.15: Impending Gangrene</th>
<th>An early sign of tissue death caused by an insufficient blood supply.</th>
<th>Skin is intact, color turns to dusky gray or black. May appear bruised and slightly edematous.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Impending Gangrene" /></td>
<td>This resident has impending gangrene of the right foot and the circulation on the left foot looks suspicious.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Figure 3.16: Wet/Moist Gangrene</th>
<th>Infection related to inadequate treatment of an infected wound. Swelling from the infection inhibits blood flow. Bacteria multiply because white blood cells cannot get to the infected part. There is a high risk of sepsis, and the prognosis is poor.</th>
<th>The person develops a fever. The affected area swells and decays and becomes very painful. Foul-smelling drainage develops. The area becomes black.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Wet/Moist Gangrene" /></td>
<td>Diabetic with severe infection and loss of toes and wet gangrene in the center.</td>
<td></td>
</tr>
</tbody>
</table>

Courtesy of Dr. Gnu, [Wikipedia Commons](https://commons.wikimedia.org/). Courtesy of [Centers of Disease Control and Prevention](https://www.cdc.gov/).

© Barbara Acello
### Table 3.2: Overview of common types of gangrene seen in long-term facility residents (cont.)

<table>
<thead>
<tr>
<th>Type of gangrene</th>
<th>Brief description</th>
<th>Overview of signs and symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Figure 3.17: Gas Gangrene</strong>&lt;br&gt;A child with gas gangrene due to arterial occlusion and systemic infection.</td>
<td>A type of wet gangrene caused by Clostridium, an anaerobic pathogen that produces gas in the tissue and causes a crackling sound when pressed.</td>
<td>The person develops a fever. The affected area swells and decays and becomes very painful. Foul-smelling drainage develops. The area becomes black.</td>
</tr>
<tr>
<td><strong>Figure 3.18: Dry Gangrene</strong>&lt;br&gt;Gangrene of the first through fourth toes in a diabetic.</td>
<td>Reduced blood flow due to increased cholesterol, diabetes, smoking, and genetic factors. Dry gangrene results from chronic ischemia without infection. Treatment is promising if ischemia is identified before the wound becomes gangrenous. Once gangrene is established, nothing can be done to save the extremity.</td>
<td>Develops gradually and progresses slowly. Tissue dries, becomes cold and black, and sloughs off (Figure 3.18).</td>
</tr>
<tr>
<td><strong>Figure 3.19A: Necrotizing Fasciitis, early</strong>&lt;br&gt;A resident with early necrotizing fasciitis and edema, discoloration, and pain out of proportion to the injury.</td>
<td>Noted here because a number of facilities have had outbreaks of this condition involving both residents and staff. Recent cases have been caused by Streptococcus Group A (GAS). High-risk conditions are chronic illness, cancer, diabetes, kidney disease, surgery, minor injuries, pressure injuries, steroids, and impaired immune system. Develops and spreads rapidly, is severe, and may result in death or amputation of all four extremities. Called Fournier’s gangrene if it is localized in the perineum.</td>
<td>Early condition (Figure 3.19A). Pain out of proportion to injury, flu-like symptoms, dehydration and intense thirst, edema, area hot to touch, respiratory failure, heart failure, and renal failure. By day four, gangrene is spreading rapidly (Figure 3.19B), profound hypotension, toxic shock syndrome, death.</td>
</tr>
<tr>
<td><strong>Figure 3.19B: Necrotizing Fasciitis, late</strong>&lt;br&gt;Necrotizing fasciitis with extensive erythema and necrosis. The resident was diagnosed with multiorgan dysfunction syndrome because this condition was diagnosed late.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Table 3.2
Overview of common types of gangrene seen in long-term facility residents (cont.)

<table>
<thead>
<tr>
<th>Type of gangrene</th>
<th>Brief description</th>
<th>Overview of signs and symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Figure 3.20A: Warfarin necrosis, early</strong></td>
<td>The precise etiology is unclear, but protein C deficiency appears to be the most likely cause. Absent or infrequent INR monitoring is a contributor. Usually develops early in the course of warfarin therapy (days 2–7). A high initial dose increases the risk of developing this condition.</td>
<td>Develops necrotic spots in non-pressure areas, such as breasts, abdomen (Figure 3.20A), penis, or upper thighs. Fascia and muscles are rarely involved, and the necrosis is confined to superficial tissues. Bullae may be present (Figure 3.20B). Color is very deep black, more so than in most pressure injuries. The person is at risk for venous limb gangrene. This problem often goes unrecognized, increasing risk of complications including death.</td>
</tr>
</tbody>
</table>

This person has early warfarin necrosis.

Courtesy of Herbert L. Fred, MD and Hendrik A. van Dijk, Wikipedia Commons.

| **Figure 3.20B: Warfarin necrosis, late** | Warfarin necrosis is difficult to diagnose, which may explain why this resident has progressed to such a late stage. |  |

Courtesy of Herbert L. Fred, MD and Hendrik A. van Dijk, Wikipedia Commons.
### Table 3.2  
Overview of common types of gangrene seen in long-term facility residents (cont.)

<table>
<thead>
<tr>
<th>Type of gangrene</th>
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</tr>
</thead>
</table>
| **Figure 3.21A - Figure 3.21D: Fournier’s gangrene**  
**Figure 3.21A: Pus draining from the scrotum** | Aerobic and anaerobic organisms both cause Fournier’s gangrene. Although this information has not been confirmed, it is presumed to be a biofilm. | Serious bacterial infection/poor hygiene of the perineal, rectal, or genital area. Also refer to necrotizing fasciitis.  
Necrosis that spreads rapidly, purulent drainage, fever and worsening infection, sepsis, and renal failure. |
| **Figure 3.21B: Swelling of the scrotal wall** | Fournier’s gangrene progresses rapidly. | |
| **Figure 3.21C: Blackening of part of the scrotal wall** | Late stage Fournier’s gangrene has become a surgical emergency. | |
| **Figure 3.21D: Complete sloughed out of the scrotal wall** | The progress is poor in late stage Fournier’s gangrene. | |
Warfarin necrosis

Many long-term care facility residents take warfarin for atrial fibrillation or due to a past history of clotting problems. In facilities with medication aides, nurses may not be aware of which residents are taking warfarin. Nursing monitoring is essential because of the high risk of complications. Regular monitoring of the PT and INR is essential.

Bleeding is the major complication of warfarin. Many nurses are not aware that skin necrosis is a complication of therapy. In this condition, skin lesions develop between the second and seventh day of therapy, although they may appear later.

Avoid mistaking these lesions for pressure injuries. They develop on the extremities, breasts, trunk, and penis (in males), commonly in fatty, non-pressure areas of the body. These shallow areas develop quickly (over a period of hours) from an initial central erythematous lesion. Skin necrosis is usually associated with an underlying protein C deficiency.

The suspicious lesions must be identified and reported to the healthcare provider promptly. No single treatment for the lesions exists, but the healthcare provider will order laboratory tests and adjust the medication. Failure to identify the condition quickly may result in the need for skin grafting and other surgical interventions, including plastic surgery, mastectomy, and amputation. Undiagnosed, the condition may lead to death.

Fournier’s gangrene

Fournier’s gangrene is necrotizing fasciitis caused by a bacterial infection of the perineal, rectal, or genital area. Although accurate descriptions of this scrotal condition are found in the writing of Hippocrates, the condition confounds physicians to this day. It is seen in both males and females but is most common in males. It is typically seen in long-term care facility residents with poor hygiene.

Although biofilms have not been identified as a cause, a combination of aerobic and anaerobic pathogens that promote infection rapidly are involved. Figures 3.21A, B, C, and D are examples of worsening infection that can occur within 48 to 72 hours. It is likely that this condition is biofilm related, making it very difficult to treat. Sepsis and renal failure are common complications associated with death. In addition to antibiotics, repeated debridement and surgeries are also necessary. The most commonly implicated microbes are as follows:

- *Escherichia coli* (E. coli)
- *Pseudomonas pyocyaneus*
• *Staphylococcus spp.*
• *Streptococcus spp.*
• *Bacteroides spp.*
• *Proteus spp.*
• *Clostridium welchii*
• *Klebsiella pneumoniae*

Chronic alcoholism and diabetes are the most common predisposing factors. Residents with leukemia, morbid obesity, HIV, or suppressed immune systems are at increased risk. Bedridden residents with paraplegia appear to be at higher risk, which may be associated with a high incidence of pressure injuries in the sacral area.

**Necrotizing Fasciitis**

Necrotizing fasciitis is also called “flesh-eating disease” or “man-eating disease.” Group A streptococcus (GAS, Group A Strep, Strep A) is the most common cause of this serious infection. Other causative organisms include *Klebsiella, Clostridium, Escherichia coli, Staphylococcus aureus, Aeromonas hydrophila,* and others.

The condition begins as an invasive skin infection. The bacteria attack soft tissues, usually in response to pressure injuries, skin tears, open areas, or very minor trauma. Occasionally, it occurs after surgery, usually abdominal surgery. Treatment may be delayed because it is often mistaken for the flu. Pain out of proportion to the injury is an important early sign that the pathogen has invaded soft tissue. After this, the condition spreads rapidly and almost always becomes life-threatening. Amputation is often necessary, and about 40% of those who contract the infection do not survive. The symptoms are varied but often include the following:

Early symptoms (usually within 24 hours):

• History of minor trauma with a skin injury, although there have been reported instances with no visible break in skin integrity
• Pain in the general area of the injury but not necessarily at the site of the injury
• Pain disproportionate to the injury; it may initially feel like a pulled muscle but progressively worsens
• Flulike symptoms, including vomiting, diarrhea, dehydration, general malaise, weakness, confusion, muscle pain, and fever
• Thirst; may become intense as resident begins to dehydrate
• Resident may complain of feeling worse than he or she has ever felt without knowing why
• Edema and redness; the affected area feels hot and very painful
• Condition worsens without any improvement of the above conditions
• Reduced urinary output
• Sunburn-type rash

Advanced symptoms (usually within three to four days):
• Edema and pain at the site of injury gradually increases in size; may develop a purplish rash (refer to Figure 3.19A).
• Large, dark blisters filled with blackish fluid (refer to Figure 3.19B). Large, dark boil-like blisters may develop.
• Wound may have a necrotic appearance with a bluish, white, or dark, mottled, flaky image.
• Progressively develops signs and symptoms of shock.

Critical symptoms (usually within four to five days):
• Profound hypotension
• Unconsciousness
• Toxic shock syndrome

In addition to the tissue decay, the bacteria cause septic shock (also called toxic shock), which results in respiratory failure, heart failure, hypotension, and renal failure. Every system in the body is rapidly affected. About 60,000 incidences are diagnosed annually in the United States, although the incidence may be much higher because statistics are elusive and not always reported.

Streptococcus A bacteria are spread through direct contact with mucus, mucous membranes, and non-intact skin. (This type of contact is prevented when standard precautions are used.) The single, most important preventive measure is keeping the skin intact! Some people are carriers. A carrier may not be symptomatic, but most have a recent history of having strep throat.
The bacteria may also be spread by coughing and sneezing or by coughing into the hand and touching an object that someone else later touches. The bacteria can survive on a dry surface for 3 days to 6.5 months (Kramer, et al., 2006). It has been found to survive in ice cream (18 days), raw and pasteurized milk at 15–37 °C (96 hours), and room temperature butter (48 hours) (International Commission on Microbiological Specifications for Foods, 1996). GAS has been found to last several days in cold salads at room temperature (Katzenell, et al., 2001).

At any time, 15% of people in the community are infected with Strep A, but the immune system keeps the infection in check. Individuals with chronic illnesses such as cancer, diabetes, or kidney problems; residents with open wounds; and those who are immunocompromised are particularly susceptible to necrotizing fasciitis. The injury that initiates a rapid, serious deterioration may be as tiny as a nick from a nail clipper, a splinter, or a paper cut.

**Prevention**

The incidence of *Streptococcus* A outbreaks has been increasing in long-term care facilities. This condition is prevented by conscientious use of standard precautions. However, staff must be aware and alert to potential signs and symptoms of the infection, which are dissimilar to infections caused by other breaks in skin integrity. In this situation, maintaining a high suspicion index and providing early intervention are the best defenses against endemic conditions and poor outcomes.

**Reverse Staging (Backstaging)**

Nurses were formerly taught to stage healing wounds in reverse order. Logically, one would think that wounds heal in reverse, or from Stage 4 to 3 to 2 to 1. However, a healed pressure injury contains scar tissue and is only about 75%–80% as strong as the original tissue. Because of this, the NPUAP and other experts do not support backstaging (reverse staging). Healing pressure injuries also do not replace the dermis, subcutaneous fat, or lost muscle during healing. In fact, 13%–56% of all pressure injuries recur at a location that previously experienced a pressure injury. (This is a resident/family/nursing assistant teaching point.)

As an ulcer heals, it fills with granulation (scar) tissue, and reverse staging does not accurately reflect those physiological tissue changes. Aside from that, measurements can be misleading because wounds may become larger as they heal, especially if they have been debrided. A Stage 4 pressure injury is always a Stage 4. If it improves, it is a “healing Stage 4.” To support your findings, document wound assessment characteristics, such as length, width, depth, presence or
absence of necrotic tissue, exudate, and presence of granulation tissue. Avoid subjective and uninformative statements that have no basis in fact, such as “healing slowly” or “healing well.” Pay attention to how you document pressure injuries, as accurate documentation is essential to preventing pressure injury formation and worsening pressure injuries. Pressure injuries are a leading cause of lawsuits and survey deficiencies. Plaintiff attorneys can be very dramatic and persuasive and garner jury sympathy. Seven-figure awards for punitive damages are common.

### Pressure Injuries and the MDS

The MDS 3.0 focuses on the impact of pressure injuries on quality of life and the need for risk factor identification and preventive care.

The care-planning process should include efforts to stabilize, reduce, or remove underlying risk factors; to monitor the impact of the interventions; and to modify the interventions as appropriate based on the individualized needs of the resident. The nursing goal is always to stabilize and heal existing wounds and prevent new areas from developing. The MDS 3.0 accurately stages wounds and does not require backstaging. The instructions state the following:

(Note: The terminology has been updated here. CMS has approved the NPUAP changes. It will take a while for the paperwork to catch up.)

For each pressure injury, determine the deepest anatomical stage. Do not reverse or back stage. Consider current and historical levels of tissue involvement.

Observe the base of any pressure injuries present to determine the depth of tissue layers involved.

Ulcer staging should be based on the ulcer's deepest visible anatomical level. Review the history of each pressure injury in the medical record. If the pressure injury has ever been classified at a deeper stage than what is observed now, it should continue to be classified at the deeper stage. Nursing homes that carefully document and track injuries will be able to more accurately code this item.

The MDS 3.0 places a great deal of emphasis on using the care plan in pressure injury prevention. The instructions recognize that pressure injuries and other breaks in skin integrity affect quality of life, may limit activity, may be painful, and may require time-consuming treatments and dressing changes. Other changes to the MDS include the following:
• The nurse is asked whether his or her determination of the resident’s pressure injury risk is based on a clinical assessment and/or medical record review

• The facility must identify in-house wounds versus those acquired elsewhere

• The facility must specify whether the resident had wounds that have healed since admission

• The facility is required to code Unstageable pressure injuries

• The MDS defines and ascertains the presence of deep tissue injury

• The facility must code the presence of venous, arterial, diabetic ulcers, and other lesions and disruptions in skin integrity (see Chapter 7)

The long and short of it is that the facility is required to provide a great deal of information that was not requested previously, but doing so is more helpful than it is harmful.

**The Pressure Ulcer Scale for Healing (PUSH) tool**

In 1997, the NPUAP developed and introduced the Pressure Ulcer Scale for Healing as a quick, reliable tool to monitor changes in pressure injury status over time. The PUSH tool is a research-validated tool that quickly and reliably captures the key assessments necessary to monitor whether a pressure injury is improving or worsening over time.

The NPUAP recommends using the PUSH tool at regular intervals. In long-term care, this generally means at least weekly and if the condition of the resident or the wound deteriorates. The pressure injury healing chart (which is attached to the PUSH tool) will enable you to graph the resident’s scores over time for each ulcer. Doing so readily reveals whether the injury is healing, unchanged, or deteriorating.

**Copyright restrictions**

Although the PUSH tool is copyrighted by the NPUAP, you are free to use it in clinical practice. Prior to implementation, facilities should thoroughly educate their nurses in its use. For complete information, instructions, and a copy of the PUSH form, see [www.npuap.org/tools.htm](http://www.npuap.org/tools.htm).

**Research trends**

The NPUAP is continuously researching and identifying evidence-based practice. In late 2009, its task force released a position paper on mucosal pressure injuries, which is available at [www.npuap.org/Mucosal_Pressure_Ulcer_Position_Statement_final.pdf](http://www.npuap.org/Mucosal_Pressure_Ulcer_Position_Statement_final.pdf).
Other assessment tools

Other accurate wound assessment tools that eliminate the need for backstaging include the following:

- The Pressure Sore Status Tool (PSST), also called the Bates-Jensen Wound Assessment Tool (BWAT). This is another simple, accurate pressure injury assessment tool in widespread use. The PSST is a paper assessment. Another tool, the Wound and Skin Intelligence System (WSIS), is a computerized assessment that incorporates the PSST and other wound management features. These tools contain 13 important elements of assessment that are not identified by simply staging an injury. They also help identify a continuum of healing so that backstaging is not necessary. The PSST may be downloaded from http://tinyurl.com/y8ntv4n.

- The Wound Healing Scale (WHS) lists eight elements for assessing wound healing.

- The Sussman Wound Healing Tool (SWHT) was developed as a tool for tracking the impact of physical therapy treatments on pressure injury healing. This tool consists of 10 categories listing the presence or absence of various tissue attributes and 11 wound measurement characteristics.

- Best Practices for Prevention of Medical Device-Related Pressure Injuries in Long Term Care poster (and others) have been updated and will help staff identify pressure injuries caused by medical devices. Please refer to http://tinyurl.com/y7lwzpvp

REFERENCES


Immobility quickly causes serious complications in elderly persons. Bedrest is often the norm in an acute care facility, where it is essential for treating medical problems. However, even in acute care hospitals, early activity and ambulation are provided whenever possible.

In long-term care facilities, bedrest must be medically prescribed, used only when necessary, and used only for a limited period of time. Bedrest can create repeated pressure on the same area, which hinders tissue recovery and increases the risk of cumulative tissue damage. For that reason (among others), mobilize residents as early as possible. Remember this when considering whether to leave residents in bed for prolonged periods for conditions such as pressure injuries and when creating a plan for residents who are difficult to move (such as those who are large). Before remanding the resident to bed, determine whether there are other viable options.

Because the systems of the human body are interdependent, one weak system will eventually affect the entire organism. Therefore, avoid isolating the care of one system from the total care of the resident. Consider all other alternatives, and endeavor to keep the resident active. Develop a plan of care that provides mobility alternatives.

If a resident is still and largely immobile, consider conducting a pain assessment. Unrelieved pain has many significant physical and psychological consequences: It interferes with the resident’s function and self-care, and it contributes to immobility, increasing the risk of pneumonia, skin breakdown, contractures, behavior problems, depression, and many other complications. The complications of acute and chronic pain are very similar to those seen in residents who are immobile. In one facility that implemented a comprehensive pain management program, one of the program’s unintended benefits was a 69% decrease in pressure injuries in the rehabilitation unit (Zinn, 2003).
Bedfast residents
Consider all bedfast and/or chairfast residents to be at risk for developing a pressure injury. Despite your best intentions, you may have a few residents in the facility who are temporarily or permanently bedfast. Conduct a tissue tolerance test for these residents (Chapter 2) to personalize their turning schedules.

Bed Positions
Nursing assistants, residents, and family members (where possible and appropriate) should be educated about the role of repositioning in pressure injury prevention. All nursing assistants should be proficient in the correct methods of repositioning and use of equipment to reduce the risk of pressure injury development.

Residents who are dependent are positioned in one of six basic positions: supine, semi-supine, prone, semi-prone, lateral, and several variations of the Fowler’s position. However, many of these positions apply pressure to bony prominences (Figure 4.1A). Additionally, most facilities do not use the prone position because it has the potential to cause respiratory problems in some elderly persons.

30º concerns
Fowler’s positions apply a great deal of pressure to the hips, sacrum, coccyx, and lower buttocks. Use them for the shortest possible amount of time. Any head elevation increases pressure on the buttocks, sacrum, and hips (Figure 4.1B), so keep head elevation as low as possible, or no higher than 30º.

Additionally, avoid positions that increase pressure, such as the 90º side-lying (lateral)
position. Although this is an accepted position, it is not good for skin because it applies pressure to a number of bony prominences (Figure 4.1C). Follow the “rule of 30” by teaching staff to use the semi-supine (Figure 4.1D) and semi-prone positions, which are sometimes called “tilt” positions because the resident is tilted between a lateral position and the supine or prone position. In any event, they are different from the lateral position, and the primary benefit is that they relieve pressure from all the major pressure points on the side of the resident’s body.

<table>
<thead>
<tr>
<th>Figure 4.1C</th>
<th>Bony prominences affected by pressure when in lateral position</th>
</tr>
</thead>
<tbody>
<tr>
<td>The lateral position applies pressure to many areas of the body.</td>
<td>Courtesy of Critical Information Network, LLC, CiNet Healthcare Learning, Carrollton, Texas.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rule of 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The head of the bed is elevated to 30° or less</td>
</tr>
<tr>
<td>• The body is placed in a 30° laterally inclined position</td>
</tr>
<tr>
<td>• When repositioned on either side:</td>
</tr>
<tr>
<td>– Position the hips and shoulders at an angle (tilted) 30° from supine</td>
</tr>
<tr>
<td>– Use pillows or wedges to maintain position without pressure over the trochanter or sacrum</td>
</tr>
<tr>
<td>• Reposition alternately on the right side, back, or left side, or use the prone position if the resident is able to tolerate it and the medical condition allows</td>
</tr>
</tbody>
</table>

Head elevation also increases pressure, friction, and shearing. Be sure that the resident is in good alignment and not slouching in bed. Try to limit the time of elevation to two hours or less. If the resident cannot lay flat due to tube feeding or cardiac or respiratory conditions, keep the head of the bed as low as possible. Avoid prolonged periods of elevation.

© Barbara Acello
Guidelines for bed positioning

Apply a support surface (see Chapter 6) to the bed based on the resident’s needs. One study demonstrates why consideration of the support surface is important: In this study, persons who were using viscoelastic (e.g., memory foam) mattresses were turned every four hours. This group had fewer pressure injuries than persons on regular hospital mattresses who were turned every two or three hours (Defloor, et al., 2005).

A resident on a non-pressure-redistributing mattress should be repositioned more frequently than those on a therapeutic or viscoelastic foam mattress. The turning schedule should be determined based on the pressure-redistributing qualities of the mattress and the results of the tissue tolerance test.

Follow the “rule of 30.”

Avoid pressure over the trochanter or sacrum.

Use the prone position if the resident can tolerate it and his or her medical condition allows.

Keep the bed crumb- and wrinkle-free.

Use preventive devices, such as pillows or props, to maintain position and relieve pressure. The most common pressure-relieving devices are made of foam. Previously, sheepskin was thought to relieve pressure, but studies have shown that, although sheepskin prevents friction and shearing, it does not relieve pressure.

Prevent bony prominences from contacting one another. Place padding between the legs to keep knees and ankles apart.

Prop the resident’s calves on pillows or use a commercial elevation device (Figure 4.2) so the heels are elevated from the surface of the bed. Hanging the heels over the end of the mattress is an option, although doing so may position the resident too low in the bed. If you elect to use this position, be careful in pulling the resident up. Dragging the heels on the bed creates a great deal of friction.

Figure 4.2

This commercial foot elevator relieves all pressure from the heels.

Courtesy of Skil-Care Corporation, Yonkers, NY, 800/431-2972.
Several studies suggest that elevating the legs is more effective than heel protectors, water-filled gloves, and other common positioning aids (De Keyser, et al., 1997; Williams, 1993).

**Resident Refusals: Positioning and Repositioning**

Residents who have the capacity to make healthcare decisions and who withhold consent may not be treated against their wishes. The facility may transfer or discharge the resident for refusing treatment only if it is unable to meet the resident’s needs due to the refusal, but this excuse is shaky at best. The better option is to fully and completely explain the consequences of the refusal in a manner that the resident understands, offer alternatives, and see whether you can reach a compromise.

Many facilities stop trying to provide care that a resident has a history of refusing. This is a major issue where positioning is concerned because the outcome of the refusal can be catastrophic for both the resident and the facility. Giving up on a resident is never a wise decision. Refusal of turning and care that affects the resident’s well-being does not give a facility license to withhold necessary care. Although a resident may refuse treatment today, that resident has the right to change his or her mind tomorrow or at any time. Avoid closing the door to a potential change of heart.

For example, a resident refuses to reposition off her back. The nurse informs her that not repositioning can lead to a pressure injury. The resident, who probably has no idea what pressure injuries are, how they develop, how much they hurt, and the complications they cause, continues to refuse. The nurse documents the refusal and passes the information on in the shift report. The next shift tries to reposition the resident and gets the same response. No one else addresses the issue. As is often true in such cases, staff members document the refusals but do not document their responses to it. The chart includes an incomplete response, such as “teaching done.” In some areas, it contains empty statements, such as “reminded/encouraged to turn,” and some staff members affix labels such as “uncooperative.” Eventually, the staff assume that nothing can be done for the resident and stop trying.

Predictably, the resident develops serious, deep, infected Stage 4 pressure injuries on her hips and torso. The family files a complaint with the survey agency and threatens to sue, and surveyors cite the facility for allowing avoidable pressure injuries to develop. Even though the resident refused to be moved, her refusal of care does not absolve the facility of the responsibility for providing care that enables her to attain or maintain the highest practicable physical, mental, and psychosocial well-being in the context of making the refusal.
**Addressing refusals**

To the extent possible, use the nursing process to address the resident’s refusal. Try to identify and understand the probable basis for the resident’s refusal, such as the following:

- Catastrophic thinking (turning a minor event into a major disaster)
- Unrealistic fears
- Misunderstanding
- Clinical depression
- Attention-seeking behavior
- Cognitive impairment

Use all data available in the medical record and elsewhere to ensure that the plan of care is all-inclusive and accurately reflects the resident’s needs. When reviewing options for managing refusals, involve the entire interdisciplinary team, including nursing assistants, activities staff, and others who are close to and have firsthand knowledge of the resident. These workers often have good insights into why the resident is refusing care and how to devise a more effective approach to the problem. View the resident holistically, and anticipate other problems that may result from the refusal or a subsequent decline. If it becomes evident that the plan is not working, reassess the resident and revise the plan. The frequency at which this review is done will vary depending on the resident’s needs, but in this situation, a quarterly review is not adequate to prevent negative outcomes. The facility should do the following:

- Assess the reasons for the resident’s refusal.
- Address the resident’s concerns (to the extent possible).
- Educate the resident; describe teaching, as well as the resident’s response and understanding, in the medical record. List specific instructions you have given to the resident and others.
- Clarify the potential risks and outcomes.
- Try to compromise and find a way to satisfy the legal requirements while honoring the resident’s preferences and accommodating needs.
- Seek and offer alternatives to turning, such as providing a turn holder and other adaptive devices to make turning easier and providing assistance and/or support with repositioning.
• Assure the resident that staff will do their best to make him or her comfortable after he or she has been repositioned.

• Inform the physician and responsible party of new open areas and/or refusals in a timely manner. Notify the physician and family if an injury worsens, if it does not respond to treatment within two weeks of its initiation, and when it heals.

• Note: Lack of prompt family notification of the development of pressure injuries is a common element of lawsuits. Lack of family notification when surveyors cite the facility for their loved one’s pressure injuries is also common and has resulted in huge fines and legal settlements. In one such case, the jury awarded $312,710,000 in damages (Schabes, 2002).

In this situation, the development and worsening of a pressure injury is potentially quite painful. The resident is probably not aware that the consequences of his or her refusal may cause severe, unremitting pain, as well as the need for treatments that have the potential to be even more painful. The resident may not know that the pressure injury is likely to recur in the same area for the rest of his or her life because the tissue will not be as strong as it was prior to the injury. Describing these facts in detail may be enough to persuade the resident to cooperate.

Residents With Mental Health Problems and Depression

The refusal problem becomes thornier if the resident has depression or other mental health needs. To manage the refusal and prevent injury to the resident, involving the social worker and/or mental health professionals may be necessary. These professionals may develop and implement a behavior management care plan that is initiated in stepwise order on each refusal. Although the resident is refusing a single service, the facility should not give up, because doing so virtually guarantees a negative outcome. However, be aware that it may take time to get a consultant in to see the resident. Do not wait for the consultant to continue addressing the issue. Instead, plan temporary interventions to prevent complications while working on this plan.

Attention-seeking behavior

Residents who refuse repositioning because of attention-seeking behavior can be difficult to manage. Many are persons with paraplegia or tetraplegia (quadriplegia).
Residents with paralysis often rationalize that because they cannot feel skin injuries, such injuries do not matter. You may be successful at changing residents’ minds by using Christopher Reeve’s well-publicized death as an example of how refusing care and ignoring the skin can have devastating consequences.

Reeve, who was tetraplegic, had full-time caregivers. During his final days, he produced and directed a full-length movie (Zinn, L., 2003) and traveled out of town to make speeches. He was busy advocating and managing his foundation and did not want to slow down. Although his caregivers urged him to reposition and temporarily return to bed to let his Stage 4 sacral injury heal, he refused, electing to live life on his own terms. The injury became infected, and he became septic as a result. He was comatose for a day preceding his death in 2004. Even though the official cause of death was heart failure, the heart failure occurred as a complication of a pressure injury. After his death, his wife praised his caregivers and admitted that Reeve was not easily persuaded to slow down.

**Aggressive behavior**

An exception to the refusal rules occurs if a resident’s unanticipated violent or aggressive behavior places the resident, staff, or other residents in imminent danger. In this situation, the use of restraints is considered a measure of last resort to protect the resident or others but must not extend beyond the immediate episode.

**Other considerations**

The long-term care regulations support and affirm the resident’s right to participate in care planning and to refuse treatment. However, the regulations do not affirm or create the right for a resident, legal surrogate, or representative to demand that the facility use specific medical interventions or treatment that the facility deems inappropriate. (For example, some facilities refuse to honor requests to withhold food, fluid, or tube feeding on moral, ethical, and religious grounds. If your facility has similar policies, residents should be informed prior to admission.)
The facility is ultimately accountable for the resident’s care and safety, including clinical decisions. Therefore, clearly document all refusals in the medical record, and list interventions to minimize complications on the care plan. Remember that a refusal of certain care does not absolve the facility of all responsibility for the problem, so reevaluate the resident and modify the plan. The care plan must reflect the facility’s ongoing efforts to find alternative means of addressing the refusal. Implement interventions to treat the resident for depression or other mental health problems when indicated.

**Bridging**

Bridging (also called pillow bridging) is a method of supporting bony or fleshy areas on pillows, elevating them above the surface of the bed to relieve pressure. It is commonly used for the coccyx, hips, heels, and ankles. It can be used to relieve pressure on selected areas for residents in all the basic body positions. Some nurses refer to this technique as “floating.”

You may think that residents will be more comfortable with pillows under high-risk areas of the body. The truth is that placing pillows directly under the body increases pressure. Bridging involves elevating an area from the surface of the bed, forming a bridge surrounding the problem area, and eliminating all tissue compression.

**Survey Observations of the Bedfast Resident**

Surveyors will carefully monitor bedfast residents, who are always at high risk of deficiencies. This is an area in which practicing fire prevention is much easier than firefighting, so be proactive in the care of bedfast residents. In addition to the usual items that surveyors monitor, they will pay very close attention to residents who are bedfast to do the following:

- Determine whether the resident is properly positioned.
- Determine whether the resident is turned regularly according to tissue tolerance and plan of care.
- Determine whether the facility is protecting the heels from pressure, friction, and shearing.
- Identify the need for padding in skin folds, such as between the knees and ankles. Surveyors will also consider the need for pillows or padding for residents with orthoses, which increase the risk of pressure and skin damage on the opposite extremity.
- Determine whether the facility is using props/supports for comfort and alignment.
• Identify the need for a trochanter roll.

• Identify the need for handrolls to prevent contractures and breakdown on the palms of the hands, and determine whether the palms of contracted hands have been cleaned and nails trimmed.

• Identify the need for a footboard or means of preventing foot drop.

**Handrolls**

Handrolls are positioning devices that are used to prevent contractures of the hands. However, they are also good preventive devices. Handrolls protect the palms, preventing breakdown that is often caused by long fingernails.

For many years, nurses rolled clean washcloths and inserted them into the hands. This practice has fallen out of favor in some circles because the texture of the washcloth promotes squeezing the palm inward, which has the potential to worsen muscle rigidity and contracture development. In contrast, soft commercial handrolls are commonly used and are very comfortable. Most are held in place by fastening a Velcro® strap across the back of the hand.

**Guidelines for using handrolls:**

• Handrolls should be considered for routine care of all dependent residents.

• Handrolls can be applied based on nursing orders. No physician’s order is needed unless the resident has severe deformities or contractures of the hands.

• After the handroll is in place, prop or support the wrist in a neutral position to prevent a contracture called wrist drop.

• Occupational therapists frequently recommend semi-rigid, cone-shaped handrolls for residents whose fingers are rigid or contracting. The large end of the cone is positioned closest to the little finger.

• Monitor the size of the handrolls for each resident. Your facility should stock a variety of sizes to accommodate different-sized hands. The diameter of the outside of the device should not be smaller than the surface you are supporting or stretching.

• The handroll should stretch the hand very slightly toward normal alignment. Remove the handroll as ordered for range-of-motion exercises, and then reapply it.
• Nursing assistants are responsible for keeping the skin clean and dry under the device. Remove the handroll once each shift, wash the hand with soap and warm water, dry well, and then reapply the handroll.

• Be sure that the fingernails are kept short and clean. Two people may be needed to clean and clip the fingernails because the fingers curl inward and are stiff and rigid. Avoid prying the hand open.

• If the hand is tightly closed, gently massage the fingers and palms to reduce spasticity. Insert an index finger on either side of the palm of the hand, and then massage each joint. After massaging the palm and back of the hand, extend the fingers gently. Stop at the point of pain or resistance.

• After you have relaxed the hand, you are ready to clean and clip the nails. One person positions the hand and extends one finger at a time, while the other cleans under the nail with an orange stick (used for cleaning fingernails, rather than a nail file) and clips the nails.

• File the nails with an emery board after clipping.

• If the handroll becomes soiled, follow manufacturers’ directions for cleaning it. Most have covers that can be removed and hand-washed, or the handroll can be placed in a mesh bag and washed in the washing machine. Air-drying works best.

Other contractures of the arm
In addition to the risk of contracted hands injuring the skin of the palm of the hand, consider the potential skin damage that cognitively impaired residents with contracted elbows and wrists (Figure 4.3) can cause. Prevent and treat these contractures appropriately.

Moving Residents
Moving residents manually creates a high risk for both the resident and nursing staff. Of any workplace in the United States, healthcare facilities have the highest incidence of employee back injuries. Such injuries result in lost time, short staffing, and a great deal of expense, and they create a very high risk of permanent disability. Everyone should take back-injury prevention very seriously.
Soaker pads not for repositioning

The large (32- to 38-inch) reusable incontinence pads used in most facilities are called soaker pads in Canada. Most facilities in the United States use these pads for moving residents, in place of a draw sheet.

However, the professional nursing organizations in Canada have done a great deal of research on back injury prevention, and WorkSafe BC has published a bulletin entitled “Soaker Pads Are Not for Repositioning” (WorkSafe NB, 2013). The reasons listed for not using the pads for moving residents are as following:

- Soaker pads are designed for protecting the bed linen from incontinence, not for repositioning residents.
- Soaker pads do not have low-friction properties. Sliding them requires great effort.
- Soaker pads are positioned under the lower part of a resident’s trunk and upper legs. They do not fully support the trunk and shoulders, so using them for repositioning results in an unbalanced load and greater effort.
- The Canadian health and safety regulations require facilities to use all equipment according to the manufacturer’s instructions (which is in keeping with U.S. laws as well). The manufacturers do not provide instructions for or address the safe use of soaker pads in lifting and moving situations.

Although the reusable incontinence pads are more economical than disposables, be aware of the resident care issues associated with their use. Reusable pads are available in various grades and textures. Some pads have a coarse, rough surface texture, which is not kind to tender skin. Friction and shearing injuries are common. The cost of these pads varies from approximately $3.99–$25 for a single 34 x 36-inch pad. When pads are purchased, cost is often a determining factor, and the person who is buying the less expensive pads may not realize that their surface is potentially damaging to residents’ fragile skin.

However, investing a little more money in a pad with a softer surface solves the problem. If the texture of pads is a problem in your facility, notify the director of nursing. Note that linen is expensive and must be replaced frequently; some pads must be replaced after 35–40 washings.

Despite these challenges, making changes is important to avoid both problems for residents and back injuries for staff. Back injuries are serious business, and we must do all we can to reduce
this risk. When using pads for turning and positioning residents, always follow your facility policies. Additionally, you may want to download the Canadian form (www.worksafenb.ca/docs/HA_Soaker-Pads-Are-Not-Repositioning-Aids.pdf) and request that your safety committee review it and develop guidelines for pad use, if applicable in your facility.

**Slings and slider sheets**

Various types of slings and sliders are available to assist with bed mobility and positioning. These items have a low-friction, slippery surface, making movement easier. Because they are slippery, use safety precautions to avoid accidentally rolling the resident over the edge of the bed or sliding him or her out of a chair. To optimize safety, engage two or more nursing assistants in this task.

A slider can be a flat, slippery sheet or tube, similar to a trash bag with the ends cut off. It is used for turning, positioning, and lateral transfers. A tubular slider may be called a roller tube, roller sheet, or slide tube (Figure 4.4). A single-layer slider may be called a slip sheet, slippery sheet, slide sheet, or glide sheet.

Sliders are available in various types, sizes, and lengths. Some have handles. Some are padded, and some have a single layer of fabric (the inner surface is slippery so that it slides on itself). Some are designed so that they will move in only one direction; when a one-way slider is used to move a resident to the head of the bed or chair, it prevents the resident from sliding back down if left in place. Some sliders move in both directions and should not be left under residents. Whatever device you are using, follow the instructions.

**Figure 4.4** Tubular slider

Roller tube works well for moving a resident up in bed. The surface is very slippery, so remove it when you have finished the procedure.

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**Single-layer sliders**

Sliding devices with a single layer of fabric have a low-friction surface that makes moving the resident easier, reducing the risk of skin injuries as well as caregiver back injury. The single-layer devices are used in various ways, either by folding the fabric or in conjunction with a second sliding device.
The slider can be used for side-to-side or up-and-down movement, such as turning the resident or moving the resident up in bed. A resident with good arm strength and sitting balance can be taught to use the slider for independent movement. Tubular sliders are used only for moving and sliding residents. Unless the manufacturer’s instructions advise otherwise, sliders should not be used in place of slings or lifting devices.

Short sliders are used for pivoting and repositioning, such as sitting (dangling) the resident on the side of the bed or moving the resident up in bed. Long sliders are used for transferring supine residents from one surface to another, such as from bed to stretcher. Sliders should be placed under the incontinent pad or drawsheet, if used.

**Safety alert**

Slings and slides are two-person moving devices. Never use them alone. Make sure that you coordinate the move so that both nursing assistants move in the same direction at exactly the same time. One person should direct the move and call out, “Move up (or in another direction) on the count of three.” Then count, “1, 2, 3.”

**Manual handling slings**

The manual handling sling is a small sling (about 20 inches long and 8 inches wide—Figure 4.5) that has a number of resident-handling applications. These items are made of fabric or plastic, with one or more handles on the long ends.

The manual handling sling is used to do the following:

- Move a resident’s hips to one side of the bed and assist with turning in bed
- Move one or both of a resident’s legs from the floor to the bed or position them within the bed
- Assist a resident from supine to sitting position in bed
- Assist a resident from dangling to standing position
Some slings can be used to help with moving amputated extremities. Some may be used by the resident to assist with independent movement.

**Full-length slings**

Use the sling for supporting and moving the resident. Slings can be positioned in various ways, depending on the procedure and the resident’s underlying medical problems and ability to assist (Figure 4.6). Using a sling eliminates pulling and tugging on a resident’s body, reduces skin friction, and makes the task easier for the nursing assistant.

The sling is not a lifting device for totally dependent residents and should not be used for combative residents. Do not use the sling to move residents who would otherwise be too heavy. Like use of sliders, use of manual handling slings is assessment-based; do not use them indiscriminately with all dependent residents. However, they will make it easier to move suitable, assessed residents and reduce friction and shearing on the skin.

When using a sling, use a slow, sustained pull to move it, as sliding it rapidly increases the risk of shearing. It is a good idea to have a layer of clothing or an underpad between the sling and the resident’s skin. Doing so provides additional insurance to prevent friction and shearing.

Many slings can stay in place under the resident and need not be removed when he or she is in bed. Follow the instructions for the type of sling you are using. No evidence-based guidelines are available to help you make this determination. However, available information suggests that leaving a moving device in place will not harm the resident. Use critical thinking to evaluate the resident’s clinical situation as well as the risk of staff injury. The NPUAP white paper available at [http://tinyurl.com/yawrg2v9](http://tinyurl.com/yawrg2v9) will help guide you with decision-making.

Remember that residents and slings move, slip, and slide in the bed. Therefore, be sure that the sling is positioned correctly before moving the resident, and if it isn’t, adjust it. The full-length
sling should be positioned from just below the shoulders to the area behind the knees. Sliding on the bed (because of a misplaced sling) creates a very high risk for friction, shearing, and additional tissue damage. It also increases the risk of musculoskeletal injury to the nursing assistant.

**Draw sheets**

If the care plan instructs staff to move a resident using a draw sheet, make sure that the item used is, in fact, a draw sheet. Do not use a full sheet that has been folded in half. A full sheet is easily wrinkled, and the wrinkles feel like rocks under a bedfast resident. In addition to being painful, such wrinkles increase the risk of skin breakdown. The single-layer draw sheet works best.

Once again, position it between the shoulders and the knees. If the bottom edge of a draw sheet or sling is at the level of the panty line, it is up too high. Adjust it and ensure that the position is correct before using it to move the resident.

Your facility can order draw sheets from their linen supplier or from online retailers. If this is not possible, check with the activities director to see whether volunteers are available to cut full sheets in half and hem the edges.

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**Resident care alert**

Limit the number of layers of bed linens for residents who are on therapeutic beds. Multiple layers have a negative impact on the skin of persons with a high risk for breakdown. Additionally, fitted bottom sheets defeat the purpose of the mattress: They fit tightly and squeeze the mattress, increasing the internal pressure. Folding a full sheet to use in place of a draw sheet and adding a reusable incontinence pad (soaker pad) further reduces the potential benefits of using the mattress. Alternatives to a fitted bottom sheet include:

- Use the bed with no sheets, although this is not acceptable if the surface is plastic.
- Cover the mattress with a flat sheet. Tuck it under the mattress loosely.
- Another alternative is to use a flat lifting sling that can be left under the resident in place of a sheet.
- Use a regular draw sheet, not a folded flat sheet.
- Use a disposable dry air flow under pad instead of a heavy, reusable pad.
- Be sure the resident’s skin is kept dry. Use a drying barrier product containing zinc oxide to dry the skin, if necessary.
- Make sure you have a facility policy that addresses the actions to take, and that staff follow the policy.
- Provide resident and family teaching to be sure they understand why the bed is made in this manner.
Slings and therapeutic beds

Many long-term care residents use alternating pressure mattresses and low-air-loss beds or overlays. You have probably learned to use these beds with no sheets and special air-permeable underpads. Your care plan probably involves keeping as little between the resident and the mattress as possible so that he or she gets the benefit of the cooling air circulating in the mattress. This poses a potential problem for residents who are moved with a lifting sling. Refer to Chapter 6 for additional information on bedding and pads.

When weighing the benefits and risks, the NPUAP has determined that slings can be safely left under residents without causing or worsening tissue damage. Before leaving a sling in place, however, evaluate the surface to ensure that it is not slippery or increasing heat on high-risk areas of the body, which would increase the risk of tissue damage.

Remember that, unfortunately, manually moving residents creates a high risk for worker injury. In addition to reducing the risk of friction and shearing, the sling reduces the risk of worker injury.

Bed Mobility

Bed mobility, which involves the skills needed for moving about in bed and is considered a late-loss activity of daily living, is the first step in a progressive mobility program for dependent residents. Many nursing assistants define bed mobility as “the ability to turn over in bed,” but it is much more—in fact, it is a fairly complex skill that includes the maneuvers listed below. If a resident cannot perform all of these maneuvers, ask the restorative nurse to assess the resident for a bed mobility program by determining whether they can do the following:

- Moving and positioning oneself comfortably
- Turning side to side
- Lifting the legs into bed after dangling
- Sitting up in bed; rising from a supine to a sitting position with knees and hips flexed
- Moving from a reclining position to a sitting position on the side of the bed, using both arms and legs, with or without use of rails
- Moving from a side-lying position to sitting up on the side of the bed, with or without use of rails
- Maintaining lateral trunk balance while sitting on the side of the bed
Bed mobility activities involve using the hands, arms, legs, and feet or a trapeze, side rails, or bed ladder (Figure 4.7). Moving in bed is usually easier when the head of the bed is flat, but if a resident has an electric bed, he or she may adjust it as needed, from flat to elevated or in between.

**Trapezes**

Trapezes are used by residents who weigh up to 1,000 lbs for changing positions and transferring into and out of bed. To use it, the resident pulls on the trapeze while pushing with the feet. In addition to helping residents maintain independence, these items help protect caregivers’ backs when moving dependent residents who can assist by pulling on the trapeze.

Various styles are available. Stand-up assist poles are sturdy telescoping poles that extend from floor to ceiling. Some poles allow for offset trapezes, handlebars, or meal trays to be attached to make them more versatile. These devices work well in situations where a trapeze cannot be used, such as with water beds, beds without underside clearance, or headboards that will not support a clamp-style trapeze device. Another kind of trapeze has a base that sits on the floor under the bed and does not need to be attached to a headboard. This type of device may be better for overweight and bariatric residents.

**Foot Care**

Care of the resident’s feet is an essential skill, even if the resident is not ambulatory. Surveyors will carefully review preventive care for foot drop and pressure injuries on the heels in bedfast residents. Monitor the feet for pressure areas from the bed, bed linen, and tight shoes. Keep the feet clean and dry, and inspect them regularly for red or open areas.

**Heel Injuries**

Bedfast residents are at high risk for pressure injuries on the heels, and residents who have had hip surgery are at very high risk. Such injuries are often serious because the skin in the heel area
is thin and there is no subcutaneous fat to speak of. They worsen rapidly and often lead to serious pressure injuries (Figure 4.8), gangrene, and below-the-knee amputation. Although pressure injuries on other areas of the body have either remained constant or declined each year, the incidence of heel pressure injuries has increased each year (except for a slight decrease in 1995). Today, 30% of all pressure injuries occur on the heel area, and 66% of all residents who have had hip surgery will develop a heel pressure injury on the affected leg.

Be purposeful about the kinds of pressure-relieving tools you use, and avoid many of the commonly used ones that actually increase risk. For example, some nurses recommend applying heel-protector booties (which are also used as elbow protectors) as a preventive measure. These prevent friction and shearing but do not relieve pressure. Some nurses apply padding under the heels; some fill exam gloves with water and place them under the heels. Pads, gloves, and doughnut-shaped devices increase pressure instead of relieving it. These should not be used.

Some authorities recommend folding pillows lengthwise and placing one under each calf to elevate the heels off the surface of the bed. This does effectively relieve all pressure on the heels, if you can find two extra pillows and if you can keep them in place. Some nurses recommend hanging the heels over the end of the mattress. Placing the sole flat against the footboard helps prevent foot drop. However, elderly residents have thin, sensitive skin, and pushing against the footboard exerts pressure on the ball of the foot, increasing the risk of breakdown in this area.

When positioning the legs to prevent pressure on the heels, keep the knees in slight flexion. Hyper-extending the knee increases pressure and may cause obstruction of the popliteal vein, predisposing the resident to deep vein thrombosis. Avoid applying pressure to the Achilles tendons.

**Footboards**

Padded footboards, which are positioned at the end of the bed, reduce the risk of foot drop and heel pressure injuries. To use it, position the ball of the foot against it, with the toes up and the
heels hanging freely over the end of the mattress. An alternative to a footboard is to place folded pillows against the end of the bed and position the feet with the toes pointed toward the ceiling. Other commercial devices such as a heel suspension boot (Chapter 2), foot elevator (Figure 4.2), and foot stabilizer (Figure 4.9) are also good options. In fact, most nurses report that a heel suspension boot is easier to maintain and better for the resident. Applying a bed cradle will also relieve downward pressure on feet from bed linen.

REFERENCES


Years ago, pressure injuries were called “decubitus ulcers.” The word “decubitus” is from the Latin term “decumbere,” meaning “to lie down.” “Cubitum” is Latin for “the elbow.” The combined term reflects the Romans’ preference for leaning on the elbows when they reclined—thus, a decubitus ulcer is one that occurs when the person is reclining (lying down) in bed. The term “pressure ulcer” means that skin breakdown can and does occur when a person is sitting in a chair or wheelchair or anywhere else when the skin is under a load. However, this description overlooks the etiology of the wound. The term pressure injury more accurately reflects our current knowledge that the damage to the skin is an accidental injury.

When our current knowledge is applied to F-Tag 314, we know that an avoidable pressure injury occurs when the facility fails to do one or more of the following:

- Assess the resident’s clinical condition and risk for pressure injuries
- Identify and implement interventions consistent with the resident’s individual needs and goals and within the scope of recognized standards of practice
- Monitor and evaluate the effects of the interventions or revise the interventions as appropriate

When a resident is seated in a chair or wheelchair, pressure on the skin is affected by the following:

- Posture and body alignment
- Position stability and distribution of body weight (Figure 5.1A)
- Body balance
- The hammocking effect of the sling seat
Limit the time that a resident spends seated in a chair without pressure relief. The pressure on bony prominences is 10–15 times higher when sitting than when there is no pressure on the skin. Tight clothing or shoes, tubing, medical devices, a chair that is too small, and pressure from wheelchair parts can also reduce blood flow. Such pressure forces blood containing oxygen and nutrients out of the area, and when this occurs, ischemia begins. Moving the resident helps restore the blood supply. When pressure is relieved, blood and oxygen rush back into the area.

Repositioning the Seated Resident and Using the 90-90-90 Position

Good chair positioning begins with the feet. When a resident is seated in a chair or wheelchair, he or she should be in the 90-90-90 position (Figure 5.1B):

- Feet and ankles are at a 90° angle to the lower legs
- Lower legs are at a 90° angle to the thighs
- Hips are at a 90° angle to the torso

Pressure relief and regular movement are needed whenever residents are seated in the chair for more than an hour. However, by beginning with the feet and using the 90-90-90 position, you offer the body support by putting it in good alignment, which will improve function, reduce the need for restraints, relieve pressure, and reduce or eliminate discomfort.
Many nurses are surprised to learn that good chair positioning is determined by the placement of the feet. Sliding occurs when the feet do any of the following:

- Are dangling
- Are not properly supported
- Slip off the footrests

Sliding even slightly causes pressure on the spine, scapula, hips, and elbows and is a primary cause of skin damage and shearing. Therefore, after the resident has been transferred into the chair, the first step is to stabilize the feet. To accomplish this, you may have to adjust the leg rest length—if the leg rests are too short, the knees will be higher than the hips, increasing pressure. You may also need to seat the resident on a low-profile cushion or use a footrest extender/elevator cushion to get the length right. Residents who slide forward may benefit from a wedge cushion. Remind the resident to sit up straight; slumping or slouching increases pressure over the coccyx. If needed, assist with other types of positioning aids.

Position the feet on the floor, footstool, or footrest. Never leave the legs dangling. Adjust the footrest height so the pelvis is slightly flexed forward by positioning the thighs slightly lower than horizontal. If the knees are higher than the hips, the resident needs more space. If the feet dangle, shorten the leg rests or add a footrest elevator (Figure 5.2) to the chair. When the chair is moving, the feet should never drag on the floor.

**The pelvis and torso**

After the feet are supported, the next concern is the torso. The resident should be upright, without leaning forward or to either side. Consider this before moving the resident into a wheelchair.

One concern is that the seat of a regular wheelchair is made of thin vinyl, causing it to sag or have a hammocking effect. This hammocking causes the thighs to rotate inward and increases pressure on the buttocks, coccyx, and ischials. In this situation, pressure redistribution (as noted
in F314) is necessary. To correct the problem, use a leveling pad, which is similar to a thin board and serves as a platform for foam, gel, or a foam/gel combination (Figure 5.3). Never use a leveling pad by itself—use a cushion at the same time.

Select a cushion to contain the leveling pad with great care. Many synthetic fillers in cushions increase heat, which in turn increases perspiration and metabolic demands on tissue that is already under pressure, thereby increasing the risk of breakdown. A foam cushion with a gel or gel/water layer on top helps cool the tissue, thus reducing the risk. Gel also reduces friction and shear force. For additional information on support surfaces, see Chapter 6.

Lateral leaning is another problem to correct. Leaning greatly increases pressure on the hips, buttocks, and ischials and affects body function due to poor alignment. Some residents are restrained due to leaning problems, but in many cases, leaning can be corrected without restraints. Sometimes it is a matter of becoming familiar with the many alternative devices available to provide postural support. For example, lateral foam bolsters (Figure 5.4A) can be used on one or both sides of the chair to support the trunk. Alternatively, a cushion (Figure 5.4B) may be used for residents who are off balance, such as

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those with severe scoliosis. A lateral support orthosis, adjustable lateral support (Figure 5.5A), or wheelchair side wings (Figure 5.5B) also provide torso support. If a resident leans forward, a padded tray table or lap buddy can be useful. Use caution in selecting these devices; leaning forward on a hard surface promotes elbow breakdown. The selection of a chair support cushion is based on an assessment of the resident’s needs. Make the decision based on the length of time that the resident will be in the chair, as well as the following:

- Need for pressure relief
- Weight
- Body type
- Position, structural, and anatomic deformities or paralysis

**Figure 5.5A**  
Adjustable lateral support

Use lateral foam bolsters on one or both sides of the chair to support the trunk, preventing the resident from leaning or falling over the wheelchair arm.

**Figure 5.5B**  
Side wings

The side wings provide torso support and reduce the risk of injury caused by leaning over the side of the chair.

**Importance of pressure relief in the chair/wheelchair**

Residents with intact sensation usually know when it is time to move because it hurts to remain in the same position. Residents with paralysis and those with cognitive impairment may not know when to move due to loss of sensation or loss of the ability to interpret the body’s signals.

Skin in the danger zone is usually red in appearance. In persons with dark or yellow skin, the problem area may appear blue-gray, dark blue, brown, or black. It may look drier than usual and be hot to the touch. The texture may feel warm, wet, mushy, hard, or soft. Remember that the area of tissue damage you can see is only the tip of the iceberg; the damage below the skin is much larger.

In addition to positioning residents in good body alignment, active pressure relief is essential to prevent serious skin damage. Sometimes, special equipment can be used to help relieve pressure, such as a tilting or reclining wheelchair or customized cushion. Experts recommend a pressure-
relieving activity once every 15–30 minutes. Moving around in the chair provides pressure relief, so teach and remind residents to shift their weight regularly.

**Importance of positioning the wheelchair wheels**

Before teaching residents pressure-relieving activities, be sure that all staff are familiar with the correct positioning of the wheelchair wheels. The small front caster wheels offer the ability to move the wheelchair in all directions, and the large part of the small wheels faces the rear when the chair is moving. Many times, however, the front wheels are turned sideways when the chair is parked, making the chair very unstable (Figure 5.6A).

The position of the small wheels affects the chair’s center of gravity. Positioning the wheels with the large part facing forward (Figure 5.6B) is a safety feature when the chair is parked. This position prevents tipping during transfers and when the resident leans forward or to the side. It also stabilizes the chair if the resident picks up an item from the floor. When the resident is being transferred into or out of the chair or the chair is parked, position the large part of the front wheels facing forward, and lock the brakes. To do so, back the chair up, then move forward, or gently push the wheels with your foot. Lock the brakes.
Pressure-relieving activities in the wheelchair or chair

Cue, prompt, or assist with repositioning as needed. Positioning aids such as a sling or the TLC pad work well for repositioning a chairfast, dependent resident (Figure 5.7).

Wheelchair pushups relieve pressure on the hips, buttocks, and coccyx. They also help increase upper body strength and help prepare the resident for transfers. They are the best method of relieving pressure when the resident is seated. The resident places the palms on both armrests, with the feet flat on the floor, then pushes the body weight up on the arms. Avoid having the feet on the footrests because that may cause the chair to tip. The resident should do this activity at least five to 10 times per day or in accordance with the frequency specified by the care plan. Residents who do not have the arm strength or trunk control to perform pushups can lean to the sides and front of the chair to relieve pressure.

See the following websites for pictures and resources that may be useful for pressure injury prevention in chairfast residents:

- [http://calder.med.miami.edu/pointis/relieve.html](http://calder.med.miami.edu/pointis/relieve.html)

Measuring Wheelchairs to Fit Residents

Proper wheelchair fit is essential for independent mobility and receiving the optimal physical benefit from the exercise of moving the chair. A poorly fitted wheelchair can serve as a restraint by limiting movement and cause the following:
• Frustration
• Pressure injuries
• Contracture development and worsening
• Deconditioning
• Worsening of osteoporosis and bone loss
• Need for restraints
• Inability to propel the chair independently

Wheelchairs are not one-size-fits-all devices. Unfortunately, most long-term care facilities are not aware of the need to individualize the wheelchair to the resident. They order the same type and size of wheelchairs from the medical supply company. In doing so, they unknowingly create problems for themselves and increase dependence in residents. As with linen, cost is an important issue in chair selection but should not interfere with selecting the appropriate items.

Residents in improperly fitting wheelchairs have many problems. In addition to the problems listed above, some residents need special positioning devices just to sit upright. Measuring the resident for a properly fitting wheelchair and ordering the correct chair often solve the problem. Fitting the chair is a simple procedure that involves taking certain measurements with the resident sitting on a firm, flat surface. If you have a physical therapist in your facility, he or she may be able to teach you this skill or obtain the measurements for you. You will find additional information for fitting the wheelchair to the resident at the following websites:

• www.phc-online.com/Measure-for-wheelchair_a/6.htm
• www.convaid.com/wheelchair-fitting-guide/
• www.quickie-wheelchairs.com/info/measuring-guide
• www.karmanhealthcare.com/how-to-measure-for-wheelchair-wheelchair-fitting/

Check to see whether your facility’s restorative nurses or licensed therapists have had special training in measuring and fitting wheelchairs. Some vendors will send a qualified person to your facility to measure for proper fit.
However, do not attempt to measure residents for power chairs, such as those that tilt and recline. To do so requires the skills of a highly qualified person who has had a great deal of special education in wheelchair positioning and fit.

**Wheelchair Mobility**

Independence involves moving about at will. The wheelchair is a mobility device, not a transportation device.

Mobility is the manner in which a person moves from one place to another. Mobility requires a physical effort. The activity helps the body stay healthy. Every body system depends on this activity to maintain good health. The most common form of mobility is walking, with or without an assistive device.

Transportation involves riding somewhere. Cars are our primary means of transportation, but motorcycles, bicycles, and scooters are popular. Some people walk and some ride horses or use skateboards.

Many people in health care facilities are pushed by staff from point A to point B on stretchers and wheelchairs. This is fast and efficient for staff, but what benefits do frail elderly residents receive? There is no physical exertion involved and no benefit to health. In fact, the residents are inactive, which promotes complications of immobility. Residents who move their wheelchairs independently receive some benefit from the exercise. Refer to [http://www.thegrowprogram.net/](http://www.thegrowprogram.net/) for additional information and suggestions on how to get residents out of wheelchairs.

Nevertheless, sitting in a wheelchair all day is not good for residents’ skin. Conduct a restorative assessment to ensure that the use of a wheelchair is appropriate as a primary mobility and stationary seating device. The GROW Program offers information about the type of assessment used for this purpose. For additional information, see [www.thegrowprogram.net](http://www.thegrowprogram.net). In any event, residents should not remain seated in their wheelchairs all day.

Some facilities feel so strongly about this issue that wheelchairs are used only to transport residents from one area to another. When the resident arrives at the destination, he or she is transferred into a regular chair or couch. Although some residents and staff were resistant initially, the wheelchair-free programs have been very successful (Waugh & Harroun, 2008).

The Omnibus Budget Reconciliation Act requires facilities to maintain residents’ ability to walk. These residents certainly should not sit in wheelchairs, but many do. A walk-to-dine program, walking trails, and walking clubs are helpful for this purpose. Ambulate residents to activities, the beauty shop, and other areas of the facility. Residents can also walk with staff to distribute mail or laundry, or they can walk with family members during family visits. Over the long term, their ability to ambulate will improve, the risk of incidents will decrease, and you will have far fewer skin problems.
If residents cannot walk, independent mobility in a wheelchair is the next best thing. The ability to propel the wheelchair independently enables residents to make decisions and choices: They decide where they want to go and when. Having a degree of independence promotes good communication, self-reliance, self-confidence, and positive self-esteem. Independent wheelchair mobility provides good exercise and helps maintain range of motion and cardiovascular fitness. It also improves the following:

- Posture
- Physical comfort and pain relief
- Respiratory function
- Speech volume
- Swallowing

Your staff are probably pushing residents in wheelchairs for their own convenience—it is much faster than cueing and encouraging residents to push themselves. However, residents should propel themselves if they are able. Although it is undoubtedly less efficient, you are not doing the residents a favor by pushing their chairs. As the saying goes, “If you don’t use it, you lose it.” In addition to declines associated with pressure injuries and skin problems, the loss of the ability to propel the wheelchair is itself a decline.

Some residents do not propel their wheelchairs due to physical problems. Some cannot propel the chair because it does not fit them correctly. Wheelchairs are available to fit residents of all sizes, as well as those with special structural and medical needs. According to one study, only 45% of the residents in the study group could propel their wheelchairs independently. Another problem identified in this study was related to the wheelchairs themselves: 46% of residents were in chairs that were either the wrong size or were in such poor repair that they didn’t function properly (Simmons, Rahman, & Dietz, 1996). Adaptations and modifications such as brake extensions give residents freedom to move independently and in safety.

Sometimes, wheelchairs must be ordered to meet very specific medical needs. These are usually recommended by a therapist and ordered by the physician. For example, some residents with hemiplegia can propel the wheelchair independently. They use the strong hand on the wheel and propel the chair by pushing the strong leg on the floor. The “hemi wheelchair” has a seat that is lower than a regular wheelchair, making foot propulsion easier. Consult the physical therapist for additional information on these and other special types of wheelchairs and accessories.
Resources


Many excellent tools and resources for teaching residents about wheelchair mobility can be found at www.wheelchairskillsprogram.ca/eng. You can obtain comprehensive information such as the following:


- Fall prevention and mobility tools: https://www.hsag.com/es/medicare-providers/nursing-home/mobility/


REFERENCES


Importance of Support Surfaces

Prolonged, uninterrupted mechanical loading of the tissue leads to skin breakdown. The primary factors affecting the risk for breakdown are as follows:

- Pressure distribution, duration (length of time), and pressure relief
- Heat
- Weight
- Body type
- Position
- Presence of deformities such as contractures

A support surface is a specialized surface used for redistributing pressure, managing tissue load and other environmental factors affecting the skin (such as cooling or wicking moisture), and providing other therapeutic functions. Pressure redistribution is essential to prevention, management, and treatment of pressure injuries. High-risk residents should be identified and provided with a support surface in both bed and chair. Nurses should have a basic understanding of the differences between the terms “pressure redistribution,” “pressure reduction,” and “pressure relief”:

Pressure redistribution: Reallocation of pressure from one area to another, causing a shift in pressure. Pressure redistribution is based on proper positioning. Support surfaces (whether a bed, wheelchair, or shoe insert) can be used to redistribute a load over contact areas of the body. Distributing the weight over a large area is best, and all affected areas must be monitored to be sure that pressure is distributed as evenly as possible. This is the preferred term, rather than
pressure reduction and pressure relief. (Note that pressure redistribution balances the pressure so that no single area is overloaded. Surfaces that reduce pressure on one area of the body generally do so by increasing pressure on other areas.) The tissue’s usual pressure distribution capacity correlates negatively with age.

Pressure reduction: Reducing but not eliminating pressure; the reduction in pressure is not necessarily below capillary closure pressure (32 mmHg).

Pressure relief: Relieving pressure on skin by reducing the interface pressure below capillary closure pressure (32 mmHg).

Note: Pressure reduction and pressure relief are both older terms. Experts recommend eliminating them and using only the term “pressure redistribution.” Nevertheless, these terms remain in widespread use.

Selecting a support surface

Support surfaces are important parts of the prevention and treatment arsenal. Remember, however, that although they are helpful, they are no substitute for careful nursing care and resident and family education.

Do not select a support surface based on a perceived level of risk. The effectiveness of the surface used will be determined by the characteristics and indications for the device, the resident’s risk and individual characteristics, and his or her response to the product. Assess the resident, and match the potential benefits of the device with the resident’s needs and specific situation. For example, consider the resident’s ability to maintain position, presence of multiple injuries, skeletal deformities and contractures, and limited turning surfaces. Be sure that you know the resident’s problems, specific level of risk, and benefits/indications for the surfaces you have available.

When selecting a support surface, do the following:

- Keep in mind the resident’s comfort, level of mobility in bed, and need for environmental (microclimate) control.
- Select a support surface that is compatible with the setting, as not all support surfaces are compatible with all care settings. Consider the weight of the bed, mattress, or overlay; available space; the width of the doors; the need for uninterrupted electrical power; and the ability to promote ventilation of heat from the motor.
For specialty beds, assess the appropriateness and functionality of the support surface regularly. Verify that the support surface is within its functional life span and is being used according to manufacturers’ recommendations.

Use an active support surface (overlay or mattress) to redistribute load for high-risk residents. Overlays and alternating-pressure mattresses have similar efficacy in terms of overall incidence of pressure injuries. Avoid support surfaces that have small cells, which are usually too small to distribute pressure evenly over deflated cells. Select higher-specification foam mattresses rather than standard hospital foam mattresses for all high-risk residents. Keep in mind that there is no documented evidence one higher-specification foam mattress is superior over others.

Once you have selected a support surface, do the following:

- Repeat the tissue tolerance test using the new support surface.
- Develop a written plan of care for the use of support surfaces and positioning devices.
- Use the correct support surface for the resident’s degree of risk and medical condition.
- Be sure to follow product instructions for use and care of the support surface. You can expect surveyors to check this information.

Other factors to consider are the following:

- The degree of head elevation can reduce the effectiveness of a support surface. When the head is elevated, pressure increases on the sacrum and ischials.

- Using a support surface with frequent turning is one of the best methods of reducing pressure intensity between the bony prominences and the bed. You may be surprised to learn that many nursing assistants believe that turning residents on therapeutic beds (and overlays) is not necessary. To address this issue, educate staff in the use of support surfaces used in the facility. Residents can and do develop skin breakdown on therapeutic mattresses and overlays, so continue to turn and reposition high-risk residents. Keep in mind that although specialty mattresses contribute to positive outcomes, excellent nursing practices and sound judgment determine whether the goals are achieved.

- Having a low-friction cover or surface is essential for reducing shear, which directly causes or contributes to 40%–50% of all pressure injuries.
**Types of support surfaces**

Therapeutic support surfaces distribute weight and pressure more evenly than regular mattresses, thereby enhancing blood flow and oxygen availability and relieving pressure on tissues. These factors reduce the risk of new breakdown and improve resident comfort. Specialized surfaces include mattresses, therapeutic beds, cushions, and overlays. When selecting a support surface, consider the following:

- **Individuality:** The device selected should be assessment-based, consider the resident’s contour and anatomy, and should not interfere with independent function, mobility, or personal autonomy.

- **Quality of life:** The support surface should promote maximum autonomy and enable the resident to participate in activities of daily living, leisure activities, and personal interactions. If a support surface interferes with these activities, the resident will be less likely to use it.

- **Pressure redistribution:** The surface should support and evenly distribute the resident’s body weight without damaging the skin. The resident should be in good body alignment, balanced, and stable.

- **Moisture control:** The surface should keep the skin dry.

- **Temperature control:** The surface should maintain skin temperature without causing the resident to become excessively hot or cold.

- **Friction:** The surface should reduce friction and shearing but should not be so slippery that the resident is at risk of sliding off.

- **Comfort:** The resident should be able to use the surface without pain.

- **Infection control:** The surface should be easily cleaned and not promote bacterial growth.

- **Flammability:** The surface should not ignite.

- **Product service requirements:** A user or owner manual should be available and should describe routine maintenance, care, and cleaning of the surface. (Many can be downloaded.)

- **Life expectancy:** The manual should describe how long the surface is expected to last when used according to directions.

- **Fail safety:** The manual should describe actions to take if the surface becomes unusable or the product does not perform as expected when used according to directions.
A 10-page paper with an overview of the types of therapeutic beds and the terms and definitions related to support surfaces may be downloaded from www.npuap.org/wp-content/uploads/2012/03/NPUAP_S3I_TD.pdf.

Therapeutic beds are generally available only to persons who have Medicare Part A benefits, and Medicare has established certain criteria for payment for each type of therapeutic bed. Keep good records of the wound sizes and progress because Medicare will audit these records to determine payment.

If a resident does not qualify for a bed under Medicare, you may purchase beds through online retailers and other vendors. The lowest cost for new beds is approximately $299. Avoid buying used beds.

**Covering therapeutic beds and overlays**

Tucking sheets in tightly defeats the purpose of some mattresses and overlays. Know how to cover the support surface you are using with a sheet. Avoid tucking the bottom sheet in tightly, which increases pressure on the skin. The best option is to apply a flat sheet loosely instead of using a fitted sheet.

**Sheets versus no sheets**

In many facilities, low-air-loss beds are used with nylon (Gore-Tex™) covers only, without sheets, in keeping with manufacturers’ recommendations. When using a low-air-loss system, the resident lies on the loose-fitting, waterproof cover, which is similar to a fitted bottom sheet but reduces friction and shearing. Another type is a flat cover that is also similar to a sheet and that covers the air cells and fastens to the sides with ties or snaps. It encases the air cushions and decreases friction, permitting air to pass through the fabric’s pores. The covers also have high moisture vapor permeability to prevent a wet surface from perspiration. This is important because the circulating air is warmed, and a combination of continuous air circulation and evaporation prevent the resident’s skin from overheating.

To avoid survey problems, facilities should have policies and procedures that explain why the nylon cover is used without sheets. Teach residents and families why such covers are better for the skin. Typically, one cover is supplied with each low-air-loss bed, but order several extra covers for each to allow for washing and air-drying. (The nylon covers must hang to dry; they cannot withstand the heat of commercial dryers.)
**Underpads**

Most low-air-loss and alternating pressure beds and overlays are meant to be used with thin, disposable incontinent pads that are air-permeable yet moisture-proof. The pads are available in small to large sizes, and their backsheets provide superior skin dryness and comfort. The downside is that the pads are expensive, about $1.50 to $3.00 per pad, depending on size. They may be restricted to residents with certain payer types, such as Medicare, private insurance, and private pay. In the opinion of this writer, the benefits are well worth the cost. Medline Extrasorbs™ and Ultrasorbs™ dry-flow underpads are common examples. If you are not familiar with these pads, evaluate the surface before buying a large quantity. Some have a rough surface, similar to industrial paper towels, and may cause shearing when exposed to a resident’s fragile skin.

With residents using low-air-loss beds, a thick reusable pad reduces the surface’s effectiveness and may increase shearing risk. If the resident is ineligible for the dry-flow pads, however, be selective about the reusable pads you use. Like some disposable pads, some reusable underpads have a coarse surface that is irritating to tender skin, so check with the product vendor for the best available pads to use. Refer to Chapter 4 for additional information on bedding and pads.

**Protecting heels and elbows**

The heels and elbows have a small surface area and no subcutaneous fat, which makes pressure redistribution difficult. Consider bridging, elevating the heels from the surface of the bed, and other nursing measures. A resident with contractures will also need individualized nursing measures to reduce pressure on bony prominences or prevent breakdown from friction and skin-to-skin contact. Remember that heel and elbow protectors do not relieve pressure. Nevertheless, applying fleece, artificial sheepskin, or knit heel and elbow protectors or booties will prevent friction and shearing, which is estimated to cause as much as 40% of all pressure injuries. Refer to Chapter 4 for additional information on caring for the feet.

**Natural sheepskin**

There is some evidence that covering the bottom sheet with natural sheepskin pads may reduce the risk of skin breakdown, but placing a reusable cloth underpad under the buttocks reduces the sheepskin’s efficiency. Additionally, please note that most sheepskin used in healthcare facilities is synthetic, as natural sheepskin is not as readily available. It is also hotter, is more expensive, and tends to ball up in the washer, so its usefulness is limited.
**Bottoming Out**

Products that are underinflated or that “bottom out” are ineffective for redistributing pressure and reducing risk of breakdown. You can determine whether a resident is bottoming out by placing your flat hand (palm up) between the overlay and the mattress. If there is less than an inch of space, the resident has bottomed out and the overlay is unlikely to reduce the resident’s risk. Air may leak from mattresses under pressure over time. When a product bottoms out, the air is distributed toward the ends, and the inflatable mattress does not support the body. The resident is sitting on the bed frame, which is likely to cause additional tissue damage.

The procedure to check for bottoming out was introduced in the 1994 Clinical Practice Guidelines on the Treatment of Pressure Ulcers. The 2014 International Pressure Ulcer Guidelines removed this procedure because it is not evidence-based. Some organizations were concerned with safety of the person checking the mattress. Unfortunately, there are no evidence-based procedures. The *State Operations Manual* (F-314) refers to using a hand check to determine whether the resident is bottoming out.

The hand check is a simple procedure with a low risk of injury to staff and no risk to the resident. It is easier to do a hand check than to fight a potential deficiency. Refer to the NPUAP position paper on this subject when developing facility policies regarding checking replacement mattress systems, alternating pressure systems, and low-air-loss overlays for effective weight redistribution. See [www.npuap.org/wp-content/uploads/2012/01/Hand-Check-Position-Statement-June-2015.pdf](http://www.npuap.org/wp-content/uploads/2012/01/Hand-Check-Position-Statement-June-2015.pdf) for more information.

Follow your facility procedure for monitoring the effectiveness of an overlay regularly and periodically check for bottoming out. Document these checks on a flow sheet.

**Bariatric Support Surfaces**

Meeting the support surface needs of bariatric residents can also be difficult. Although beds and support surfaces are available, they can be expensive. Depending on the payer source, the support surface may be a nonreimbursable item that the facility is expected to provide. Some payers will allow billing for bariatric support surfaces, but the billing code is the same as that used for regular-sized equipment, which is much less expensive. Make sure that the coding is accurate. Depending on the payment source, the facility may have to pay for the item, or you may need to request preapproval for it.
Another concern in meeting bariatric needs is that the resident may be receiving treatment for several different comorbidities. For example, bed or support surface used to treat other conditions (such as respiratory problems) may be indicated. Likewise, caring for obese residents poses numerous care challenges. Nurses caring for this population must be educated in meeting the residents’ special needs and skin care challenges in a clinically efficient, nonjudgmental, ethical, and legally sound manner.

**Entrapment Concerns Associated With Replacement Mattresses and Overlays**

Long-term care facility residents are at high risk for injury and entrapment from use of bed rails in hospital beds. The greatest risk usually occurs when the original mattress is replaced and the new mattress is not the same size or does not have the same properties as the original. Because injuries and deaths associated with medical equipment are covered under the mandatory reporting rules, the FDA has been collecting data and studying this issue. Between January 1, 1985, and January 1, 2013, the FDA received reports of 901 incidents of patients caught, trapped, entangled, or strangled in hospital beds. The reports included 531 deaths, 151 nonfatal injuries, and 220 cases where staff intervened to prevent an injury. Most of the affected individuals were frail, elderly, or confused.

### Safety alert

**2015 FDA incidents of persons caught, trapped, entangled, or strangled in hospital beds**

“Patient entrapment is uncommon,” says Joan Ferlo Todd, RN, a senior nurse-consultant at the Food and Drug Administration’s (FDA) Center for Devices and Radiological Health (CDRH). “But when it occurs, it’s often fatal. Not all patients are at risk for entrapment, and not all hospital beds pose an entrapment risk,” says Todd. “But healthcare facilities, as well as patient caregivers, are urged to take a careful look at hospital beds. They need to determine if there are large openings that present an entrapment risk, and to take steps to minimize this risk.”

Any type of rail or grab bar attached to a bed, as well as the fit of the bed mattress, should be assessed for entrapment risks, she adds. “It is important to view the hospital bed as a system,” she says. “Not all mattresses or bed rails are suitable with any given bed frame” (U.S. Food and Drug Administration, 2016).
Entrapment is a very real risk with some support surfaces, air-filled overlays, and therapeutic mattresses because they are easily compressed. The dimensions of the mattresses are different from those of the original equipment supplied or specified by the bed frame manufacturer. Variations in side rail design (Figure 6.1A) and mattress thickness and/or density may affect the potential for entrapment.

Adjuncts as shown in Figures 6.1B, 6.1C, and 6.1D can be used between the bed and rails in some beds to reduce gaps and prevent entrapment.
Additional information is available at www.fda.gov. “A Clinical Guidance for the Assessment and Implementation of Bed Rails in Hospitals, Long Term Care Facilities, and Home Care Settings” may also be downloaded from www.fda.gov.

**Risk of entrapment with low-air-loss beds**

Incidences of injury and death related to side rail entrapment are increasingly common. This is especially problematic when inflatable beds or overlays are used, because they are more easily compressed than regular mattresses. Some newer replacement mattresses have integrated side air bolsters that keep residents centered in bed and reduce the risk of entrapment, but many older models are still in use. Even with the safeguards available for newer beds, facilities must assess residents carefully. You should do the following:

- Assess the resident’s needs before deciding to use side rails. If side rails are considered safe, beneficial, and appropriate for the resident, follow the FDA recommendations for checking for potential sources of injury.

- Inspect bed frames, side rails, and mattresses regularly to identify areas of possible entrapment.

- Remember that movement, compression of the mattress, and other factors, such as the resident’s weight or position, can create gaps.

- Make sure that side rails are properly installed and fit correctly. Avoid bowing, and ensure that the rails are the correct distance from the head and foot of the bed.

- Ensure that the resident’s overall body size, height, and weight are appropriate for the bed’s dimensions.

Although the mattress, bed frame, and side rails may appear to be safe, a resident’s limbs can become caught in small side rail openings. To reduce risk, assess the resident; discuss options with other staff members, the resident, and the responsible party; and then plan the resident’s care accordingly. Many adjunctive devices are available to keep residents safe, such as bed bolsters, guards, and pads. Select the appropriate device, and then install it correctly to eliminate gaps between rails and mattress.
Consider additional safety measures for residents at high risk for entrapment, including those with altered mental status (organic or medication-related), general restlessness, spasticity, choreiform movements, seizure disorders, and various neuromuscular disorders. Increased risk also occurs when the resident’s size and/or weight are inappropriate for the bed’s dimensions. Side rail pads (Figure 6.2A) and positioning aids (Figure 6.2B) are useful for closing off open spaces in which residents may accidentally become entrapped.

**Figure 6.2A** Side rail pad

Side rail pads are available in many sizes and styles, for both single rails and split rail configurations.

*Courtesy of Skil-Care Corporation, Yonkers, NY, 800-431-2972.*

**Figure 6.2B** In-bed positioning system

An in-bed patient positioning system helps keep residents away from rails. This design also makes turning and positioning easier and more secure, and reduces the risk of skin breakdown.

*Courtesy of Skil-Care Corporation, Yonkers, NY, 800-431-2972.*

### Safety alert

You may be surprised to learn that many nursing assistants prefer to use rails because they believe it means that they do not have to worry about centering the resident in bed. They believe that if a resident is close to the side of the bed, it is easy to elevate the rail to ensure that the resident will not slip out or fall. However, this approach may be a problem if the rails are down. Educate staff on the importance of bed positioning and centering the residents in the bed.

### Support Surfaces for Chair and Wheelchair Seating

Little can be said about seating systems and chair support surfaces that has not already been covered in the preceding information. No single support surface has been proven to consistently perform better than others in all situations. Choose the type of support surface based on assessments, resident problems and needs, and the cushion’s properties. Consider the following:

- Postural alignment
- Skeletal deformities
- Weight distribution
Chapter 6 | Support Surfaces

- Balance
- Stability
- Pressure relief
- Location of red, open, or high-risk areas
- Special needs

Some residents have anatomic and structural problems that are simply beyond nursing expertise, such as those who have severe contractures or scoliosis, cerebral palsy, post-polio syndrome, or other neuromuscular disorders. When working with such residents, seek a referral to an occupational or physical therapist who has special education and certifications as an assistive technology practitioner and who has expertise in positioning and wheelchair seating.

**Importance of positioning**

Positioning in good body alignment is essential for pressure reduction. If a resident spends a great deal time in a wheelchair, do the following:

- Position the resident upright, in good alignment, and in the 90-90-90 position (see Chapter 5).
- Be sure that the wheelchair fits the resident.
- Be sure that the wheelchair legs are the correct length so that the knees are lower than the hips. If the legs are too short, the resident will experience high pressure on the ischials.
- Be sure that the feet are supported.
- Conduct a tissue tolerance test in the chair.
- Use a chair with a tilt/recline feature for optimal pressure relief, if possible.
- Use a cushion to redistribute pressure. Cushion selection should be assessment-based and should meet the resident’s individual needs. Consider the cushion’s pressure distribution, shear reduction, moisture retention, and heat-accumulation properties. Avoid rings and doughnut-type devices, which increase pressure, and check the cushion for bottoming out.
- Develop a resident-specific plan of care.
- Instruct the resident in pressure-relieving techniques (see Chapter 5).
- Teach staff when and how to reposition the resident.
- Teach the resident and/or staff to avoid the following:
– Movement or activities that rub, scratch, or cut the skin.
– Shoes or clothing that are too loose or too tight. Both can cause or contribute to skin damage.
– Clothes with thick seams, buttons, or zippers in areas that will apply pressure to the skin.
– Encourage and assist residents to quit smoking, which decreases oxygen to the skin and interferes with healing. The restorative programs in some facilities help residents quit smoking.

**Pressure Mapping**

The properties listed for bed support surfaces also apply to cushions for wheelchair seating. To help identify and manage seating options, some facilities use pressure mapping (although the equipment is expensive, so its use is limited in some areas). Pressure mapping involves placing a flat sensor pad under the resident to measure pressure. The sensors are connected to a computer that shows a picture of vertical pressure on the skin (Figure 6.3), with blue colors indicating low pressure and reds indicating high pressure. A grid on the screen displays numbers that correspond with the pressure reading. In addition to helping identify high-risk areas for individual residents (this information is residentspecific and cannot be generalized to other residents or cushions), these features make pressure mapping useful in teaching residents, as they show visual effects of weight shifts and pressure relief.

Although it is an excellent tool, pressure mapping should not be the only factor used to select a support surface. It can be used for verifying clinical and professional judgment but should not replace it. Remember: Treat the resident, not the equipment.

**Figure 6.3**

Pressure mapping is highly individualized. Two individuals using the same wheelchair cushion have very different results. A three-dimensional display option provides even more information.

*Courtesy of Northwest Regional Spinal Cord Injury System, Department of Rehabilitation Medicine, University of Washington.*
Pressure is not the only indicator of risk for skin breakdown. Heat, moisture, paralysis or sensory loss, nutrition, fluid intake, aging changes in skin, underlying disease, friction, and shearing all contribute to pressure injuries. For additional information, see the following websites:

- www.wheelchairnet.org/wcn_wcu/SlideLectures/MS/3PressureMapping.pdf

**Final Words on the Subject**

As with everything else in healthcare, there are no panaceas. Healthcare changes rapidly and evidence-based practice has become a requirement. By learning, understanding, and applying the properties and performance characteristics of the many types of support surfaces, you can best match the support surface with your resident’s needs and clinical condition.

**Resources**


Lower-Extremity Wound Identification

Lower-extremity wounds are a common, recurrent problem in about 1% of the general population and 3.5% of persons over 65. This number increases to about 5% in those over age 80. Leg wounds are closely associated with venous disease, but about one-fifth of all persons have arterial disease, either alone or in conjunction with venous disease. Wounds of the lower legs and feet have many other causes as well. Pressure causes some open areas on the feet or legs, such as when a resident sits with the feet or legs crossed for prolonged periods of time or wears tight, ill-fitting shoes, or twisted socks. Other lower-extremity wounds are caused by malignancies, infections, and underlying medical conditions in which open areas develop readily, spontaneously, or after a minor injury. Assess the resident and the injury using the guidelines in Chapter 3.

Proper identification of lower-extremity wounds is an essential starting point for nursing care. Although lower-extremity wounds have multiple etiologies, the most common are pressure, neuropathy, and arterial or venous insufficiency. It is important to investigate the cause and learn the nature and characteristics of each open area because this information guides prevention and treatment. Misdiagnosis can lead to long periods of inappropriate treatment, which is often painful and can be harmful. Additionally, survey compliance is an issue. Long-term care facilities can expect to receive deficiencies for allowing preventable wounds to develop and/or worsen. Even when wounds are categorized as unavoidable, facilities are expected to identify the risk factors, take active measures to prevent new or worsening breakdown, and treat open areas promptly according to the standard of care.
Review Table 7.1 for a side-by-side comparison of the appearance and characteristics of venous, arterial, and diabetic ulcers.

**Arterial (Ischemic) Ulcers**

An arterial ulcer (ischemic ulcer) (Figure 7.1) is caused by a blockage or disruption of arterial blood flow as a result of arterial occlusive disease. Atherosclerosis is the most common cause of this condition, although trauma and thrombosis are also common inciting events.

Arterial ulcers may be misidentified as lacerations or skin tears, but injuries heal quickly compared with ulcers. In this condition, symptoms begin spontaneously. An early symptom (which may or may not be diagnosed in residents with arterial ulcers) is intermittent claudication, which is a diagnosis given for calf muscle pain and that can include aches, cramps, numbness, or a sense of fatigue. The problem develops or is most pronounced when the muscles in the calf or thigh do not receive enough oxygenated blood during exercise, causing pain and cramping. Symptoms disappear after a brief period of rest. Precipitating factors are as follows:

- Cardiovascular disease
- Diabetes
- Dyslipidemia
- Generalized arteriosclerosis
- Hypertension
- Increased pain with activity and/or elevation
- Inflammatory or autoimmune disorders
- Intermittent claudication
Table 7.1: Leg ulcer comparison chart

<table>
<thead>
<tr>
<th>Arterial Leg Ulcers</th>
<th>Diabetic Leg Ulcers</th>
<th>Venous Leg Ulcers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Causative or predisposing factors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>Diabetes mellitus with peripheral neuropathy</td>
<td></td>
</tr>
<tr>
<td>Advanced age (usually &gt;45; often elderly)</td>
<td>Hyperglycemia</td>
<td></td>
</tr>
<tr>
<td>Peripheral vascular disease</td>
<td>Ankle equinus deformity</td>
<td></td>
</tr>
<tr>
<td>Arteriosclerosis</td>
<td>Reduced ankle dorsiflexion</td>
<td></td>
</tr>
<tr>
<td>Atherosclerosis</td>
<td>Edema of extremity</td>
<td></td>
</tr>
<tr>
<td>History of intermittent claudication</td>
<td>Limited joint mobility</td>
<td></td>
</tr>
<tr>
<td>Limited joint mobility</td>
<td>Lower limb immobility</td>
<td></td>
</tr>
<tr>
<td>Lower limb immobility</td>
<td>Ill-fitting shoes</td>
<td></td>
</tr>
<tr>
<td>Edema of extremity</td>
<td>Neuropathic wounds most commonly occur in persons with diabetes, but are also seen in Hansen’s disease, spinal cord injury, and severe frostbite of the extremities</td>
<td></td>
</tr>
<tr>
<td>Ill-fitting shoes</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Common Location of Ulcers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distal extremity</td>
<td>Under the heel</td>
<td></td>
</tr>
<tr>
<td>Between toes or on tips of toes</td>
<td>Over the knuckle area of toes (phalangeal heads)</td>
<td></td>
</tr>
<tr>
<td>Over the knuckle area of toes (phalangeal heads)</td>
<td>Tips of toes</td>
<td></td>
</tr>
<tr>
<td>Tip of heel</td>
<td>Between the toes</td>
<td></td>
</tr>
<tr>
<td>Lower leg</td>
<td>Ball of the foot</td>
<td></td>
</tr>
<tr>
<td>Bony prominences of foot and ankle; commonly on lateral malleolus; rarely over medial malleolus of ankle</td>
<td>Over metatarsal heads</td>
<td></td>
</tr>
<tr>
<td>Any area subject to rubbing from shoes or clothing</td>
<td>Ulcer is usually on a bony prominence or area exposed to pressure</td>
<td></td>
</tr>
<tr>
<td>Any area subjected to trauma</td>
<td>Open areas common on feet, below ankles</td>
<td></td>
</tr>
<tr>
<td><strong>Appearance and characteristics of lower legs and feet</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skin dry, thin</td>
<td>Sensation diminished or absent in feet</td>
<td></td>
</tr>
<tr>
<td>Skin appears tight and shiny</td>
<td>Decreased or absent ability to feel temperature changes</td>
<td></td>
</tr>
<tr>
<td>Hair loss on foot and ankle</td>
<td>Deformities of feet</td>
<td></td>
</tr>
<tr>
<td>Toenails thick</td>
<td>Palpable pulses</td>
<td></td>
</tr>
<tr>
<td>Pallor of lower legs when elevated</td>
<td>Skin warm to touch</td>
<td></td>
</tr>
<tr>
<td>Red color (rubra) of lower legs when down</td>
<td>Loss and atrophy of subcutaneous fat</td>
<td></td>
</tr>
<tr>
<td>Loss of subcutaneous fat, atrophy</td>
<td>Person complains of paresthesia (pins and needles sensation)</td>
<td></td>
</tr>
<tr>
<td>Cyanosis</td>
<td>Ulcer probably painful</td>
<td></td>
</tr>
<tr>
<td>Coolness to touch, decreased skin temperature</td>
<td>Pain may be relieved by ambulation</td>
<td></td>
</tr>
<tr>
<td>Decreased or absent pulses</td>
<td>Absent ankle reflexes</td>
<td></td>
</tr>
<tr>
<td>Capillary refill delayed (&gt;3 seconds)</td>
<td>Atrophy of muscles in feet cause shifting of bones</td>
<td></td>
</tr>
<tr>
<td>Pain on walking; in later stages, pain at rest; pain may be intense when limb is elevated</td>
<td>Permanent flexion of toes (hammertoes)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flattening of the arches of feet</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gait changes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eventual loss of skin temperature regulation; distal rubra without warmth</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Loss of sweat and oil gland function</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Edema, firm to touch, may be pitting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Palpable pulses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dilated veins/varicosities visible on surface of skin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Thin, dry skin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>History of healed ulcers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Area around wound hyperpigmented (highly colored, blue, or brown color)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rashes or dermatitis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fibrosis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>May complain of throbbing pain, that worsens at night or during activity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>May complain of aching or heaviness in legs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pain usually intensifies with dressing changes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>May complain of severe burning or stinging</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pain may subside with elevation</td>
<td></td>
</tr>
</tbody>
</table>
Table 7.1

<table>
<thead>
<tr>
<th>Arterial Leg Ulcers</th>
<th>Diabetic Leg Ulcers</th>
<th>Venous Leg Ulcers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Appearance of ulcerated area</strong></td>
<td><strong>Appearance of ulcerated area</strong></td>
<td><strong>Appearance of ulcerated area</strong></td>
</tr>
<tr>
<td>• Wound margins well defined, regular, even</td>
<td>• Wound margins even and regular</td>
<td>• Irregular shape</td>
</tr>
<tr>
<td>• Necrotic tissue present</td>
<td>• Wound bed deep</td>
<td>• Ulcer is superficial, flat, shallow crater</td>
</tr>
<tr>
<td>• Gangrene possible; person’s risk is high</td>
<td>• Infection, cellulitis</td>
<td>• May be covered with yellow, moist tissue</td>
</tr>
<tr>
<td>• Wound bed white or pale in color</td>
<td>• Small to moderate amount of drainage</td>
<td>• Red-brown or blue color surrounding the wound</td>
</tr>
<tr>
<td>• Pale, blanched, or purple skin surrounding wound</td>
<td>• Sensation diminished or absent</td>
<td>• Usually not painful; pain increases with leg dependency, decreases with cool temperature, leg elevation, and activity</td>
</tr>
<tr>
<td>• Shiny, taut, thin, and/or dry</td>
<td>• Skin may appear brown in color</td>
<td>• Moderate to heavy drainage</td>
</tr>
<tr>
<td>• Atrophied (subcutaneous tissue)</td>
<td>• May have calloused area around ulcer</td>
<td>• May have scaly, dry, rash surrounding wound</td>
</tr>
<tr>
<td>• Edematous; edema is variable or atypical</td>
<td>• Infected wound may have thick, yellow slough and tan to black necrotic tissue in the wound</td>
<td>• Surrounding tissue fibrotic</td>
</tr>
<tr>
<td>• May be full or partial thickness</td>
<td>• Noninfected wounds have red wound bed with thick white-yellow callus formation encroaching on the wound bed</td>
<td>• Person may complain of severe pruritus</td>
</tr>
<tr>
<td>• Severe pain, decreases with dependency, increases with cool environment, activity, or leg elevation</td>
<td>• Amount and type of exudate depends on whether area is infected</td>
<td>• Edema</td>
</tr>
<tr>
<td>• Cellulitis, infection</td>
<td></td>
<td>• Exudate</td>
</tr>
<tr>
<td>• Minimal drainage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Heals slowly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• May be misidentified as a skin tear, laceration, or pressure from a shoe</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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- Moderate to severe peripheral vascular disease
- Obesity
- Sickle-cell anemia
- Smoking
- Vascular procedures/surgeries
- Vascular problems elsewhere in the body

**Treatment**

Healing depends on blood perfusion. The wound will not heal unless the blood flow is addressed.
When managing an arterial wound, do the following:

- Use a dry dressing for wounds with eschar and those that are not infected
- Treat infection aggressively
- Avoid hydrocolloids and other dressings that are changed every three to seven days
- Change dressings frequently for moist or draining wounds
- Monitor the wound closely if moist dressings, such as hydrogels, are used
- Monitor the wound and periwound skin regularly for maceration and signs of infection

For additional information, download the following:


**Venous (Stasis) Ulcers**

Venous ulcers (Figure 7.2) account for the majority—about 55%–70%—of lower-extremity wounds. A venous ulcer (stasis ulcer) occurs in the presence of valvular incompetence of the lower legs. Ulcers are most common in the area of the medial malleolus but can develop anywhere between the ankle and midcalf. They are usually recurrent and often result from minor trauma, such as bumping the leg. They may begin as blisters or as a result of minor irritation, such as scratching dry, itchy skin. The resident
may complain that the legs ache or feel heavy. Elevating the legs may relieve some discomfort.

The etiology of a venous ulcer is almost the exact opposite of that of an arterial wound. In this condition, the legs have too much blood because the damaged valves make circulation so poor that blood cannot return to the heart. Other precipitating conditions are as follows:

- Advanced age
- Blood pooling in the feet and ankles
- Cigarette smoking
- Congestive heart failure
- Edema (usually pitting)
- History of vascular ulcers
- Obesity
- Orthopedic procedures
- Pain reduced by elevation
- Pregnancy
- Previous deep vein thrombosis with phlebitis
- Pulmonary embolus
- Reduced mobility
- Sedentary lifestyle
- Traumatic injury
- Varicosities
- Venous hypertension

The resident has dilated superficial veins, with dry scaly crusts. Over time, the edema worsens due to fibrin deposits from the fluid leaking into the tissue. The red blood cells release their hemoglobin, causing discoloration of the lower calf, called hyperpigmentation or hemosiderosis (Figure 7.3), on the lower third of the leg. This produces visible changes. The tissue appears
gray-brown, dark, tan, or purple in light-skinned individuals and dark purple, black, or dark brown in dark-skinned persons. Pulses are usually palpable, and capillary refill is <3 seconds.

These areas are very difficult to heal, and healing takes a long time. One-fourth to one-third of persons with venous insufficiency also have arterial insufficiency, and most residents also have varicosities. The skin on the lower extremities in these residents is usually warm. This is deceiving on assessment because you may expect it to be cool due to the color and poor circulation. Edema and eczema are common in this area as well. All of these factors make healing difficult.

Compression therapy is a common treatment for venous wounds. However, nurses should be aware that compression is contraindicated in persons with concurrent arterial insufficiency. For additional information, refer to the “Compression for Primary Prevention, Treatment and Prevention of Recurrence of Venous Leg Ulcers: An Evidence- and Consensus-based Algorithm for Care Across the Continuum” at http://vlu.wocs.org/#home.

**Treatment**

Evidence-based treatment for venous ulcers includes leg elevation, compression therapy, dressings, pentoxifylline, and aspirin therapy. Surgical management is often considered when conservative measures fail or when the ulcer is large in size or of prolonged duration (Collins & Seraj, 2010). For mixed venous-arterial ulcers, treatment is usually aggressive, possibly including revascularization and compression. Saphenous surgery and split-thickness skin grafts may be necessary, and vacuum-assisted closure (see Chapter 10) is commonly used.

The initial goal of venous ulcer management is to control edema, usually by using elasticized stockings. Ace wraps and pneumatic pumps may also be used unless the resident has arterial insufficiency. Use such compression therapy in conjunction with topical wound care, whose goals are to absorb exudate, remove devitalized tissue, and prevent infection. Use a topical steroid or
similar product to control itching, if present. When caring for a resident with a venous wound, follow these guidelines:

- Use absorbent dressings, such as hydrofibers, alginates, and foams.
- Change dressings as often as necessary to control drainage, prevent leaking, and prevent maceration of the periwound tissue.
- Avoid or limit the use of chemical debriding agents, if possible. If used, monitor carefully and protect the periwound skin by coating with petrolatum or a comparable product.
- Avoid hydrogels and similar moisture-retentive dressings.
- Avoid products that commonly cause skin sensitivity, such as those containing lanolin, phenol alcohol, or topical antibiotics.
- Use compression therapy in addition to topical wound care to reduce edema and facilitate healing.
- Monitor the wound and periwound skin regularly for signs of cellulitis and dermatitis.
- Your primary goals are to maintain a moist environment, absorb exudates, and prevent infection.

**Resident Teaching**

Resident education should address the following:

- Ongoing use of compression hosiery, including after the ulcer has healed
- Elevating the affected extremity
- Avoiding prolonged periods of standing
- Calf pump exercises

**Graduated Compression Stockings (GCS)**

Graduated compression stockings (GCS) have been effectively used for years to prevent deep vein thrombosis in person who are hospitalized. They are also common in long-term care facilities and are worn by many persons living in the community. These stockings have many names, including elasticized stockings, anti-embolism hosiery, TEDS®, and Jobst® stockings. GCSs are just as the name implies: They are hosiery that provides graduated pressure and are tightest at the
ankle, becoming progressively looser as they extend up the proximal leg. The hosiery does the following:

- Increases blood flow velocity
- Improves valve function
- Reduces the risk of venous stasis and pooling
- Compresses superficial veins and capillaries, redirecting blood to the deeper, larger veins, where it flows effortlessly to the heart
- Reduces venous hypertension
- Decreases the risk of blood pooling and stagnation
- Decreases the potential for thrombus formation by decreasing blood vessel (venous) distension, contact time, and the concentration of coagulation reactants
- Provides additional support for the venous system, reducing edema and promoting venous return from the ankles and calves

These properties make GCS an ideal adjunct in the prevention and treatment of venous ulcers. Although they will not heal varicose veins, consistent use of GCS reduces the risk of complications. Using regular wrapped elasticized bandages will help reduce lower-extremity edema, but they are ineffective for improving the muscle-pumping mechanism of the calf (which enhances blood flow). When the resident’s leg muscles contract, the elastic bandage stretches, which does not promote or assist in venous return. Another concern is that improperly applied elasticized bandages create a tourniquet effect, reducing blood flow back to the heart. Despite the fact that the GCS is a low-tech device, using it properly is of critical importance.

**Additional Considerations**

Some residents have such poor circulation that their legs are at risk, and the wounds require intensive monitoring and aggressive preventive measures. Aggressive and intensive suggestions include the following:

- At the end of each shift, the off-going nurse should check the resident’s feet and open or loosen any pressure-relieving devices to enable the leg to rest while the skin cools and dries.
• At the beginning of each shift, the oncoming nurse should monitor, observe, and palpate the resident’s heels, check lower-extremity pulses, and replace/fasten the open pressure-relieving device.

• Monitor circulation in the resident’s feet and toes every four hours, or as specified on the care plan. Note color, sensation, swelling, temperature, and ability to move. Report abnormalities to the physician.

• Check the circulation in the toes of residents wearing anti-embolism hosiery (TED hose, compression hose, graded pressure hosiery) one or more times each shift by looking through the hole in the toe end of the stocking. Document this monitoring on the flow sheet. Because anti-embolism hosiery are difficult and time-consuming to remove for inspection, palpation, or visualization of the heels, make a vertical split across the heels of this hosiery. Doing so enables you to retract the stocking to inspect or palpate the heel, and it relieves pressure.

The Unna Boot

An Unna boot is an effective form of compression therapy used for treating venous stasis problems. The boot is a nonstretchable, pliable dressing that supports and preserves the leg contour during muscle contraction. The boot is actually a paste bandage that is impregnated with zinc oxide, gelatin, and glycerin. Various manufacturers promote other additives to accelerate healing, but the jury is still out as to their efficacy.

When the resident walks, the boot exerts even pressure on leg veins, with a pumping action. Walking activates the boot and improves circulation. Advantages to using the Unna boot are as follows:

• Reduced healing time

• Increased comfort

• Decreased itching (some brands also contain calamine lotion)

• Ability for the resident to walk normally

• Fewer dressing changes

• Low cost

Apply the Unna boot when edema is minimal. The boot applies very little compression; its primary benefit is its semi-rigid nature. To use it, dress open areas before applying the boot, and
then wrap the boot in a circular fashion from the foot to just below the knee. Avoid tension on the bandage. It stiffens as it dries, which prevents edema from increasing. Unna boots harden to an inelastic form and require frequent changes (Collins & Seraj, 2010), about every four to seven days. Disadvantages to using the Unna boot are as follows:

- Limited absorptive capacity for heavily draining wounds
- Residents are not able to shower independently; staff can seat the resident in a shower chair and cover the boot with a plastic bag
- New breakdown can develop if the boot is applied incorrectly or not changed frequently enough
- The boot is semi-rigid and does not accommodate changes in leg volume when edema subsides
- The wound is not visible with the boot in place; if the resident complains of pain or other symptoms, the boot must be removed

Despite the drawbacks, the boot is most effective for persons with lower-extremity edema that has not improved with compression. It is also effective for bedfast and nonambulatory persons who cannot tolerate high levels of compression. Some physicians order an elastic wrap to the leg after the Unna boot has dried (Solid, 1984). Inelastic compression bandages such as the Unna boot provide limited pressure at rest but high pressure with activity (De Araujo, T., et al., 2003; Puffett, et al., 2006).

Inelastic short-stretch bandages have properties similar to those of the Unna boot, but they are less rigid. They have proven to be an efficacious method of treating venous ulcers (Franks et al., 2004). These bandages stretch up to 70% beyond their nonextended length. They work in conjunction with the muscles, similar to the Unna boot, and they provide continual compression, preventing further edema. However, unlike the Unna boot, they can be washed in mild soap, air-dried, and reused. One type is called an Unna paste bandage, but it is a short compression bandage, not an Unna boot. They provide higher working pressure and greater muscle pump efficiency (the resistance the bandage places against the muscles when the resident is active) than elastic garments and may be worn 24 hours per day.
Diabetic (Neuropathic) Ulcers

A diabetic ulcer (neuropathic ulcer) (Figure 7.4) may develop in residents with a diagnosis of diabetes mellitus with peripheral neuropathy.

Smoking and heredity are also common risk factors, and although neuropathic wounds are most common in residents with diabetes, they are also seen in persons with the following:

- Advanced age
- Alcoholism
- Chemotherapy
- Hansen’s disease
- HIV, AIDS, and related drug therapies
- Hypertension
- Impaired glucose tolerance
- Obesity
- Raynaud’s disease
- Scleroderma
- Severe frostbite
- Spinal cord injury and neuromuscular diseases

Complications of this kind of wound can be very serious and include the following:

- Cellulitis
- Osteomyelitis
- Gangrene
**Charcot fracture**: A Charcot (neuropathic) fracture results from chronic wear and tear on the bones and joints of the foot. The etiology is poorly understood but may involve a combination of factors. Sensory neuropathy, repeated injuries and minor trauma, and metabolic abnormalities that weaken the bone are believed to be leading causes. Although it’s seen primarily in persons with diabetes, such fractures occasionally occur in non-diabetics. What makes it serious is that diabetic neuropathies affect sensation, and the person can crush their joints and bones unknowingly by walking on an injured foot. The process can cause collapsed arches and changes in foot shape.

**Treatment**

Your major concerns are to protect the foot from trauma, prevent and relieve pressure, and prevent and aggressively treat infection. Revascularization may be necessary. Follow these guidelines when caring for a person with a neuropathic wound:

- Monitor blood sugar closely and maintain tight glycemic control (Hgb A1c < 7%).
- Regular hemoglobin A1c monitoring.
- Use absorbent dressings, such as hydrofibers, alginates, and foams.
- Alginates have been used very successfully with short-stretch bandages (Kasseroller & Brenner, 2009).
- Change dressings as often as necessary to control drainage, prevent leaking, and prevent maceration of the periwound tissue.
- Use dressings that maintain a moist surface, absorb exudates, and allow easy visualization. Use occlusive dressings with caution.
- Use props, bridging, and/or pressure-relieving devices to relieve pressure to the wound site.
- Eliminate necrotic and devitalized tissue. Necrotic tissue is usually overloaded with bacteria, and devitalized tissue provides a good culture medium for pathogen growth and impairs the ability to fight infection.
- Chemical debridement may be used to clean the wound bed and remove slough, but sharp debridement may be needed.
- Hydrogels work well for maintaining a moist environment for wounds with little or no exudate.
• Monitor the wound and periwound skin regularly for signs of cellulitis.

• Offload pressure on the foot with a cane, crutches, walker, wheelchair, custom shoes, special orthopedic shoe modifications, custom inserts, custom relief orthotic walkers, diabetic boots, forefoot and heel relief shoes, and total contact casts.

Diabetic socks

Persons with diabetic neuropathy of the foot are at risk for sensation loss, which allows injuries or diabetic foot ulcers to go undetected. Infection may occur. If not treated promptly and properly, amputation may be needed. Diabetic socks are important for maintaining healthy feet. They protect the feet from external injury and damage, reduce or minimize irritation, provide light or no compression, reduce pressure, and are more comfortable than regular socks.

Other Types of Ulcers

Many types of leg ulcers have been identified. The most common are arterial, venous, diabetic, or a combination of these. Although the information in this chapter focuses on the most common types, nurses must be aware that many other causes and types of wounds exist as well. Other causes should be considered for wounds that do not quite fit the typical diagnoses or do not respond to the usual treatment.

Over the past few decades, with the advent of the internet and widespread travel, the world seems to have gotten smaller. As we have become more global, ulcers that were previously seen only in developing countries are being seen throughout the world. Clinicians in the United States may not have learned about or been exposed to ulcers caused by conditions such as Leishmaniasis, Hansen's disease (leprosy), hematological ulcers (seen in anemia, sickle-cell disease, and thalassemia), and mycotic or bacterial skin infections. In addition, systemic immune disorders, medications, and malignancy can cause nonhealing ulcers.

When you encounter an ulcer, evaluate it:

• Carefully observe the clinical features of the ulcer, and compare them to what is known for the most common types of leg wound. Consider the most common causes first before moving to the rarer ones. If a resident has traveled outside of the United States or has known conditions associated with atypical leg ulcers and/or slow healing, be sure to inform the healthcare provider. At the very least, nurses must be aware that ulcers may
have other causes, and they should discuss these possible causes with the healthcare provider if the open area does not fit the usual mold.

- Also consider other etiologies:
  - Medication-related ulcers: These are increasingly common in persons using warfarin (Coumadin). These ulcers can be seen upon initiation of therapy but also in long-term warfarin use. Skin necrosis develops in areas with good blood supply that are often not subject to pressure, such as the muscles, breast, penis, abdomen, and buttocks. The resident may complain of redness and a tight feeling of the skin, or paresthesia. The lesions develop rapidly and are well demarcated, looking like ruptured blood vessels. An online search for “warfarin necrosis” will bring up an abundance of information. Short- and long-term hydroxyurea use is also known to cause skin ulcers. For healing to occur, the medications must be discontinued, and surgical intervention and skin grafting may be necessary.

Malignant Ulcers

With any nonhealing skin ulcer, consider malignancy. Nonhealing wounds and wounds that initially show signs of healing but then break down are highly suspect. In any event, treatment is not successful. Such ulcers usually increase in size rapidly. They often have an irregular, nodular appearance with an irregular, raised, or rolled border. Wounds caused by a malignancy are often itchy but not painful. The resident should be referred to a dermatologist for biopsy. Common malignancies are as follows:

- Basal cell: A slow-growing area.
- Squamous cell: A fast-growing area.
- Nodular melanoma: A highly pigmented area, malignant and fast-growing.
- Infective conditions: Ulcers may be bacterial, viral, parasitic, or fungal. Some of these take a long time (up to a year) to manifest signs and symptoms. Unfortunately, diagnosis can be elusive because laboratories typically do not (or cannot) test for some of the rare causative organisms, especially parasites and fungi.
- Vascularities/inflammatory conditions (vasculitic ulcers): These primarily occur as a result of small vessel disease. The presence of antibodies leads to inflammation of
arterioles, venules, and capillaries, causing ischemia, vascular obstruction, and infarction. Vascular wounds are commonly triggered by connective tissue disease, infection, malignancy, and medication. They are more common in women. These areas have the following characteristics:

- Initially appear to be dark, palpable spots or ruptured blood vessels
- Often expand rapidly
- Are usually on the shin and often appear clean, shallow, and otherwise healthy; sometimes sloughy in the acute phase
- Active inflammatory edges
- Lesions are surrounded by erythematous, purple, or purple-red edges, or a necrotic margin
- Pain can be severe, even before the lesions first appear
- May appear as “punched out”
- Sometimes have an associated rash

**Resources for Atypical Wounds**

- “Massive Tissue Necrosis Can Be Induced by Heparin or Warfarin”: [www.ncbi.nlm.nih.gov/pmc/articles/PMC2448648/pdf/ulstermedj00077-0125.pdf](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2448648/pdf/ulstermedj00077-0125.pdf)
- “Guideline for the Management of Patients with Other Causes of Leg Ulceration”: [www.google.com/url?sa=t&cd=11&ved=0ahUKEwjFxLjEZXPAhVm7YMKHVFl5gLQFghlMAo&url=http%3A%2F%2Fwww.hacw.nhs.uk%2FEasySiteWeb%2FGatewayLink.aspx%3Falld%3D8801&usg=AFQjCNNGFTqao1c0ZN3fpJCDA0Sc9_diOBg&sig2=d2TzIJsOS8ke2btSinkB8lg](http://www.google.com/url?sa=t&cd=11&ved=0ahUKEwjFxLjEZXPAhVm7YMKHVFl5gLQFghlMAo&url=http%3A%2F%2Fwww.hacw.nhs.uk%2FEasySiteWeb%2FGatewayLink.aspx%3Falld%3D8801&usg=AFQjCNNGFTqao1c0ZN3fpJCDA0Sc9_diOBg&sig2=d2TzIJsOS8ke2btSinkB8lg)
- “Care of People with Chronic Leg Ulcers: An Evidence-Based Guideline”: [www.nzgg.org.nz/guidelines/0008/ACF672.pdf](http://www.nzgg.org.nz/guidelines/0008/ACF672.pdf)

**Describing and documenting the wound**

Ulcer care begins with accurate assessment (see Chapter 3) and healthcare provider notification. Accurate description and documentation are also necessary for identifying the type of ulcer and selecting the most effective treatment product.
Preventive Plan of Care

Develop individualized preventive measures to meet the resident’s needs, and note them on the plan of care. Use the nursing process to evaluate their effectiveness quarterly, and more often if there is a change in condition. Please note that these approaches are specific to the lower legs and feet; see Chapter 8 for general pressure injury approaches. Suggested care plan approaches include the following:

- Relieve pressure on the heels by elevating the calves on pillows or through pressure-relieving boots.
- Pay careful attention to foot care, including regular washing with mild soap.
- Teach nursing assistants the importance of drying well between toes.
- Apply moisturizers to feet to manage dry skin and cracking (avoid the area between the toes).
- The nursing assistant should inspect the feet daily.
- A licensed nurse should perform a weekly foot inspection during routine check.
- Obtain podiatrist care according to resident needs.
- Use well-fitting shoes with round or box toes; avoid pointed toes.
- Check shoes for fit and pressure.
- Use special orthopedic/custom/diabetic shoes, as needed and ordered.
- Use clean, absorbent socks that fit properly.
- Teach nursing assistants and residents the importance of changing socks daily.
- Wear white cotton socks if a fungal infection (athlete’s foot) is present.
- Ensure proper-fitting anti-embolism hosiery according to actual measurements, as specified by manufacturer. Avoid guessing on size. Measure for accuracy.
- Check the anti-embolism stockings periodically to be sure the tops have not rolled or turned down. Keep the fabric straight.
- Apply anti-embolism hosiery correctly. Most brands have a hole in the toe end to allow access for circulation checks. In some hosiery, the hole is on the top of the foot, whereas in others it is on the bottom. As long as the heel is centered, the hole will be in the correct place.
• List the wearing schedule for the anti-embolism hosiery on the care plan, according to physician orders and facility policies. For most residents, the hosiery is applied during the day and removed at bedtime.

• Make sure that the resident has two pairs of anti-embolism hosiery available. Hand-wash the hosiery in mild soap, and allow them to air dry. Never send them through the facility washer and dryer.

• If diabetic, maintain blood sugar control (Hgb A1c of < 7%).

• Protect the feet and legs from injury.

• Keep feet and legs covered with pants, socks, stockings, etc. Consider using skin sleeves or covering with stockinette.

• Always wear shoes when out of bed; never get up in stocking feet or barefoot.

• Ensure that the room is free of obstacles.

• Trim toenails regularly (clip straight across, and check for sharp edges).

• Pad side rails, if needed.

• Pad wheelchair leg rests, if needed.

• Position the resident correctly in the chair or wheelchair.

• Support the feet when the wheelchair is moving; never allow them to drag on the floor.

• If the legs are too short to reach the footrests of the wheelchair, ask therapy or maintenance to shorten the leg rests or add a commercial foot elevator.

• Support the feet on footrests, floor, or stool when the wheelchair is parked; the legs should never dangle.

• Push the wheelchair from behind by guiding it with the handgrips. Avoid walking too quickly. Slow down and look before turning corners.

• Approach swinging doors with caution. Prop the door open before entering, if possible. If not, back the wheelchair through the doorway.

• Always back the wheelchair over the thresholds in doorways.

• Regularly turn and reposition immobile residents.
• Palpate pedal and posterior tibial pulses during the weekly skin check; document the results on flow sheet.

• Support the sole of the foot to prevent foot drop.

• Avoid tucking upper bed linen in tightly over the feet.

• Reduce sources of friction and shearing to the feet.

• Teach nursing assistants to move residents without dragging their heels on the bed.

• Monitor foot appliances one or more times each shift for proper placement and adequate circulation to feet.

• For residents with unilateral lower-extremity amputation, position the remaining joints and extremity in extension. Avoid elevating the stump on pillows. These residents are at high risk for developing contractures, which further increase the risk of pressure injuries. Specify positioning instructions on the care plan.

REFERENCES


Ongoing Plan of Care

Once a pressure injury has been identified, update the care plan immediately. Never leave an ineffective plan in place. If you have a preventive plan of care in place, it was ineffective. Try to determine why it did not work. For example, ask the following:

- Did staff know about the plan?
- Did they follow the plan?
- Is the problem due to resident noncompliance?
- Were more aggressive measures needed?
- Was a tissue tolerance test done to individualize the time interval for pressure relief? Does it need to be repeated?

Identifying the reason that the plan did not work will help you prevent further breakdown. Assess contributing factors, and initiate appropriate interventions. Review the resident’s history and medical condition, medications, and other risk factors to determine whether the care plan addresses all potential causes or complications.

Planning Care

Use the steps of the nursing process to develop the plan of care. The care plan should be personalized to the resident, as well as realistic and meaningful. Encourage and allow the resident to participate in making decisions about his or her life and care. Consider how the pressure injury affects the resident’s medical, emotional, social, and environmental needs and quality of life.
Chapter 8 | Nursing Strategy: The Plan of Care for a Resident With a Pressure Injury

Consider the various items on your risk assessment and resident-specific issues (e.g., head of bed elevated, diabetes, pressure injuries on both hips that limit turning surfaces), and write the plan to address them.

When planning pressure injury care, determine the overall goal based on multiple perspectives:

- Resident
- Family members involved in the resident’s care
- Interdisciplinary team

Based on this information, determine whether the goal/priority of pressure injury care will fall into one of these categories:

- Comfort (palliative)
- Active pain management (combined with other treatment)
- Maintenance (ongoing)
- Healing (aggressive)

Consider the following:

- Any and all problems associated with the pressure injury, including medical, emotional, social, environmental, and economic issues
- Skeletal and structural problems that affect positioning (e.g., CVA, hip fracture, amputation, surgery, scoliosis, pain)
- Respiratory problems that affect your ability to position the resident
- Finger stick blood sugars (FSBS) and hemoglobin A1c (Table 8.1)
- The overall impact of these problems on the resident’s health and quality of life
- Strengths and resources available to the resident that can be mobilized to deal with each identified problem
- Whether additional information is needed
Chapter 8 | Nursing Strategy: The Plan of Care for a Resident With a Pressure Injury

Identify goals that are as follows:

- Useful.
- Outcome-based.
- Realistic and attainable. Do not be afraid to break a goal into tiny pieces that are part of a larger goal. Setting a goal too high or making a goal too complex may overwhelm both the resident and staff.
- Individualized to the resident based on a synthesis of the assessment information.
- Measurable. Numbers and percentages are often used to accomplish this.
- Important to the resident; he or she should prioritize goals, if possible. Things that are important to the resident enhance quality of life.
- Easy to understand; all staff should know exactly what the goal is expected to accomplish, based on real problems.

Develop the plan by doing the following:

- Listing what needs to be done, who will do it, when, how, etc.
- Defining what outcomes should be expected in measurable terms
- Determining a realistic time frame for the outcomes

### Table 8.1 Comparison of Hgb A1c and FSBS

<table>
<thead>
<tr>
<th>Hemoglobin A1c</th>
<th>Average daily blood glucose</th>
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</thead>
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<tr>
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<tr>
<td>11.0%</td>
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<td>8.0%</td>
<td>205 mg/dl</td>
</tr>
<tr>
<td>7.0%</td>
<td>170 mg/dl</td>
</tr>
</tbody>
</table>

**Suggested care plan approaches for residents with pressure injuries**

The resident with a pressure injury is at risk for additional breakdown. Review the preventive approaches in Chapter 2, and list all that are relevant on the plan of care. For leg injuries, also consider the care plan approaches in Chapter 7. You may wish to consider using the Nursing
Interventions Classification (NIC) and Nursing Outcomes Classification (NOC) care plan approaches. These systems simplify care plan development and evaluation considerably by providing listings of research-based approaches and a means of measuring outcomes. You can select the relevant approaches from their exhaustive lists. Other potential actions and example care plan approaches include the following:

- Repeat the pressure injury risk assessment.
- Repeat the tissue tolerance test in bed and chair.
- Notify the MDS nurse and other appropriate team members.
- Complete a significant change MDS upon emergence of a pressure injury at Stage 2 or higher when no pressure injuries were previously present at Stage 2 or higher.
- Develop any necessary individualized measures to meet the resident’s needs, and note them on the plan of care (e.g., avoid positioning on left side, prefers two pillows behind back).
- Communicate care plan changes to staff, and update relevant flow sheets.
- Take steps necessary to enhance the resident’s systemic condition to promote healing.
- Counsel the resident to quit smoking. Avoid nicotine patches if operative closure will be done. Patches have a longer half-life than tobacco.
- Request a dietitian reevaluation as soon as possible.
- Correct fluid deficiencies. Ask the dietitian to calculate the resident’s minimum fluid needs. Record this number on the care plan. Evaluate the resident's total fluid intake each day for adequacy by comparing the dietitian’s calculations with the actual fluid intake.
- Review food intake and nutritional status, and determine whether nutritional supplements and other corrective measures are needed.
- Increase assistance with meals, if needed.
- Increase fluids.
- Implement intake and output monitoring and assessment.
- Increase frequency of weight monitoring.
- Individualize the treatment based on the characteristics of the wound.
• Employ effective wound bed preparation and establish a moist healing environment that includes removal of nonviable tissue, evaluation of pathologic findings (e.g., granulation tissue, scar, gangrene, infection, fibrosis, tumor), evaluation and treatment of infection, elimination of odor, pressure relief and stimulation of blood flow, management of drainage, and initiation of wound closure.

• Promote a clean wound base.

• Prevent the wound from drying out.

• Avoid maceration of the wound and periwound tissue.

• Fill wound cavities.

• For terminally ill and palliative care residents, establish realistic goals, such as relieving pain and preventing pressure injury progression.

• Relieve pressure on the heels by elevating the calves on pillows or using pressure-relieving boots in which the heels float.

• Protect the elbows from shearing with elbow (heel) protectors. Check the elbows regularly for signs of pressure.

• If the resident is bedfast, monitor the ears and back of head for pressure. You can bridge these areas with small (travel-size) pillows.

• Consider microfiber pillows for pressure reduction on the sides of the feet, heels, ears, and elbows. These can be purchased at department stores or online. The small cylindrical pillows are about 14 x 8 inches and are filled with microfiber beads, similar to beanbag chairs. They are excellent for pressure reduction.

• Increase frequency of bathing.

• Prevent buildup of moisture on skin in pressure areas and bony prominences.

• Evaluate the open area at the time of each treatment (daily during dressing change, or if a transparent dressing/no dressing is present). Check the following:
  - Appearance of periwound tissue
  - Appearance of skin surrounding the dressing
  - Presence of possible complications
- Presence of increased redness, swelling, odor, or drainage
- Whether pain, if present, is being adequately controlled

- Evaluate the status of the dressing, if present. Check whether dressing is any of the following:
  - Intact
  - Draining (check amount of drainage)
  - Leaking

- Observe the resident’s skin daily (nursing assistant) with careful attention to the bony prominences. Notify nurse promptly of problems or abnormalities.

- Completely reassess and measure the open area at least weekly, any time there is a change, or according to facility policy.

- Consider descriptive documentation of the open area before a resident leaves the facility (for clinic visit, hospitalization, etc.) and immediately upon return.

- Document the results of all assessments in the medical record.

- Frequently evaluate the efficacy of the treatment, and modify the plan of care as needed.

- If the condition of the resident or wound deteriorates, immediately reevaluate the treatment plan, be sure that the plan is being correctly implemented, and contact the healthcare provider.

- If no progress in healing is noted in two weeks, reevaluate the adequacy of the treatment plan, as well as adherence to the plan. Modify as needed. Evaluate for infection. Notify the healthcare provider.

- If a debriding agent is used, discontinue use as soon as necrotic tissue is removed. Protect the healthy skin surrounding the open area when debriding agents are used.

- Use skin barriers and similar products around the open area to help prevent further breakdown and to prevent irritation from tape and dressing adhesives.

- Some residents with sensitive skin have problems with tape remover burning. Try baby oil, mineral oil, or olive oil. Be aware that tape may not stick to the area if an oily residue is present.

- Provide pain management by eliminating mechanical sources of pain and providing analgesia. Assess the resident frequently using a pain scale. (You may need a separate

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136 | Pressure Injuries in Long-Term Care: A Toolkit for Clinical Staff © Barbara Acello
care plan goal for addressing pain.) Also see the care plan approaches for pain during dressing change in Chapter 9.

- Arrange interventions to meet psychosocial needs and goals.
- Note that psychological stress, sleeplessness, and depression have been implicated in altered immune response and impaired healing.
- Note that some residents with paraplegia and tetraplegia (quadriplegia) view their bodies as separate objects, neglecting care and pressure-relieving measures.
- Note that some individuals with paralysis from spinal cord injury have deliberately induced serious pressure injuries so that they could be hospitalized.
- Assess and manage incontinence. Protect the open area from contamination from urine and stool.
- Provide resident, family, and staff teaching as indicated.
- Avoid positioning the resident on existing pressure injuries. Consider the following:
  - A resident should avoid sitting if he/she has an open area on a sitting surface.
  - Employ positioning techniques and devices and use of support surfaces.
  - Provide frequent turning and regular repositioning based on tissue tolerance and individual needs. Develop a written schedule if appropriate.
  - The goal of load management is to create an environment that enhances soft tissue viability and promotes healing of the pressure injury.
  - Avoid doughnut-type devices and exam gloves filled with water.
  - Maintain the head of the bed at the lowest degree of elevation medically necessary.
  - Move a sitting resident at least once per hour.
- Take steps to prevent wound infection. Signs of localized infection include the following:
  - Thick yellow or green pus
  - Foul smell from the sore
  - Redness and swelling around the sore
  - Tenderness and warmth around the sore
  - Nonhealing wound
• Signs of systemic infection include the following:
  – Fever or chills, hypothermia
  – Mental confusion
  – Tachycardia
  – Weakness
  – Elevated white blood count

Refer to Chapters 11 and 12 for additional information about infection.

Apply the principles of standard precautions in the care and treatment of all pressure injuries and open skin wounds.

**Care Plan Approaches and Practices for Preventing Wound Infection**

Apply the principles of standard precautions when treating pressure injuries:

• Wash your bandage scissors with an alcohol product or soap and water before and after each use. Your bandage scissors may transfer pathogens to environmental surfaces, from one resident to the next, and to your own hands and pockets.

• Leave the treatment cart in the hallway. Remove your supplies and carry them into the resident’s room, placing them on a clean surface. Avoid bringing large facility stock bottles (such as normal saline) into a room. Pour what you need into a paper cup or plastic medicine cup.

• Change gloves and wash hands after cleansing the open area and before applying ointment and clean or sterile dressings. Avoid cross-contamination between wounds. (Care for the cleanest area first if multiple open areas are present.)

• When caring for a resident with multiple open areas, change gloves between wounds. Discard gloves in a manner that avoids contamination of the environment and of clean supplies.

• Use sterile instruments for debridement.

• Clean dressings and a no-touch technique are usually recommended. Follow facility policy for use of clean or sterile dressings; dispose of soiled dressings and contaminated trash in a manner that avoids contamination of the environment and of clean supplies.
• During the dressing change procedure, avoid crossing over clean supplies with contaminated items and dressings. Place an open plastic trash bag at the end of the bed or a place where it will not cause contamination.

• Debridement of necrotic tissue is one of the most important ways for preventing infection. Eschar and slough are excellent media for breeding pathogens. The necrotic tissue presents a severe insult to the tissue, and the wound will not heal until the eschar has been removed. Devitalized tissue is almost always colonized with many bacteria. Consider the following points on debridement:

  – In the long-term care facility, chemical and autolytic debridement are most common. These are slow methods compared with sharp debridement.

  – In most states, nurses cannot perform sharp debridement. Your board of nursing may permit you to crosshatch eschar so debriding agents will penetrate the tissue. Check with your nursing board before performing this procedure.

  – Autolytic debridement is done with transparent films, hydrogel, and hydrocolloid dressings. This type of debridement liquefies and softens the eschar. Natural enzymes within the body will digest the devitalized tissue.

  – Chemical debridement is done with prescription creams and ointments. Protect the surrounding skin with petroleum jelly or other comparable products if using chemical debriding agents. Change the treatment as soon as the dead tissue has been removed.

  – At one time, wet-to-dry dressings were the gold standard in wound care. Avoid them if possible. Wet-to-dry dressings are painful for the resident and often ineffective. Many excellent methods of debridement are available, making this outdated treatment unnecessary.

  – Debride heel open areas with eschar only if edema, erythema, fluctuance, or drainage are present. Never debride stable heel lesions with eschar. Dry eschar is a natural protective dressing. Removing it increases the risk of complications, including infection and amputation. Eliminate all pressure from the heel.

Eliminate infection, if present. A wound that has been contaminated will heal; an infected wound will not. Consider the following:

• All Stage 2, 3, and 4 wounds are colonized. Regular cleansing, debridement (if needed), and careful technique should prevent colonization from proceeding to infection and delayed wound healing.
• Topical antibiotics may be appropriate. (Systemic antibiotics may not penetrate the wound tissue or be effective in decreasing bacterial levels in granulating wounds, whereas topically applied antimicrobials are often effective.) Watch for response and sensitivity. Avoid all unnecessary antibiotics. However, systemic antibiotic therapy is indicated for treating sepsis, bacteremia, advancing cellulitis, and osteomyelitis.

Other Issues

Other issues concerning the care plan are as follows:

• Repositioning
  • Be sure that care plan and nursing assistant assignment sheets contain repositioning schedules and instructions.
  • Select a documentation system that does not require staff to initial the form each time the resident is turned. There is no requirement to do this, and it is unrealistic for staff. A single line on a flow sheet, such as “Turned q 2 hours this shift,” should be sufficient.
  • Nursing assistant assignment sheets should list all appropriate interventions related to preventive skin care or pressure injuries.
  • Consider keeping the assignment sheets.
  • Implement a written communication system for nursing assistants who discover a skin problem.

Care plan review

• Reevaluate the plan of care when there is a lack of progress or a decline. The plan is not working.
  • Document this review.
  • Complete a new risk assessment.
  • Clearly update the plan.

Diarrhea

The enzymes in the digestive system break down food. They also break down skin. Residents with diarrhea can experience rapid skin breakdown, so consider using an external fecal collection pouch to contain liquid feces. Many brands are available, and the directions for application vary with the manufacturer. The collection system consists of an adherent skin barrier and a pouch, and it can be
attached to a bedside collection device. The fecal collector provides a closed system that helps minimize the spread of infectious organisms. Charcoal filters can be applied if flatus is a problem.

The downside to external fecal collection devices is that they do not work well for residents who are ambulatory or who slide down in bed. When applied correctly, they last 12–48 hours. Skin irritation may impair the ability to apply the device, as may moisture barrier creams. Using a skin prep product to improve adhesion may be helpful.

Stool transplant is being used successfully to treat *Clostridium difficile* diarrhea. A vaccine is also in the works to prevent this condition. For additional information, refer to [http://thefecal-transplantfoundation.org/](http://thefecal-transplantfoundation.org/).

**Wound Pain**

Many long-term care facility residents have at least one painful chronic medical condition. Immobility, improper movement, friction, and shearing often increase pain. Open areas on the skin can be excruciatingly painful. Sixty to eighty percent of residents with chronic wounds experience some pain, and 50% of residents with pressure injuries have pain, especially those with Stage 3 and 4 pressure injuries (European Wound Management Society, 2002). Residents with paralysis and spinal cord injuries often experience persistent pain in areas that otherwise have no sensation. Residents who have had an amputation experience phantom pain, which is a very real form of neuropathic pain that may result in burning, tingling, itching, numbness, or pain seeming to originate in a part of the body that has been removed. Neuropathic pain is associated with abnormal processing of sensations by the nervous system.

Inadequate pain management causes delayed healing and lack of compliance with care. Circulation to the wound can be decreased during episodes of pain. Pain typically subsides with healing in acute wounds, but the protracted inflammatory response seen in chronic wounds may cause primary hyperalgesia, an increased sensitivity in the wound and surrounding skin (secondary hyperalgesia). Over time, the resident experiences additional pain during treatment, debridement, movement, etc. This can trigger alldynia, a condition in which normal, nonpainful stimuli cause pain. Because wounds damage nerves, some residents may develop neuropathic pain, a condition in which the resident’s pain response is exaggerated. Minor sensations, such as air on a wound, a light touch, or a change in temperature, will evoke intense pain. Other complications such as infection and ischemia may contribute to the resident’s pain response. Inadequate wound management also contributes to wound pain.
Pain is highly variable and individualized (Szor & Bourguignon, 1999), and there is no proven relationship between the intensity of pain and the type or size of the wound. Therefore, avoid assuming that wound size affects pain. A small wound can be very painful, whereas a large wound in a different resident may cause only mild discomfort. The results of one study revealed that the degree of pain is related to the stage of the pressure injury. This is one piece of a growing body of evidence dispelling the belief that Stage 4 pressure injuries are painless (Coleman, 2001).

**Managing wound pain**

Always assume that residents with pressure injuries have pain unless they tell you that they do not. Pain is whatever the resident says it is. Elderly persons, cognitively impaired persons, and those with communication and language barriers are most vulnerable for undertreatment of pain. Monitor for nonverbal cues to pain, such as behavior problems, crying, yelling, holding or rubbing a specific body part, moaning, avoiding dressing changes, withdrawal, and constant sleeping. Pain is a major issue in quality of life, and pressure injuries hurt.

The goal of pain management in the resident with a pressure injury is to eliminate the cause of the pain, to provide analgesia, or both. Assess all residents for pain related to the pressure injury or its treatment. Avoid assuming that a resident is not in pain because he or she cannot express or respond to it. Manage pain by eliminating or controlling the source. Because pain may be evoked or may be especially acute during dressing changes and debridement, take steps to prevent it. Provide analgesia as needed and appropriate (U.S. Department of Health and Human Services, 1994).

Regularly assess residents with open wounds and pressure injuries for pain using a validated pain scale. If the pain is frequent or constant, consider giving a scheduled pain medication. If the resident has an order for PRN analgesics, give them at the earliest sign of pain. Do not wait for pain to get out of control. Always evaluate the resident’s response to pain-relieving medication, and consider asking manufacturers’ representatives, the wound care consultant, the pharmacist, and others for recommendations about pain management dressings and treatments.

**REFERENCES**


CHAPTER 9

Wound Dressings

Matching the Wound to the Dressing

Before selecting a dressing, you must be familiar with every aspect of the wound (see Chapter 3). These factors will help you estimate the age of the wound, whether it is healing, and whether pressure or infection are present. You also must accurately stage and describe the wound to the healthcare provider.

Many dressings contain an active treatment agent, so consider the characteristics of the wound when selecting a dressing. The keys to effective management are maintaining a moist environment, managing bacterial balance in the wound, and managing exudate, and choosing the right dressing is essential to achieving these goals. Base your selection of dressings on the following:

- Manufacturer’s recommended use
- Pressure injury characteristics
- Nature and volume of drainage
- Tissue in the wound bed
- Condition of the periwound skin
- Goals for healing (of both the resident and staff)

Consider these essential factors when selecting a dressing and treatment product to promote healing:

- Temperature
  - Maintaining normal temperature is essential because cellular functions are affected by wound temperature.
Localized hypothermia can suppress the resident’s immune response and inhibit healing. Similarly, cooling the tissues with irrigation, cleansing solutions, and frequent dressing changes inhibits healing.

Some dressings, such as semi-occlusive dressings, impede moisture loss and diminish this local cooling.

Applying a dressing that reduces moisture loss and does not require frequent changes will eliminate or reduce manual cooling of the wound.

**pH balance**

Water has a pH of 7.0 and is considered neutral. A substance with a pH below 7.0 is considered acidic. As the number approaches 1.0, the acidity increases. A product with a pH above 7.0 is considered alkaline. The alkalinity increases up to a limit of 14.0.

The pH of the wound should be neutral and about 7.4, which is similar to that of the bloodstream.

Wound contamination from urine, stool, or other drainage will alter the pH and slow healing.

Some antiseptics and cleansing products significantly impact the pH of the wound and inhibit healing. For example, acetic acid has a pH of 2.4. Although it will control bacteria (*Pseudomonas*), the healthcare provider must decide whether the benefits of eliminating bacteria outweigh the risks of cellular toxicity.

**Bacterial balance**

Preventing infection by keeping the bioburden low is critical to healing. Your goal is to keep the wound clean and prevent contamination.

One study found that bacteria can penetrate up to 64 layers of gauze (Lawrence, 1994).

**Semi-occlusive dressings** reduce wound infection by more than 50% compared with gauze dressings (Hutchinson, 1989; Hutchinson, 1993).

Semi-occlusive dressings also serve as a mechanical barrier to bacteria (Mertz, 1995; Lawrence, 1994).

**Moisture balance**

Moistening a wound externally does not have the same effect as retaining moisture over a period of time. For example, wet-to-dry dressings do not keep the wound
continuously moist and must be moistened regularly. Semi-occlusive dressings, in contrast, keep the wound continuously moist.

- Healthy tissue is moist, not wet. If a wound becomes too wet, such as from uncontrolled exudate, the tissue will become macerated. The dressing must have the ability to absorb moisture and transmit vapor. Absorbent dressings, such as alginates, foams, hydrofibers, and hydrocolloids, help balance moisture in the wound.

- Protecting the periwound skin
  - Select a dressing that will manage exudate and protect the periwound skin.
  - Protecting the periwound skin is essential. Skin preps and sealants can be applied to protect the skin from leakage and from the effects of tape.

**Purposes of Wound Dressings**

Unfortunately, there is no panacea for healing all types of wounds. Many individual variables must be considered. A nurse may call a physician and request an order for a dressing that is changed every five to seven days because, as far as workload goes, this is preferable to dressings that are changed daily or more often. Even if the physician has not seen the wound, he or she usually approves the order. Although the treatment may be effective, however, the wound may get worse instead because the dressing isn’t appropriate for that wound. For healing to occur, the dressing (primary and secondary) must match the wound type.

Properties to consider include the ability of the dressing to do the following:

- Protect the wound from trauma, contamination, and infection
- Cushion the wound
- Debride (if needed)
- Keep the wound clean
- Allow gas exchange
- Control bacterial count
- Maintain moist (not wet) wound environment and prevent wound drying
- Absorb exudate
• Insulate the wound
• Eliminate dead space
• Control odor
• Reduce pain
• Promote granulation

Selecting a dressing

• After familiarizing yourself with every aspect of the wound, select the most appropriate dressing that does the following:
  – Maintains a moist environment in the wound bed
  – Keeps the periwound skin dry while keeping the wound bed moist
  – Controls exudate without desiccating the wound bed
  – Meets the relevant criteria listed above

The nurse should do the following:

• Consider the moisture vapor transport rate (MVTR), which should be listed in the package insert. This is the degree of occlusivity of the dressing. The lower the MVTR, the higher the occlusivity and moisture retention. An MVTR of 35 or less is needed to maintain a moist healing environment.

• Consider caregiver time for dressing management.

• Eliminate dead space in the wound by loosely packing cavities. Avoid overfilling.

• Monitor dressings near the anus, since they are difficult to keep in place and are exposed to contamination. An external fecal collection pouch may be helpful.

• Consider potential sources of contamination for the treatment you are using, and anticipate the time and supplies needed to prevent cross-contamination. For example, gloves should be changed after the soiled dressing is removed and the wound is cleansed. Apply clean gloves before applying the clean dressing.

• When you have finished the procedure, clean your hands and bandage scissors with soap and water or alcohol-based hand cleaner.

Table 9.1 will help you select the product category that is useful based on the wound characteristics.
## Table 9.1: Common wound care dressings

<table>
<thead>
<tr>
<th>Type of Dressing</th>
<th>Indication</th>
<th>Information</th>
</tr>
</thead>
</table>
| **Absorptive**         | Full and partial thickness wounds, skin grafts, burns, abrasions, lacerations, surgical incisions, wounds of all types with drainage. | • Dressings vary with manufacturer. Semiadherent or nonadherent; some are highly absorptive.  
  • Minimize wound trauma.  
  • Primary or secondary dressings absorb mild, moderate or heavy drainage.  
  • Used for filling wound cavities, maintaining a moist environment, and providing autolytic debridement. |
| **Alginate** (Calcium Alginate) | Heavily draining wounds, tunneling wounds, both infected and noninfected wounds. Highly absorbent and may be used as wound packing. | • Used as a primary dressing.  
  • Made from seaweed and will absorb up to 20 times their usual weight. Forms a gel-like wound covering that maintains a moist environment and permits autolytic debridement.  
  • Provides rapid hemostasis during sharp debridement.  
  • May be ineffective in dry wound bed, or when little exudate is present.  
  • Must be used with a secondary (cover) dressing. For very heavy drainage, consider an absorptive secondary dressing; change when drainage leaks through the dressing. May also cover with foam, hydrocolloid, or film.  
  • Do not moisten before applying.  
  • Available as ropes and mats for tunneling, sinus tracts, or undermining. Do not use to fill tunneling or dead space unless it can be retrieved. When used as packing, pack loosely.  
  • Gentle to tissue.  
  • Frequency of change determined by drainage. May be left in place for up to seven days.  |
| **Antimicrobial**      | Use in wounds with active signs of clinical infection, positive culture, or in nonhealing wounds. | • Helps eliminate pathogens. Many different types available.  
  • Antimicrobial products eliminate pathogens. They do not heal wounds. Change the treatment when the infection has cleared.  |
| **Biologics, biosynthetics** | Used for clean, partial thickness wounds.                                                       | • Work as scaffolding or membranes to promote undisturbed granulation and healing.  
  • Available as gels, solutions, and semi-occlusive sheets with a variety of potential uses. |
| **Collagen**           | All types of infected and noninfected wounds; tunneling wounds, skin grafts, and donor sites. A good option for nonhealing wounds. | • Provides hemostasis.  
  • Encourages formation of collagen fibers in healing wound; enhances bodies’ natural repair mechanisms, stimulates development of new tissue; promotes debridement.  
  • Comes in several forms. Flakes and granules are not dressings. However, collagen is available in an absorbent sheet that dissolves into the wound when it contacts body heat and a small amount of moisture. This type of collagen is used as a primary dressing. A secondary dressing is necessary. |
| **Composite**          | All types of infected and noninfected wounds.                                                   | • Nonadherent; provide bacterial border and absorptive layer. Some have a border of tape or transparent film, which should extend at least 1 inch beyond margins. Adhere to intact skin. Consider skin sealant on wound borders.  
  • Many unique dressings fall into this category.  
  • May be used as primary and secondary dressings.  |
<table>
<thead>
<tr>
<th>Type of Dressing</th>
<th>Indication</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compression Dressing &amp; Wraps (Unna boot)</td>
<td>Venous stasis leg ulcers.</td>
<td>• A nonstretchable, pliable dressing that supports and preserves leg contour during muscle contraction.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Correct application is essential for product effectiveness. It should not be wrapped tightly.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Hardens as it dries to prevent edema. Impregnated with zinc oxide, gelatin, glycerin, and other ingredients, depending on manufacturer.</td>
</tr>
<tr>
<td>Contact layer</td>
<td>Full- and partial-thickness wounds, donor sites, and split-thickness skin grafts.</td>
<td>• Primary dressing to protect wound bed and allow granulation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• May also be used with medicated products.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Used with a secondary dressing. Allows exudate to pass through to be absorbed by secondary dressing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• These have proven quite useful in painful wounds.</td>
</tr>
<tr>
<td>Co-polymer starch dressings</td>
<td>Wounds with minimal to large amounts of exudate.</td>
<td>• Applied in a moist form and changed daily.</td>
</tr>
<tr>
<td>Fillers</td>
<td>Full- and partial-thickness wounds, tunnels, undermining, draining wounds. Used in deep cavities that need packing to fill dead space and absorb drainage.</td>
<td>• Many different dressings in this category. Some (such as Mesalt®) have antimicrobial properties.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Softens necrotic tissue.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• A secondary dressing is needed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Pack loosely.</td>
</tr>
<tr>
<td>Foam (Polyurethane Foam)</td>
<td>Full- and partial-thickness wounds; wounds with moderate to heavy drainage. Helpful for packing deep wound cavities, for venous stasis, and other weeping ulcers.</td>
<td>• Absorbent, nonadherent; maintains a moist environment, provides thermal insulation, decreases maceration.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Various thicknesses available for different size wounds and absorption needs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Easy to apply and remove.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Do not use for dry wounds.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Stretch net works well to secure. Some have an adhesive surface; others have tape attached.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Cover at least one inch of surrounding skin.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Should be changed when strike through of drainage is within one inch of the edge.</td>
</tr>
<tr>
<td>Gauze (woven) (usually cotton)</td>
<td>Protection against trauma and infection; wicks exudate.</td>
<td>• A good cover or absorptive dressing. No therapeutic properties.</td>
</tr>
<tr>
<td>Gauze (nonwoven) (rayon, polyester, and other products)</td>
<td></td>
<td>• Often used for wound cleansing. Several studies have shown that infection rates are higher and healing time is slower in wounds dressed with gauze than with other dressings.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Avoid packing wounds tightly; gently fill the wound to prevent pressure on tissue and wound expansion.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Note: Select woven gauze sponges very carefully. Check the fiber and ensure it is gentle (nontraumatic) to skin. Gauze can be very traumatic, irritating, and harmful to tender, granulating tissue and sensitive skin.</td>
</tr>
</tbody>
</table>
### Table 9.1: Common wound care dressings (cont.)

<table>
<thead>
<tr>
<th>Type of Dressing</th>
<th>Indication</th>
<th>Information</th>
</tr>
</thead>
</table>
| **Honey** | Antibacterial, antifungal, provides rapid automatic debridement, deodorizes wounds, stimulates the immune system, speeds healing, anti-inflammatory properties reduce inflammation, reduces or relieves pain, relieves edema | - Never use commercial (food grade) honey because antibacterial activity and microbiological quality cannot be ensured.  
- Medical grade honey is available in a tube, and in honey impregnated dressings, which are less messy and easier to use.  
- Purchase honey with the highest UMF factor possible. |
| **Hydrocolloid** | Full- and partial-thickness wounds, pressure injuries, wounds with necrosis. Useful for light to moderate drainage. Useful for autolytic debridement. Powder and paste preparations are available to increase absorbency. Note: Use with caution on residents with fragile skin, deep or infected wounds, and wounds in which tendon or bone is exposed. May worsen necrotic foot injuries. May cause hypergranulation. | - Occlusive, water resistant.  
- May be used under a compression dressing or over an alginate.  
- Swells to absorb exudate.  
- Contraindicated for infected wounds, heavily exuding wounds, wounds with undermining, tunneling, or sinus tracts.  
- Promotes granulation, provides a moist environment, padding, and insulation.  
- Available in a multitude of sizes, shapes, & thicknesses to conform to many areas of body.  
- Requires a clean, dry periwound surface.  
- Dressing should allow at least 1¼” around wound margins. Some curl at edges and must be taped. Benzoin, skin prep, or stoma adhesive may be used around the edges. (Some contain alcohol; avoid open/irritated tissue.)  
- The frequency of dressing change is 3 to 7 days. Change before it leaks.  
*Note: Follow package directions for removing dressing. Some dressings may cause skin tears and other injuries if removed improperly.* |
| **Hydrofiber** | Infected wounds, chronic leg ulcers. | - Some (but not all) contain silver. Moisten product in dry wound to promote release of silver.  
- Absorbs exudate, reduces dead space, eliminates pathogens, prevents colonization, creates a barrier to prevent bacteria from reaching deep tissues, creates & maintains a moist environment, prevents tissue damage caused by dressing adherence, reduces risk of maceration. May be used under hydrocolloids. |
### Table 9.1  
**Common wound care dressings (cont.)**

<table>
<thead>
<tr>
<th>Type of Dressing</th>
<th>Indication</th>
<th>Information</th>
</tr>
</thead>
</table>
| Hydrogel         | Full- and partial-thickness wounds, deep wounds, wounds with necrosis, abrasions, donor sites, minor burns, burns caused by radiation therapy. | • Used for burns and wounds that need cooling properties.  
• May be ineffective with heavy exudate. (Special formulations are available to absorb exudate.)  
• Available in sheets, gels, granules, and impregnated gauze. In deep wounds, apply gel to the sides and base.  
• Loosely pack the rest with gauze. (Do not fill wound with gel.) Another option is to saturate gauze pad with NS, and then add gel to fill wound bed, tunneling, or undermining.  
• Maintains a moist environment, promotes epithelialization and granulation, and is useful for autolytic debridement.  
• Useful for moistening hard, dry eschar.  
• Must be used correctly to prevent wound desiccation. |
| Impregnated Dressings | Used as packing or as a primary dressing (with a medicated treatment product) to maintain a moist environment. | • Always require secondary dressings.  
• Many dressing materials available, including gauzes, nonwoven sponges, ropes, and strips that are saturated with a solution, emulsion, oil agent, or compound including saline, petrolatum, xeroform, zinc salts, iodine, or scarlet red. |
| Interactive/ Bioactive | Used for diabetic wounds, infected wounds, and wounds with slough | • Provides a moist environment conducive to healing and debriding wounds with tough and adherent slough.  
• Monitor for maceration. |
| Nonadherent Dressings | Wounds needing a dressing that maintains a moist environment, skin grafts and donor sites, abrasions, lacerations. | • May also be used to reduce bacterial proliferation in superficial wounds.  
• These are primary dressings to maintain a moist environment and provide a non stick surface. Some are impregnated with other compounds. Nonimpregnated dressings are nylon or polyurethane coverings. |
| Occlusive Dressings | Helpful to ensure increased absorption and effectiveness of topical medication in the wound. | • Completely block water, liquid, or gases in or out of the dressing.  
• Helpful for reducing surface necrosis, preventing desiccation, padding the wound, decreasing pain, speeding healing, stimulating growth factors, activating enzymes needed for debridement, and providing protection. |
| Odor-Absorbing Dressings | Malodorous or infected wounds with moderate drainage. Many of these contain charcoal or chlorophyll. | • Contain a layer that absorbs exudate and neutralizes odor.  
• Often used with other dressings to absorb heavy exudate and reduce or eliminate odors. |
| Semi-Occlusive Dressings | Used to create a moist healing environment | • Moisture vapor permeable. (See MVTR number on package; should be <35.)  
• Some nurses have voiced concern that these promote infection, but they do not. Studies have shown that they decrease the incidence of infection by more than 50% compared with gauze.  
• Moist wounds may have more noticeable odors than dry wounds.  
• Many leave a residue or create gel resembling pus.  
• Use with caution on infected wounds, but the dressings alone do not promote infection.  
• May cause maceration. |
### Table 9.1  Common wound care dressings (cont.)

<table>
<thead>
<tr>
<th>Type of Dressing</th>
<th>Indication</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silicone</td>
<td>Indicated to reduce pain, cover skin tears, cover wounds that are difficult to dress, and wounds at high risk for scars.</td>
<td>• Some can be left in place for up to seven days, some are adherent and do not require tape, some have tape borders, some are heart-shaped to fit the sacral area.</td>
</tr>
<tr>
<td>Silver Dressings</td>
<td>Used to reduce the risk of infection or eliminate infection in partial- and full-thickness wounds.</td>
<td>• Many varieties available, including films, island dressings, polymers, cavity fillers, alginates, powders, creams, and nonadherent barriers. Many contain sustained release broad-spectrum silver.</td>
</tr>
<tr>
<td>Tissue Engineering and Growth Factors</td>
<td>Chronic, nonhealing wounds.</td>
<td>• Tissue engineering frequently involves stem cells, a controversial topic in the U.S. This field is in its infancy. Nevertheless, it is being used for wound care with good results, although availability is limited.</td>
</tr>
<tr>
<td>Transparent film</td>
<td>Stage 1 pressure injuries, partial-thickness wounds, wounds with little exudate, wounds with superficial necrosis. May be used for other superficial wounds, such as abrasions or skin tears, as a covering for blisters, wounds on elbows, heels, and flat surfaces. Contraindicated for infected or exuding wounds, and wounds with tunneling, sinus tracts, and undermining. May be used with care for debriding and softening dry, necrotic tissue.</td>
<td>• Work well as a secondary dressing rather than taping a primary dressing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Promote a moist environment. Allows the exchange of oxygen. Waterproof so resident can shower.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Mold and adhere to many parts of the body, prevent infection, speed healing, and reduce pain.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Dressing is transparent, so the nurse can readily monitor progress.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Use caution for residents with fragile skin.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Do not stretch loose skin or film when applying.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Dressing should extend about 1¼ inch beyond the edges of the wound. Use skin sealant or stoma adhesive to hold in place, if needed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Those with a frame are easiest to apply.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Some brands contain silver to reduce the incidence of infection.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Usually remain in place for 3 to 7 days.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Change dressing when exudates leaks onto intact skin around the wound to avoid maceration.</td>
</tr>
</tbody>
</table>

**Note:** Application technique is important to prevent wrinkling and ensure an intact periwound surface. Follow package directions for removing dressing. Can cause skin tears and other injuries if removed improperly. They tend to roll up if exposed to high friction areas of the body.

**Caution:** Some of the newer transparent films are marked specifically for IV use. These were designed to promote visualization, while keeping IV insertion sites dry. Do not use these dressings to cover wounds.
Red, Yellow, or Black

Marion Laboratories developed an effective system of wound identification and treatment based on the color of the wound. Wounds are color-coded red, yellow, or black based on the predominant color in the wound bed. Refer to Table 9.2 for selecting dressings for using the red-yellow-black system.

<table>
<thead>
<tr>
<th>Wound/Characteristics</th>
<th>Dressing type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red wound</td>
<td>Alginates</td>
</tr>
<tr>
<td></td>
<td>Collagen</td>
</tr>
<tr>
<td></td>
<td>Composite dressings</td>
</tr>
<tr>
<td></td>
<td>Hydrocolloids</td>
</tr>
<tr>
<td></td>
<td>Hydrogels</td>
</tr>
<tr>
<td></td>
<td>Moist impregnated gauzes</td>
</tr>
<tr>
<td></td>
<td>Specialty absorptive dressings</td>
</tr>
<tr>
<td></td>
<td>Transparent films</td>
</tr>
<tr>
<td></td>
<td>Wound fillers</td>
</tr>
<tr>
<td>Yellow wound</td>
<td>Alginates (moist or draining wounds)</td>
</tr>
<tr>
<td></td>
<td>Collagen</td>
</tr>
<tr>
<td></td>
<td>Hydrocolloids</td>
</tr>
<tr>
<td></td>
<td>Hydrogels</td>
</tr>
<tr>
<td></td>
<td>Moist impregnated gauzes</td>
</tr>
<tr>
<td></td>
<td>Transparent films (for autolytic debridement)</td>
</tr>
<tr>
<td></td>
<td>Wound fillers</td>
</tr>
<tr>
<td>Black wound</td>
<td>Debriding agents</td>
</tr>
<tr>
<td></td>
<td>Hydrocolloids</td>
</tr>
<tr>
<td></td>
<td>Hydrogels</td>
</tr>
<tr>
<td></td>
<td>Moist impregnated gauzes</td>
</tr>
<tr>
<td></td>
<td>Transparent films (for autolytic debridement)</td>
</tr>
<tr>
<td></td>
<td>Wound fillers</td>
</tr>
</tbody>
</table>

Nursing is an art and a science, and changing wound dressings involves both. The art involves organizing your time and supplies, protecting the resident’s dignity and privacy, and making the dressing change as painless as possible for the resident. The science involves preventing wound contamination and cross-contamination, thereby preventing infection. Surveyors routinely watch nurses change dressings and have cited numerous deficiencies for cross-contamination.

Pain During Treatment and Dressing Change

Relieving pain is a fundamental nursing function. Assess the resident, and offer oral pain medications throughout your shift. Reassess 30 to 60 minutes later to ensure that the drug was effective. The following are strategies for pain relief at dressing change:
• Offer analgesics when pain is anticipated. Premedicate the resident at least 30 to 60 minutes before dressing change or debridement, and evaluate the resident’s response. If the procedure is exceedingly painful despite the premedication, a stronger drug may be needed. Topical products, such as those containing lidocaine, are also an option, but be sure the product you are using does not reduce blood flow.

• Teach the resident facts about pain and pain management.

• Involve the resident in decision-making, and instill in him or her a sense of control over the pain.

• Offer and provide anti-anxiety medications if requested.

• Monitor the resident’s body language and nonverbal cues for signs of pain during the treatment.

• Avoid unnecessary manipulation of the wound.

• Protect the wound from sources of irritation, including airflow from a fan or window.

• Warm the cleansing or irrigation solution prior to cleansing the wound.

• Use only normal saline or pH-neutral wound cleansers. Be gentle when cleaning the wound.

• Allow the resident to stop and rest during a painful procedure, such as a dressing change.

• Match the dressing and treatment product to the wound. Use dressings that are nonadherent and that reduce pain. Avoid woven cotton gauze, which is highly irritating to sensitive skin.

• Select wound products that maintain a moist environment in the wound bed. Do not allow the wound to become desiccated. A dry wound bed is more painful.

• Select treatments that can remain in place for several days if a product is available that is appropriate for the wound. Avoid frequent dressing changes by using advanced products if possible. Product selection should be assessment-based. Do not choose long-term dressing just because it makes treatment easier.

• Ayello and her colleagues published a good mnemonic for making treatment decisions called TIME (Ayello et al., 2004), which stands for four key clinical observations:
  – T is the type of tissue in the wound; is it nonviable or healthy?
  – I is the presence or absence of infection and/or inflammation.
– M stands for moisture balance and avoiding wound desiccation or maceration.
– E stands for edge (wound edges or margins); is the margin advancing or not?

• Consider contact layer dressings that remain in place, decreasing the need to manipulate the tender wound bed and increase pain.
• Use compression bandages, if needed, to reduce edema and relieve pain.
• Apply barrier products to protect the wound margins, preventing maceration and further breakdown. This is particularly important if chemical debriding agents are being used.
• Many residents complain that pain is intense during dressing removal. Allow the resident to remove his or her own dressing if desired. Manage pain with oral and topical products as noted previously.
• Remove tape and dressings carefully and gently. If the dressing or tape sticks to the skin during dressing removal, apply normal saline, then wait a few minutes. If the resident’s skin is sensitive, or if he or she is at risk for skin tears, minimize the use of tape. Use stretch roller bandage, Montgomery straps, Coban®, etc., to cover the dressings. You can also cut strips of hydrocolloid dressing to create a frame around the open area. Apply tape to these strips instead of to the skin. Leave the frame in place, and use it for as long as possible.
• Rolls of Opsite™ and Tegaderm™ transparent film are available in various widths. The adhesive is kind to the skin and is a good alternative to paper tape. It is also useful for covering awkward areas.
• Follow manufacturers’ instructions for removal of hydrocolloids and transparent films.
• Avoid treatments that increase unpleasant or painful sensory stimulation, such as wet-to-dry dressings.
• Splint or immobilize the wound during movement and treatment if possible.
• Teach residents to use relaxation and distraction techniques, such as guided imagery; slow, deep breathing; biofeedback; and listening to music through a headset.

**Wound Care Technique**

There is no consensus of expert opinion regarding whether to use clean or sterile technique when caring for chronic wounds such as pressure injuries. Most experts recommend using a clean,
no-touch technique in which you touch only the corners of the dressings, but expert opinions are just that: opinions. They are based on current practice and are not evidence-based; they have not proven to be either beneficial or harmful. In any case, dressing procedures that involve sharp debridement require sterile technique.

Other considerations include the following:

- If the procedure involves using a treatment cart, leave it in the hallway. Remove all needed supplies and carry them into the resident’s room. Lock everything else in the cart. Make sure that potentially harmful items are not accessible to residents.

- Avoid bringing large facility stock bottles into a room. Pour liquid treatment products into plastic medicine cups or drinking cups for individual use. Apply these stock products with a tongue depressor or applicator, rather than your fingers. Discard any extra product when you have finished the treatment.

- The over-bed table is reserved for clean items, such as the water pitcher and meal tray, so it makes a good surface for clean supplies. Before placing supplies on the over-bed table, wash the surface or cover the table with a new disposable underpad to further reduce the risk of cross-contamination.

REFERENCES


Recommended Treatment Options

Sometimes the dressing you use is your treatment. However, other products and modalities may be ordered in addition to or instead of the wound dressing. These treatments are the focus of this chapter.

**Stage 1 pressure injuries**
- Update the plan of care and communicate changes to all staff
- Remove all sources of pressure, friction, and shearing
- Clean the wound and pat dry
- Apply a moisturizer
- A dressing is not usually needed, but some nurses prefer to use a transparent film or thin hydrocolloid dressing to protect the area

**Stage 2 pressure injuries**
- Update the plan of care and communicate changes to all staff
- Remove all sources of pressure, friction, and shearing
- Clean the wound and pat dry
- If the wound is dry or has minimal exudate, use a hydrogel dressing and cover with a moisture-retentive dressing
- If minimal to moderate exudate is present, apply a hydrocolloid or foam dressing; change as ordered and as needed
Stage 3 and 4 pressure injuries

- Update the plan of care and communicate changes to all staff.
- Remove all sources of pressure, friction, and shearing.
- Cleanse the wound.
- If minimal to moderate exudate is present, apply a hydrogel-impregnated gauze. Cover with a moisture-retentive dressing.
- If moderate to heavy exudate is present, apply a calcium alginate or hydrofiber dressing into the wound. Use alginate rope for packing dead space. Use an alginate sponge for more superficial wounds. Cover with an absorbent dressing, such as an ABD or foam dressing.

Procedure for Wound Care

- Carefully apply the principles of standard precautions. Change gloves for each area. Avoid all environmental contamination with used gloves.
- Observe the wound. If the wound has changed since the last dressing change, or if signs or symptoms of infection are present, completely reassess and document the wound.
- The wound cannot become infected if bacteria do not invade and penetrate healthy tissue. Appropriate cleansing eliminates bacteria and impairs their ability to attach to healthy tissue. The product (type of cleanser) used and nursing technique are essential to proper wound cleansing.
- Cleanse the wound with normal saline or a gentle (pH-neutral) wound cleanser to remove debris and bacteria before applying a dressing. Saline is physiologic to the body and will not damage healthy tissue. Avoid cytotoxic products that destroy granulation tissue and may dry the wound bed, whose use would run counter to your objective of maintaining a moist healing environment. Be gentle to prevent pain and trauma to healing tissue. Work from clean to less-clean areas to prevent contamination. Use each gauze or swab once, and then discard it. Avoid contaminating the cleansing solution with used swabs or gauze.
- Use gauze pads and cleansing solution to clean the wound. Select gauze sponges very carefully.
- Check the fiber, and ensure that it is kind to skin. Woven gauze can be traumatic, irritating, and harmful to tender, granulating tissue. There is a higher incidence of infection and trauma associated with friction when coarse cleansing materials are used.
(Rodeheaver, et al., 1975). Cotton non-woven gauze is gentler. Remember that wounds that have been injured or traumatized are at higher risk for infection and heal more slowly.

- Apply cleansing solution to the gauze or cotton swab, and then squeeze it (as appropriate) so it is not dripping. When using cotton swabs, swab the wound once, then discard the swab. If more solution is necessary, use a clean swab. Never dip a used swab into a bottle of cleansing solution. Some wound cleansers must be rinsed off; others do not require rinsing. Follow the product directions. If in doubt, rinse the cleanser from the wound with a gauze sponge moistened with normal saline and pat dry with a clean sponge.

- Cleanse a linear wound or surgical incision from top to bottom. Move from clean to less-clean areas.

- Use a new sponge for each stroke. Work outward from the wound in parallel lines (Figure 10.1A). Avoid rubbing back and forth. Rinse, if necessary, using the same technique.

- To cleanse an open area, work in half circles or full circles, beginning in the center of the wound and working outward (Figure 10.1B). Cleanse the skin at least 1 inch beyond the edge of the dressing. If no dressing will be applied, clean at least 2 inches beyond the wound margins. Use new gauze for each circle. Rinse, if necessary, using the same technique. If the resident has more than one wound, cleanse the cleanest wound first and the least clean last. After cleansing the wound, remove and discard your gloves. Wash your hands for at least 20 seconds, or use an alcohol hand cleaner. This step is critical to prevent cross-contamination and infection.
Hydrotherapy, Cleansing, and Irrigating the Wound

Hydrotherapy is the therapeutic use of water for relaxation of muscles and treatment of physical disability, injury, or illness. It is most commonly performed in a whirlpool tub to which an antibacterial agent is added. Hydrotherapy will also improve movement, promote wound healing, and relieve pain. Treatments can be internal or external and include application of heat and/or cold.

Note that, although there are highly technical differences between hydrotherapy and aquatic therapy, most nurses use the terms interchangeably. Many infection control concerns are associated with use of hydrotherapy, and it is considered an outdated treatment, but some physicians still order it. Make sure that the resident is infection free, the whirlpool is completely disinfected before and after use, and treatment is indicated for the resident’s individual condition.

Wound Irrigation

Irrigation is a gentle form of mechanical debridement. Use normal saline for wound cleansing at a pressure between 4 and 15 pounds per square inch (psi). Low irrigation pressures (below 4 psi) will not cleanse the wound adequately. Avoid very high-pressure irrigations, such as those conducted using dental irrigation instruments. Pressures above 15 psi are likely to traumatize the wound and force bacteria into the tissue.

Use low-pressure cleansing for noninfected granular wounds by using saline and a bulb or piston syringe. Higher-pressure cleansing is indicated for necrotic and infected wounds. Filling a 35-ml syringe with normal saline and a 19-gauge IV catheter is effective for removing wound and necrotic tissue. This is more effective in removing bacteria than a bulb syringe (Stevenson, 1976). Avoid normal saline when a silver dressing is used (Wheeler, et al., 1976).

Pulsatile Lavage

Pulsatile lavage may also be called pulse lavage, pulsatile jet lavage, or simply “the wound gun.” Therapists routinely provide this procedure in many facilities. Pulsatile lavage is a form of hydrotherapy in which normal saline or another solution is used in a manual spray nozzle to irrigate and debride wounds. The solution is delivered under pressure, and suction is used to remove wound debris and the irrigation solution.
The goal of pulsatile lavage therapy is to remove unwanted debris and tissue without damaging healthy tissue. When using this therapy, pressure control is essential. To ensure that you set the pressure correctly (which users do using the handset), be thoroughly familiar with the equipment you are using, and follow manufacturers’ instructions. The device uses an irrigation pressure of 4–15 psi, which is considered safe. Higher pressures may traumatize the wound and force pathogens deep into the tissue. Most clean wounds need only 4–8 psi. However, if the wound is undermining, set the pressure at 2–4 psi. Higher pressures may force microbes into the undermined tissue.

The negative-pressure pulsed action of the lavage is believed to stimulate granulation and enhance growth of granulation tissue. Daily cleansing is done for most wounds until the base is full of granulation tissue, at which point treatments are decreased to two or three times weekly. Twice-daily treatments may be needed if 50% or more of the wound is covered with necrotic tissue. Each treatment takes about 15–30 minutes. It is a good idea to premedicate the resident with an analgesic prior to the treatment.

Precautions to use with pulsatile lavage

Serious outbreaks of infection have occurred as a result of pulsatile lavage use, even when manufacturers’ instructions were followed. Some infections were the result of environmental contamination due to aerosolized fluids.

Apply the following precautions during a pulsatile lavage treatment:

- Apply the principles of standard precautions and use personal protective equipment. Wear a fluid-resistant gown, gloves, mask/goggles or face shield, and hair cover (also consider shoe covers).
- Consider applying a surgical mask to the resident to serve as a droplet barrier.
- Cover the resident’s lines, ports, and wounds that are not being treated with a towel or drape.
- Carefully follow the manufacturer’s directions for use of the device and cleansing and disinfecting the equipment.
- Perform the procedure in a private room enclosed with walls and doors (no privacy curtains or large open areas). The room should be well ventilated and have no supplies stored on open shelves or cabinets.
- Bring only essential equipment into the treatment area.
- Reduce the risk of aerosol contamination by covering exposed surfaces during treatment.
• The gun’s splash shield should remain in contact with the wound and periwound area at all times when the unit is in use.

• Use continuous suction as recommended by the manufacturer (about 60–100 mmHg).

• Empty the suction canister after each use.

• Discard all single-use components immediately after use.

• Thoroughly clean, sterilize, or disinfect all reusable items after each use.

• Thoroughly clean and disinfect the treatment room and environmental surfaces after each treatment.

**Negative Pressure Wound Therapy Systems**

Negative pressure wound therapy (NPWT) systems provide a closed, moist healing environment. Topical NPWT uses subatmospheric (negative) pressure to heal wounds and stimulates granulation tissue formation. The device consists of a porous sponge (Figure 10.2A) that is sealed under a semi-occlusive transparent film dressing (Figure 10.2B). The dressing is connected to a vacuum pump with tubing (Figure 10.2C), and the pump removes fluid and potentially infectious materials, relieves edema, helps decompress tissue, and improves circulation.

The indications for use of NPWT include pressure injuries, venous and neuropathic wounds, and
dehisced surgical wounds. In wounds that are candidates for NPWT, the wound bed should not have exposed blood vessels and should contain less than 20% necrotic tissue.

The device is associated with a 61% faster healing time than a historical control group managed with traditional treatment (Guttman, 2003). The resident requires frequent monitoring. The therapy unit must remain on; do not leave the negative pressure off for more than two hours per 24-hour period. Also, check the dressing frequently to ensure that the foam is collapsed and the negative pressure is being delivered consistently. Monitor the exudate and periwound tissue for signs of infection and other complications. A sudden rapid increase in bright, red blood in the tubing and/or canister requires immediate assessment. Always use caution with residents who are on anticoagulant therapy.

National Pressure Ulcer Advisory Panel (NPUAP) recommendations

The NPUAP suggests the following:

- Consider NPWT as an early adjuvant for the treatment of deep Stage 3 and 4 pressure injuries.
- Debride necrotic tissue prior to the use of NPWT.
- Follow a safe regimen in applying and removing the NPWT system. Refer to the NPUAP Clinical Practice Guideline and manufacturers’ instructions for further details.
- Evaluate the pressure injury with each dressing change.
- Place a nonadherent interface dressing on the wound bed, and lower the level of pressure and/or changing the type of pressure (continuous or intermittent) if pain is anticipated or reported.
- Educate the individual and his/her family about NPWT when used in the home setting.

NPWT is an excellent device when used correctly by a trained, qualified professional. Staff must be vigilant for potentially life-threatening complications, such as bleeding, and be prepared to
act promptly if they occur. Facilities must have policies and procedures addressing its use. This device has very precise instructions.

<table>
<thead>
<tr>
<th>Safety alert</th>
<th>FDA public health notifications</th>
</tr>
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<tbody>
<tr>
<td>The FDA has issued two public health notifications due to deaths and serious complications, especially bleeding and infection, associated with the use of NPWT systems, along with numerous recommendations to reduce the risk. From 2007 through 2011, the FDA received reports of 12 deaths and 174 injuries associated with NPWT systems. Most of the deaths occurred at home and in long-term care facilities. Most of the injury reports noted retention of foam dressing pieces and foam adhering to tissues or becoming embedded in the wound. The majority of these individuals required surgical procedures for removal of the retained pieces, wound debridement, and treatment of wound dehiscence, as well as additional hospitalization and antibiotic therapy.</td>
<td></td>
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</tbody>
</table>

**Cadexomer Iodine**

Cadexomer iodine is a sustained-release form of iodine that is not cytotoxic to wounds. It is available as an ointment or an impregnated dressing sheet. The iodine cleanses the wound bed and eliminates microbes, absorbs fluids, and removes exudate, pus, and debris. The gel forms a protective cover on the surface of the wound. The product changes color when it is time to change the dressing. (It is initially brown but turns yellow.) Cadexomer iodine is useful for chronic, nonhealing wounds, including leg ulcers (venous, arterial, and mixed etiology), pressure injuries, and exuding, infected wounds (in conjunction with systemic antibiotics).

**Debriding Agents**

Necrotic burden is the term used to describe nonviable tissue, exudates, necrotic material, slough, and high levels of bacteria. The necrotic burden gradually but continuously accumulates in chronic wounds due to uncorrected systemic problems, such as diabetes and venous insufficiency. It may be impossible to completely resolve these systemic issues.

Enzymatic debriding agents are manufactured enzymes. Topical enzymes digest and dissolve the devitalized tissue, liquefy slough, and soften eschar for easier removal. When applied directly to a wound, they work with naturally occurring enzymes to degrade and eliminate necrotic tissue. There are several categories of enzymes, and they should be selected based on
the type of tissue they target. Selective enzymes act only on devitalized tissue. Nonselective enzymes, in contrast, cannot distinguish between devitalized and viable tissue. Therefore, when using a nonselective enzyme, carefully apply it only to devitalized areas, such as slough and eschar. Avoid the periwound tissue. In fact, it is a good idea to protect the periwound skin with a layer of petroleum jelly before beginning. Avoid healthy tissue, granulation tissue, and any exposed tendons.

Cleanse the wound thoroughly with normal saline, and remove as much debris as possible before applying an enzymatic debriding agent. Be sure that the cleansing agent is compatible with the enzyme debrider. Avoid acidic solutions and those containing metal ions such as silver and mercury, which will inactivate the enzyme. If allowed by your state nurse practice act, cross-hatch the eschar with a scalpel so that the enzyme penetrates the necrotic tissue. Apply the enzyme according to the instructions on the manufacturer’s package insert. (Note that enzymatic debriding agents are compatible with topical antibiotics, and some residents experience a transient burning and/or erythema when the product is applied.) Cover the wound with a dressing (although note that covering the wound with an occlusive dressing may promote bacterial growth). Monitor the wound carefully for signs of infection.

Limit the application of enzymes to the time it takes to dissolve necrotic or slough tissue, then change the treatment to a product designed to heal the wound. Change the treatment when the necrotic tissue is gone and most of the wound surface is covered with granulation tissue.

**Silver**

As you know, all chronic wounds are colonized with bacteria. Nurses are responsible for evaluating the presence of bacteria in the wound. If no signs and symptoms of infection are noted, antimicrobial therapy may not be needed. This is where your nursing assessment skills and close wound observations are essential.

Occasionally, poor healing is the only indicator of a chronic wound infection. If no improvement is evident within two to four weeks, treatment for infection may be indicated. Such treatments may vary: Systemic antibiotics, for example, may not adequately penetrate chronic granulation tissue, which means that the drug fails to reduce the bacterial counts in the wound bed. If non-healing or surface changes are identified, a seven- to 14-day trial of topical antimicrobials may be helpful. When the wound begins healing and the infection is controlled, discontinue the topical preparation.
Silver has been used for eliminating bacteria in wounds for centuries, but its use decreased when antibiotics were discovered. In the past decade, there has been a resurgence of this product, and many new products are available. Topical silver preparations are a welcome tool in the wound-healing arsenal. Silver is available in many different vehicles, including creams, hydrocolloids, alginates, powders, foams, mesh gauze, films, and gels. Slow-release preparations that can remain on the wound as long as seven days are also available.

There are many advantages to applying treatments containing silver:

- Silver is a safe, nontoxic, broad-spectrum antimicrobial that is not cytotoxic to the wound bed.
- Silver is toxic to pathogens but has a relatively low toxicity to human tissue.
- Silver has a broad spectrum of activity. Many of the newer silver products eradicate methicillin-resistant Staphylococcus aureus, Pseudomonas aeruginosa, Escherichia coli, Candida albicans, vancomycin-resistant enterococci, and other clinically significant pathogens.

**NPUAP recommendations**

The NPUAP suggests the following:

- Consider silver dressings for pressure injuries that are infected, heavily colonized, or not healing
- Consider silver dressings for wounds that are at high risk for infection
- Avoid prolonged use of silver dressings; discontinue when the infection is controlled
- Consider use of silver sulfadiazine (Silvadene®) in heavily contaminated or infected pressure injuries until definitive debridement is accomplished

**Important information**

For a wound to heal, exudate, necrosis, inflammation, and infection must be corrected. Nurses must be familiar with these important issues when using products containing silver in wound care:

- Silver increases wound surface calcium, stimulating epithelialization.
- Moisture is needed to transport ionic silver to the wound. Normal wound exudate will accomplish this purpose. However, if the wound bed is dry, another product must be
added to activate silver release. Follow the product’s directions. Keep in mind that some silver dressings should be used only with sterile water. Using normal saline and other products will interfere with product efficacy.

- Silver does not absorb well into necrotic tissue.

- Avoid the use of silver when enzyme debridement is used. Use manual debridement, or apply silver after necrotic tissue has been removed. The method selected should match the needs of the resident.

Use of silver as a treatment is discussed with the dressing information earlier in this chapter.

### Other Antimicrobials

Mefenide (sulfamylon), Garamycin (gentamicin), and Bactoban (mupirocin calcium 2%) are commonly recommended for topical wound care. Bactroban reduces the risk of resistance if properly prescribed. Some researchers believe that Bactroban is equal in efficacy to cephalexin; however, it may inhibit epithelialization and increases the risk of maceration. It has also been identified as an allergen, so monitor the resident’s response to treatment carefully.

Another commonly ordered topical is Triple Antibiotic Ointment (polymyxin B sulfate, bacitracin zinc, neomycin). This product decreases the risk of infection and is said to reduce scarring. Nitrofurazone and Polysporin have also been used successfully. Metronidazole is believed to interrupt and interfere with the synergistic action of bacteria in chronic wounds, enhancing healing. However, use metronidazole with caution in residents who have a history of seizures or peripheral neuropathy. Gentamycin eliminates Gram-negative organisms. Like other products, topical antimicrobials must be frequently reevaluated. If the wound does not respond, consider resistant organisms or other problems interfering with wound healing. Discontinue the topical antimicrobial when the infection is under control. Many contain ingredients that inhibit fibroblast activity.

### Guidelines for topical antimicrobials

The key to using topical antimicrobials for nonhealing wounds is accurate, consistent nursing assessment and documentation of wounds and rapid identification of signs of infection. Three general guidelines apply to using topical products on wounds:

- Avoid systemic products, which increase the risk of drug resistance. Gentamycin and tobramycin are sometimes avoided for this reason.
- Avoid common allergens, such as neomycin.

- Avoid products that are known to be cytotoxic. Do not use topical antibiotics randomly. You should be guided by culture and sensitivity reports. Use topical antibiotics for a limited period of time. Some specialists rotate topical antibiotics to prevent development of resistance.

## Honey in Wound Care

Honey has been used successfully in wound care for centuries, since Egyptian times in about 2000 BC. During that time, application of rust and dung were the next two most popular wound care remedies. The medical profession began to accept honey as a valid treatment during the first half of the 20th century, and formal research was conducted. Research into the use of honey for wounds was virtually abandoned when antibiotics were discovered, but in the past decade, a fair amount of research has been conducted. Much of this was initiated due to the emergence of antibiotic-resistant pathogens. Medical-grade honey has been accepted as an effective treatment for various types of wounds.

Over one-fourth of today’s prescriptions began as folk remedies, and more than half of all natural remedies were first identified by witch doctors, shamans, tribal healers, or others with no medical training. A number of folk therapies have made a comeback because they measure up to or outperform current treatment and have passed the test of scientifically sound clinical trials. Honey, leeches, and maggots are among wound care preparations that have been accepted as mainstream treatments in certain situations today.

Honey has progressed from being a popular alternative treatment to an accepted mainstream treatment in a relatively short period of time. It is not a generic product and should be selected by evidence-based research and antibacterial strength. The FDA requires manufacturers to have evidence to support claims of efficacy. Manuka (*Leptospermum* species) honey is currently the strongest antibacterial medical-grade honey available. Various medical-grade products and wound gels are made from Manuka honey.

### Unique Manuka Factor (UMF)

UMF is a measure of the antibacterial strength found in some but not all strains of Manuka honey. Medical-grade Manuka honey is tested by independent laboratories for UMF, using a standardized set of testing criteria. The UMF concentrations vary from batch to batch and year to year. The potency of the antibacterial factors in honey can vary as much as 100-fold depending on the type (Molan, 1992), which is one reason it’s important to know the UMF number.
The product is given a rating between zero and 20. The UMF quality trademark ranges from five upward:

- 0–4 Not detectable
- 5–9 Low levels
- 10–15 Useful levels
- 16+ Superior high-grade levels/high therapeutic value

The UMF number indicating the antibacterial strength is printed on the label, such as UMF 4+ or UMF 18+. The UMF is a quality trademark that can be used only by licensed users who meet set criteria.

Wounds dressed with medical honey have a rapid rate of healing. Honey may work by stimulating the activity of the immune system. It has also shown great promise for its ability to eradicate antibiotic-resistant organisms because it reduces the available water to pathogens due to its high osmolarity. It has reportedly eliminated MRSA in pressure injuries and open areas on the legs in immunosuppressed persons (Chambers, 2006; Natarajan, et al., 2001). Honey is also listed in the chart in Chapter 9.

**Honey and compression therapy for venous ulcers**

Compression therapy is the only proven treatment for healing venous leg ulcers. Usually, a primary dressing is used under the compression (Unna) boot. There is no evidence that any single type of primary dressing used in this manner is better than another, and a honey dressing may be used as a primary dressing in compression therapy.

**Older Treatments**

Several treatments are so old that there is no current evidence-based information about them. However, anecdotal information is strong, so they are worth a brief mention for your consideration.

**Tincture of benzoin**

Many years ago, benzoin was a first-line treatment for pressure injuries (Molan, 1992; Grossman & Lightfoot, 1945). Today, many hikers and bicyclists use tincture of benzoin to toughen intact skin on pressure areas to prevent blisters.

Stable (dry, adherent, intact without erythema or fluctuance) heel eschar should not be removed because it provides a natural biological cover for the wound.
Tincture of benzoin is also useful for painting the edges of steri strips, transparent film, and hydrocolloid dressings that will not stick to the skin. Apply a thin layer where the edges of the dressing will be applied. Allow it to dry for a minute so it is tacky when you apply the dressing. One note of caution: Tincture of benzoin contains alcohol and will burn if applied to open or irritated areas. Apply it only to intact skin.

**Petroleum gauze**

Using petroleum (such as Vaseline®) gauze to maintain a moist wound environment is also effective in some situations. Use your usual treatment, cover the wound with a piece of petroleum gauze, and then apply the dressing. The petroleum gauze prevents the dressing from sticking to the wound while maintaining a moist environment that promotes healing. The petroleum is also somewhat occlusive, making it difficult for pathogens to invade the wound bed.

**Hypergranulation tissue**

Development of hypergranulation (or overgranulation) tissue (see Chapter 3) is a common complication in wounds when an occlusive dressing is used. You may have heard this called “proud flesh.” It is often associated with use of hydrocolloid dressings. Although it is not harmful, it delays wound healing. It is believed to cause increased scar tissue in some people. Some therapists and wound specialists trim and scrape the excess tissue, but this is not within the scope of nursing practice. The most common treatment for such tissue appears to be silver nitrate sticks, although they can be painful. Other commonly used treatments involve discontinuing the occlusive dressing and covering the wound with a hydrogel or foam. Some healthcare providers order hydrocortisone cream 1% to shrink the swollen tissue. This is usually covered with some type of gauze dressing.

**Crusting for skin irritation**

Crusting is a treatment technique that has been used successfully to treat denuded skin surrounding a stoma pouch. The skin may be erythematous, edematous, eroded, weeping, or bleeding. Some nurses use crusting when caring for irritated skin surrounding pressure injuries. To use this technique, do the following:

- Wash the area with skin cleanser (no sting), normal saline, or water. Leave the skin moist.
- Apply a barrier, stoma, or antifungal powder to the periwound area, and gently dust away excess; the powder will stick to the skin.
• Apply a nonalcohol (no sting) skin sealant over the powder; cover the powder well. Allow to dry; don’t wash or rub the crusts off.

• Apply two to four coats of skin sealant to form a crust. Allow each layer to dry before applying another.

• Avoid adhesive dressings if possible. If you must apply an adhesive dressing to the area, blot with a damp cloth or a no-sting skin sealant to seal the powder. (Adhesives will not adhere to the powder.) Allow to dry.

• Do not apply other creams or ointments to the crusted area.

• Cover the entire area with a dressing.

**Poor or Abnormal Healing**

The stages of healing are the same for everyone. However, the rate of healing is determined by many factors. For example, young, healthy individuals heal more quickly than older persons. Persons in a state of good nutrition and hydration heal better than those with malnutrition and dehydration, and vitamin C in particular is needed for the body to make and maintain collagen. Additionally, the location and severity of the wound also affect the outcome of the healing process.

Good nutrition is essential to wound healing. Collagen is necessary for wound repair; if collagen is inadequate, the wound may reopen. A deficiency of vitamin C is associated with decreased collagen synthesis, increased capillary fragility, and poor healing. If excessive collagen is produced, however, fibrosis is likely to occur as a reparative or reactive process, which may impair function.

Collagen is also available as a wound treatment. Flakes, powder, dressings, and films containing collagen may be used as a primary dressing. Such dressings dissolve when they contact body heat, so be sure that they are covered with a secondary dressing.

Additional information about collagen is available in the chart in Chapter 9.

**Delayed or Stalled Healing**

Failure to heal may be caused by systemic factors such as diabetes, malnutrition, and cardiac disorders. Local factors that interfere with healing include infection, a desiccated wound bed, and cytotoxic products. If a wound stops healing, check for signs of infection. If infection is not the
problem, you must identify and treat the cause. Be sure the wound bed is clean, moist, and free from eschar and slough. Make sure that the resident is turned at frequent intervals. Epiboly is a condition in which the wound stops healing and the edges roll under, impairing migration and wound closure. When this occurs, it needs to be treated to jump-start healing. Using silver nitrate sticks around the edges of the wound is usually effective, although they are likely to sting.

If all local and systemic causes for nonhealing have been ruled out, then consider a two-week trial of topical antibiotics. If the trial is ineffective, obtain a culture and sensitivity to determine whether an occult infection is causing the problem. (Avoid using the same product topically and systemically, as doing so promotes resistance.)

REFERENCES


Systemic Factors That Increase the Risk of Wound Infection

Most long-term care residents have one or more medical conditions and other factors that increase the risk of infection in an open wound. Chronic wounds and those with necrosis, foreign bodies, or a large surface area and depth are at increased risk. Systemic factors that increase the risk of wound infection are as follows:

- Poor circulation/reduced perfusion
- Metabolic disorders
- Inadequate nutrition, malnutrition, dehydration
- HIV and other conditions that cause an immunocompromised state
- Diabetes mellitus
- History of alcohol abuse
- Cigarette smoking
- Taking corticosteroid medications

Definitions

These definitions will be helpful in understanding the material in this chapter:

- Aerobic organisms require oxygen to reproduce and survive. Anaerobic bacteria can live without oxygen and will die in an oxygen-rich environment. Many are residents of the gastrointestinal tract and may cause infection if they relocate to other areas of the body.
Aerobic bacteria (such as Escherichia coli) consume oxygen, creating tissue hypoxia that paves the way for infection with anaerobes.

- Gram-positive and Gram-negative bacteria are so named based on their appearance after a particular stain (Gram stain) is applied. The variation in appearance occurs due to the differences in the cell wall structures. When Gram stain is applied, Gram-positive bacteria stain purple and Gram-negative bacteria appear pink or red. The Gram-negative bacteria cell wall is much more complex than the Gram-positive cell wall, which is thinner or absent entirely. Refer to the appendix for lists of pathogens according to Gram stain.

- Sepsis is a serious systemic inflammatory response caused by the presence of toxins.

- Septicemia is a systemic infection in the bloodstream. Bacteria multiply and release toxins, which spread throughout the body. (This condition was formerly called blood poisoning.)

- Septic shock is the outcome of serious infection. It is caused by pathogens such as Gram-negative bacteria and, specifically, by decreased tissue perfusion and oxygen delivery as a result of infection with such pathogens. It can cause multiple organ dysfunction syndrome (formerly known as multiple organ failure) and death. The mortality rate is about 50%. It is common in immunocompromised and elderly persons. Like other forms of shock, we cannot predict exactly when it will occur, and it reaches a point when it becomes irreversible. A primary goal of treatment for infection is prevention of septic shock.

- Synergy occurs in a polymicrobial infection (which is caused by two or more organisms) in which one type of bacteria aids the survival and growth of another type. Synergy also occurs when one treatment product enhances another. Some products interfere with polymicrobial synergy. For example, metronidazole is believed to interrupt and interfere with the synergistic action of bacteria in chronic wounds, enhancing healing. Routine use of metronidazole—that is, when infection is not an issue—is discouraged because of potential sensitivities and resistance problems.

**Pressure Injury Colonization**

All Stage 2, 3, and 4 wounds are colonized with bacteria. Staphylococcus epidermidis is typically colonized in wounds, but there are potentially many others. A more common term is “contaminated,” but this is not exactly accurate because the organisms causing contamination cannot multiply. Contaminated wounds can be cleansed and will heal. Microbes that cause colonization, in contrast, can and do multiply. As bacteria progressively invade the body, the person mounts an immune response, which helps resist infection.
Some bacteria in the wound can be helpful by preventing overgrowth of more virulent organisms. At low levels, bacteria are believed to support healing. Colonization may also provide a physical barrier that prevents more virulent organisms from adhering to the wound. Treated properly, the colonized wound will heal.

Such wounds should not be treated with systemic antibiotics: Although bacteria are present, the concentration is low, and the organisms are not interfering with healing or damaging the wound. Use of standard precautions, avoidance of cross-contamination, and proper wound management (including cleansing, debridement, and treatment products) will prevent colonization from progressing to infection. Maintaining a moist environment is also important.

**Critical colonization**

Critical colonization occurs when microbes in the wound delay healing. The virulence and number of pathogens outweigh the resident’s resistance—the organisms are growing more quickly than they are dying. Some authorities consider the term *critical colonization* synonymous with *localized infection*, believing that a wound is either infected or not (Edwards & Harding, 2004) due to its relationship with the Cutting and Harding criteria for wound infection, which have become a benchmark for wound infection (Table 11.1). As the wound changes from colonization to infection, a subtle period of critical colonization will occur, during which the bacterial burden increases and subclinical infection is present (Dolynchuk, et al., 2000).

<table>
<thead>
<tr>
<th>Abscess</th>
<th>Cellulitis</th>
<th>Discharge (serous exudate with inflammation; seropurulent; hemopurulent; purulent/pus)</th>
</tr>
</thead>
</table>

**Suggested additional criteria**

- Delayed healing (compared with normal rate for site/condition)
- Discoloration
- Friable granulation tissue that bleeds easily
- Unexpected pain/tenderness
- Pocketing at base of wound
- Bridging of the epithelium or soft tissue
- Abnormal smell
- Wound breakdown

Adapted from Cutting & Harding, 1994.

Certain pathogens are more devious than others (for lack of more understandable professional terminology), which is why developing infections may be difficult to detect. Chronic wounds that are colonized but not infected with certain microbes may demonstrate delayed healing.
without any other signs of infection or recognizable inflammatory or immunological response. This causes the caregiver to believe that all is well. Some microbes cause a response of their own.

Although the wound is not healing, other signs and symptoms of infection are absent. Exudate may increase and become purulent. Slough appears yellow-brown in color. The wound bed may look pinkish-gray. A foul odor may develop that was not previously present. Red hypergranulation tissue that bleeds readily may be present. Identifying and treating the problem at this stage will prevent serious wound infection, systemic infection, and other complications.

Consider the mnemonic NERDS to identify critical colonization, or a mostly superficial infection:

- **N** = Nonhealing
- **E** = Exudate (inflammatory exudate)
- **R** = Red or friable granulation tissue
- **D** = Debris (tissue debris)
- **S** = Smell (malodorous) (Bergstrom, et al., 1994)

**Management**

When a wound stops healing or shows signs of deterioration, a culture is useful. However, remember that your objective is to treat the resident, not the culture results. The optimal type and duration of treatment is affected by the infecting organism, the location and depth of the wound, and the immunocompetence of the resident. If the wound is localized and not systemic, a topical product may be used if the organisms are sensitive to it. Using silver or Cadexomer iodine in the wound may eliminate the infection. If you have a culture and sensitivity report to guide you, see if a topical product is available to kill the pathogen. This is preferable to using a systemic antibiotic to eliminate a localized infection. After the problem is resolved, return to a moist healing treatment.

When using a topical antimicrobial product in this situation, monitor the resident very closely. If the wound worsens or does not show improvement, two to four weeks of antibiotic therapy may be necessary. This may seem excessive, but the practice is based on research showing that failure to provide adequate antibiotic treatment for several weeks results in an unacceptably high rate of recurrence (Krukowski & Matheson, 1988). The optimum duration of therapy is unresolved, and prolonged administration increases the risk of drug resistance. Therefore, the healthcare
provider must use his or her best clinical judgment to determine whether the benefits of treatment outweigh the risk to the resident. Nursing personnel must monitor the wound closely and use good assessment skills. Describing the wound characteristics accurately will assist the healthcare provider in determining the best course of treatment.

**Infection alert**

Recent surveillance data suggest that *Pseudomonas aeruginosa* may become the next antibiotic-resistant superbug (Hirsch & Tam, 2010).

**Wound Infection**

Progression from colonization to infection depends on the number and type of organisms present, the virulence of the organisms, the synergistic action of the various bacteria in the wound, and the resident’s ability to mount an immune response (see Tables 11.2A and 11.2B).

<table>
<thead>
<tr>
<th>Number of organisms x Organism virulence = Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>No fever</td>
</tr>
<tr>
<td>No fever</td>
</tr>
<tr>
<td>Fever (or hypothermia); may show other signs of systemic involvement</td>
</tr>
<tr>
<td>No pain or mild situational pain</td>
</tr>
<tr>
<td>New or worsening pain</td>
</tr>
<tr>
<td>Pain, sudden &amp; severe onset or worsening</td>
</tr>
<tr>
<td>Wound healing</td>
</tr>
<tr>
<td>Healing stalled</td>
</tr>
<tr>
<td>Wound worsening or delayed healing (compared with normal rate for site/condition); increasing size or satellite areas</td>
</tr>
<tr>
<td>No odor</td>
</tr>
<tr>
<td>May or may not have odor</td>
</tr>
<tr>
<td>Malodorous</td>
</tr>
<tr>
<td>Healthy, beefy red granulation tissue</td>
</tr>
<tr>
<td>Abnormal, friable, or absent granulation</td>
</tr>
<tr>
<td>Friable granulation tissue that bleeds easily or new necrotic tissue</td>
</tr>
<tr>
<td>No drainage or minimal exudate</td>
</tr>
<tr>
<td>Serous exudate increased or excessive; may be clear or translucent before turning purulent</td>
</tr>
<tr>
<td>Excessive &amp; purulent drainage</td>
</tr>
<tr>
<td>Normal healing wound</td>
</tr>
<tr>
<td>Tissue debris, possible tunneling or pocketing</td>
</tr>
<tr>
<td>Tunneling, pocketing, maceration, edema, erythema, warmth</td>
</tr>
<tr>
<td>Peri wound tissue normal, not red or hot to touch</td>
</tr>
<tr>
<td>May show evidence of early peri wound involvement, such as redness &amp; edema</td>
</tr>
<tr>
<td>Peri wound tissue edematous, red, hot to touch</td>
</tr>
</tbody>
</table>
Infections are typically caused by *Staphylococcus aureus*, *Escherichia coli* (*E. coli*), *Klebsiella*, *Proteus*, *Pseudomonas*, and some anaerobic pathogens. As a rule, *Staphylococcus aureus* and *Pseudomonas aeruginosa* are highly virulent and adherent to wound tissue. Some pathogens, such as beta-hemolytic streptococci, are especially virulent and can cause serious infections in very low numbers. The age of the wound tends to affect the organisms present. *Staphylococcus* is usually found in new wounds, whereas *Proteus, E. coli, Pseudomonas*, and *Klebsiella* are found in wounds of over 30 days’ duration. Gram-positive and Gram-negative organisms are listed in Table 11.3.

<table>
<thead>
<tr>
<th>Staphylococcus aureus</th>
<th>Escherichia coli</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clostridium welchii</td>
<td>Klebsiella</td>
</tr>
<tr>
<td>Streptococcus pyogenes</td>
<td>Proteus mirabilis</td>
</tr>
<tr>
<td>Streptococcus faecalis</td>
<td>Pseudomonas aeruginosa</td>
</tr>
<tr>
<td>Streptococcus hemolyticus</td>
<td>Enterobacter</td>
</tr>
</tbody>
</table>

Gram-negative bacteria cause the most serious infections and are a major concern because the incidence of Gram-negative drug resistance is high and increasing. The cell wall of Gram-negative microbes is difficult for antibiotics to cross, and there are other barriers inside the cells as well. Additionally, a single bacterium can establish a biofilm colony very quickly. It is no wonder that the incidence of drug-resistant Gram-negative infections is on the rise. As of today, they are winning the war. This is a frightening proposition.

**Infection alert**

“For Gram positives, we need better drugs. For Gram negatives, we need any drugs.”

—Dr. Brad Spellburg, Infectious Disease Specialist at Harbor UCLA Medical Center, http://www.battlingsuperbugs.com/
concern over the lack of research and the increasing inability to eradicate bacteria, especially Gram-negative bacilli, with the drugs we have. This report clearly notes that of all the compounds in development for the treatment of drug-resistant infections, none had an entirely Gram-negative spectrum. Clearly, there is a need for information on managing localized wound infection without using the few systemic antibiotics we have left. When a wound is infected, microbes have spread into deeper tissues and triggered an inflammatory response. There is a high concentration of infectious organisms, and the resident does not have the systemic defenses (as previously listed) to fight the infection. An infected wound will not heal until the infection has been eliminated, and if an infection is allowed to progress untreated for a long period of time, the resident may develop sepsis or osteomyelitis, a serious infection of the bone.

The most common signs of wound infection are an enlarging wound, pain, redness, drainage, and odor. Chronic wound infection can be very subtle: It is characterized by progressive wound deterioration or by a wound that initially shows signs of healing and then stalls. (Remember to rule out other causes for nonhealing, such as not turning the resident.) Signs and symptoms of covert infection include the following:

- Atrophy of formerly healthy granulation tissue
- Discoloration of granulation tissue to a pale gray or deep red color, with tissue becoming more fragile and bleeding
- Copious, malodorous exudate that is watery or serous in appearance
- Undermining

If the wound is surrounded by cellulitis, it has already progressed beyond the covert stage of infection. This infection can be adequately assessed using a properly obtained swab culture. In this case, systemic antimicrobial therapy is needed in addition to local wound care, cleansing, and debridement. Untreated, a local infection will progress to systemic infection. Signs of sepsis include fever, chills, tremors, hypotension, multi-organ failure, and death. Sadly, sepsis related to wound infection is not uncommon in elderly persons. You will find a comparison of signs and symptoms of colonization, critical colonization, and infection in Table 11.4.
### Table 11.4  Signs and symptoms comparison

<table>
<thead>
<tr>
<th>Critical Colonization</th>
<th>Systemic Infection</th>
<th>Cellulitis Sepsis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tissue dull in appearance. Absence of beefy red granulation tissue. However, this is only one sign. Cannot be diagnosed by appearance alone</td>
<td>Fever (may be a late sign in an elderly person); Hypothermia is a sign of sepsis in elderly</td>
<td>Fever above 101.3° F (38.5° C) or below 95° F (35° C) (Fever may be a late sign in an elderly person; Hypothermia is more common in elderly)</td>
</tr>
<tr>
<td>Presence of slough that is difficult to eliminate and control</td>
<td>Chills</td>
<td>Chills</td>
</tr>
<tr>
<td>Wound does not decrease in size; may increase in size. Not responding to treatment</td>
<td>Delirium, new onset or worsening of confusion</td>
<td>Malaise, feeling unwell</td>
</tr>
<tr>
<td>Drainage increases. Begins clear but progresses to thick, purulent drainage, usually green or yellow; may be malodorous</td>
<td>Difficulty concentrating, inability to concentrate, more forgetful than usual</td>
<td>Hypotension; Pulse &gt; 90; Respirations &gt; 20, dyspnea</td>
</tr>
<tr>
<td>Hypergranulation, friable tissue may be present</td>
<td>Weakness; Loss of appetite. Malaise, feeling unwell</td>
<td>Lymphangitis; regional lymphadenopathy</td>
</tr>
<tr>
<td>Wound margins may take on a rolled appearance; demarcation may be present</td>
<td>Tachycardia; Hypotension</td>
<td>Deceased urine output</td>
</tr>
<tr>
<td>Edema, swelling surrounding ulcer, painful periwound redness, may be hot to touch</td>
<td>Cellulitis; Spreading erythema; more than 2 cm beyond wound margins</td>
<td>Change in mental status</td>
</tr>
<tr>
<td>Exacerbation of pain, or pain present when it was not previously, or change in the quality experience of pain</td>
<td>Edema, induration of tissue</td>
<td>Organ compromise. Progressive multi organ failure leading to death</td>
</tr>
</tbody>
</table>

**Wound pain related to infection**

Studies have identified pain as a major factor in persons with pressure injuries, and at times, pain can help identify an infection because the resident may feel a problem before you can see signs of tissue damage. This is very common with skin infections, such as candidiasis (Figure 11.1). The resident may complain of pain and burning in the area several days before signs of infection are visible on the skin, and a unique odor may be present. This problem often occurs in the groin and
perineal area. It may be mistaken for a Stage 1 pressure injury, depending on the location, but if it is mistakenly treated with a barrier product, it usually gets worse because it stays wet. An antifungal cream or powder is needed to clear such an infection. Keep the area dry. Document all skin inspections and risk assessments accurately, including details of pain suggesting infection.

**Management**

If you suspect a wound infection, perform a complete resident assessment. Inspect the wound thoroughly, using the assessment guidelines in Chapter 3. Culture the wound. If the person is symptomatic and the concentration of pathogens in the wound is high (>100,000), antibiotic treatment is probably indicated in conjunction with good local wound care. To overcome infection, make sure that the resident receives sufficient fluids and nutrition to fortify the immune system.

Laboratory tests, such as a CBC, may also verify the presence of infection. However, consider the complete clinical picture. An elevated white blood count, in the absence of other signs of infection at the site of the pressure injury, does not necessarily indicate a wound infection. In fact, the white blood count does not always rise significantly until an elderly resident is very ill. An elevated white count may indicate the presence of a urinary tract or other infection elsewhere in the resident’s body.

**Cleansing With Normal Saline Versus Other Liquids**

A 1994 government publication made a significant impact on the products we use to cleanse wounds. Generally speaking, healthcare workers resist change and are very slow to modify their practices, but this change was accepted rapidly and the practice continues to this day.

The 1994 Agency for Health Care Policy and Research (AHCPR) Treatment of Pressure Ulcers’ Clinical Practice Guideline, No. 15, strongly advocates the use of normal saline for cleansing wounds, noting that skin cleansers and antiseptics are cytotoxic and should not be used (Panel
for the Prediction and Prevention of Pressure Ulcers in Adults, 1994). The National Pressure Ulcer Advisory Panel (NPUAP) continues to recommend this approach for clean wounds (European Pressure Ulcer Advisory Panel and National Pressure Ulcer Advisory Panel, 2009). Newer literature has exposed the conditions under which many old studies were done, including the one used by AHCPR: Human and animal studies were confused, in vitro and in vivo conditions were mixed together, and product concentrations were inconsistent.

Chronic wound infection may be very subtle. It is characterized by initial healing followed by progressive deterioration. (Be sure to rule out other causes for nonhealing, such as not turning the resident.) Signs and symptoms include atrophy of formerly healthy granulation tissue and discoloration of granulation tissue to a pale gray or deep red color, with tissue becoming more fragile and bleeding. If the open area is surrounded by an area of cellulitis, it has already progressed to infection and needs systemic antibiotic treatment.

Acute infection is suggested if the wound has copious, malodorous exudate that is watery or serous in appearance. Undermining may also develop. Acute infection can be adequately assessed using a properly obtained swab culture. Systemic antimicrobial therapy is needed in addition to local wound care, cleansing, and debridement.

Current NPUAP guidelines suggest cleansing pressure injuries with confirmed or suspected infection, debris, or high levels of bacterial colonization with combination products, antimicrobials, or solutions with surfactants (appropriate for the wound and consistent with current toxicity/efficacy recommendations) until the wound bed is clean.


**Toxins**

Toxic protein molecules (enzymes), called toxins, cause disease in many bacterial infections. Toxins may affect the cells directly or intermingle with cells of the immune system, which may cause either cell death or compromised cell function. Two major types of toxins are endotoxins and exotoxins.

**Endotoxins** (also called LPS [lipopolysaccharide] or LOS [lipo-oligosaccharide]) are part of the outer membrane of Gram-negative bacteria. This is a complex subject that is well beyond the
scope of this book, but the term endotoxin was first coined to describe the cause of endotoxin shock, which has high mortality, especially in immunocompromised or debilitated individuals. Endotoxins are secreted when the cell wall is disrupted, and may also cause Disseminated Intravascular Coagulation (DIC), a serious condition that may also result in death. Examples of common endotoxins are *Escherichia coli*, *Salmonella*, *Shigella*, *Pseudomonas*, *Neisseria*, *Haemophilus influenzae*, *Bordetella pertussis*, *Legionella pneumophila*, *Helicobacter pylori*, and *Vibrio cholerae*.

**Exotoxins** are proteins that are secreted by pathogens. They are very powerful and can destroy or disrupt normal cell metabolism. Some are absorbed from the infected wound and travel to other areas of the body, where they damage the organs. The toxic properties of some exotoxins can be neutralized by heat or chemicals to create a toxoid, some of which can be used for effective immunizations. Common exotoxins are *Clostridium botulinum*, *Clostridium tetani*, *Escherichia coli*, some strains of *Staphylococcus aureus* (including those that cause toxic shock syndrome), and *Streptococcus pyogenes*.

Please refer to a microbiology book for more comprehensive and complete information.

**Septic Conditions**

Septic conditions are very serious in elderly persons. They have the potential to occur with any unresolved infection. Sadly, septic conditions are seen with increasing frequency in long-term care residents with pressure injuries and urinary tract infections. Sepsis is also a common factor in many lawsuits against long-term care facilities. The best prevention is early recognition and treatment.

The terms “sepsis,” “septicemia,” and “septic shock” are sometimes used interchangeably, but they describe different problems. Septic conditions are commonly caused by *Staphylococcus aureus*, Gram-negative rods, *Pseudomonas*, or *Bacteroides fragilis*. If a resident shows signs and symptoms of systemic infection, contact the healthcare provider promptly. Understanding that septic conditions must be prevented is the most important factor.

**Causes of septic shock**

Septic shock occurs when the body attempts to destroy an invading pathogen. The pathogen is usually a Gram-negative bacteria (75% of the time), but Gram-positive organisms, rickettsia, fungi, and viruses have all been implicated.
Signs and symptoms

Septic shock usually occurs when the resident is being treated for a known infection. Signs and symptoms depend on how far advanced the condition is when it is identified. Fever (or hypothermia), tachycardia, hyperventilation, and warm, dry, flushed skin are early signs. As the condition progresses, the resident becomes hypotensive and hypoxic, with rapid, shallow respirations; tachycardia; and cool, clammy skin. Hemodynamic changes and compromised organ function occur.

Elderly long-term care residents often become hypothermic when they are septic. If a resident develops a temperature of 93°F–96°F, monitor carefully for signs of infection and maintain a high index of suspicion. At this point, dehydration is also common. As the condition progresses, the pulse becomes weak and thready, and pulmonary edema may occur. You may auscultate crackles in the lungs. Oliguria will occur, and mental changes will be evident as a result of decreased oxygenation. The body’s compensatory mechanisms fail, and death ensues. Blood cultures should be used to guide treatment with antibiotics that will cover these organisms.

Treatment

Long-term care facilities are not equipped to manage a septic condition properly, so a resident with such a condition should be transferred to the hospital. He or she may be admitted to intensive care. Aggressive treatment consisting of antibiotic therapy, fluids, and oxygenation is required. In the early stages of treatment, antibiotics may exacerbate symptoms as the bacteria are destroyed. The cell walls of the Gram-negative pathogens contain toxins that are liberated when the immune system attempts to destroy them. Other substances are released in response, creating massive shock. This is very hard on the resident.

Several products will effectively treat shock caused by Gram-negative bacteria. However, they are ineffective if the condition is caused by other pathogens. Elderly persons do not respond well to any treatment when the infection is advanced. In the event that treatment is effective, complete recovery takes a long time—when stable, the resident may be transferred to a subacute care unit or long-term acute care hospital. Prevention is the best option.

Carbapenem-Resistant Enterobacteriaceae (CRE)

In 2013, the Centers for Disease Control and Prevention (CDC) released an urgent press release and other information describing a dangerous family of bacteria named carbapenem-resistant
Enterobacteriaceae (CRE) (Centers for Disease Control and Prevention [CDC], 2013a). These Gram-negative rods are resistant to last-resort antibiotics. Ninety-one percent of CRE cases were in persons who have been in healthcare facilities and have underlying comorbidities. Almost half of those contracting this pathogen die, even with treatment. In addition to Enterobacter, some strains of Pseudomonas aeruginosa, Klebsiella, and Acinetobacter have demonstrated resistance to carbapenems. CRE bacteria that have been identified are listed in Table 11.5.

<table>
<thead>
<tr>
<th>CRE bacteria that have been identified</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Enterobacter species</strong></td>
</tr>
<tr>
<td>Citrobacter freundii</td>
</tr>
<tr>
<td>Escherichia coli</td>
</tr>
<tr>
<td>Enterobacter aerogenes</td>
</tr>
<tr>
<td>Enterobacter cloacae</td>
</tr>
<tr>
<td>Enterobacter gergoviae</td>
</tr>
<tr>
<td>Klebsiella pneumonia</td>
</tr>
<tr>
<td>Klebsiella oxytoca</td>
</tr>
<tr>
<td>Morganella morganii</td>
</tr>
<tr>
<td>Proteus mirabilis, other Proteus species</td>
</tr>
<tr>
<td>Providencia species</td>
</tr>
<tr>
<td>Salmonella enterica</td>
</tr>
<tr>
<td>Serratia marcescens</td>
</tr>
</tbody>
</table>

CRE are spread by direct contact with workers, hands and by indirect contact with contaminated environmental surfaces and medical equipment. The microbes are powerful and can transfer resistance to numerous other bacteria. For these reasons, persons who are known to be infected with CRE are placed on contact precautions. When to discontinue contact precautions is a murky subject. Do not depend on the results of serial cultures: A resident may be negative today and positive next week, and residents may be colonized for long periods of time. The CDC does not have enough information to make recommendations for discontinuing contact precautions (CDC, 2013b). This trio of microbes has the potential to create an army of super pathogens that can cause serious complications and life-threatening infections.

CRE can cause infections in almost any part of the body, including wound infections, bloodstream infections, ventilator-associated pneumonia (VAP), and intra-abdominal abscesses. Half of persons who contract bloodstream infections will die. Most CRE infections involve the urinary tract, usually in persons who have a urinary catheter or urinary retention.
The CDC has tracked one type of CRE from a single hospital to healthcare facilities in at least 42 states. Almost 200 hospitals and long-term acute care facilities cared for one or more persons with this infection during the first half of 2012.

**Recommendations**

The *Enterobacteriaceae* family consists of more than 70 bacteria, including *Klebsiella pneumoniae* and *E. coli* that normally live in the digestive tract but commonly escape to other areas of the body, where they wreak havoc. They commonly appear in culture and sensitivity (C&S) tests, including wound cultures. Over time, some become resistant to last-resort antibiotics known as carbapenems. CDC recommends the following:

- Enforcing use of infection control precautions (standard and contact precautions)
- Grouping persons with CRE together
- Dedicating staff, rooms, and equipment to the care of persons with CRE, whenever possible
- Having facilities alert each other when persons with CRE transfer back and forth
- Asking the person whether they have recently received care somewhere else (including in another country)
- Using antibiotics wisely; practicing antibiotic stewardship

The causative organisms are found in stool or wounds, so personal protective equipment during treatment procedures is essential. Good handwashing, standard precautions, and avoidance of environmental contamination are vital.

A CRE prevention toolkit with in-depth recommendations for hospitals, long-term acute care facilities, and health departments is available at [www.cdc.gov/hai/organisms/cre/cre-toolkit/index.html](http://www.cdc.gov/hai/organisms/cre/cre-toolkit/index.html). Many links to additional resources are available on that page.

**Antibiotic Treatment**

Because of antibiotics, many lives have been saved and the human life span has been extended. Penicillin, streptomycin, chloramphenicol, and tetracycline were introduced between 1936 and 1952. Before that, we had no truly effective means of fighting infection.
Chapter 11 | Wound Infection

Picture a large infectious disease ward in a city hospital in 1936: Hospitals did not have private rooms in those days, so six or eight patients were cared for in the same room. All the patients have septicemia and are critically ill and receiving palliative care. Then one day, a physician introduced a new drug in this ward. Within 24 hours, everyone had improved. Medicine had turned a corner. The physician had introduced an antibiotic that changed the face of medical practice from one that diagnosed and maintained patients to one that could treat and cure patients.

The situation today is not quite as abysmal, but it is rapidly marching in that direction. The pathogens are very smart. They have effectively changed themselves and become “superbugs” that are drug-resistant. A microorganism is considered multi-drug-resistant (MDR) when it has developed three or more resistance mechanisms (National Nosocomial Infections Surveillance System, 2004).

Bacteria began developing resistance to the new drugs almost immediately. Scientists recognized the problem and developed many new generations of antibiotics, but some have been removed from the market for a variety of reasons. By the early 1960s, 80% of all Staphylococcus aureus (SA) infections were resistant to penicillin.

Antibiotic research and development costs millions, and it takes a long time to recoup the investment. That’s part of why no new antibiotics have been introduced in the United States since 2002. One is in clinical trials and should be released in 2017 or 2018. The resistance problem is serious, and the introduction of CRE poses a great threat.

We are on borrowed time. Soon all of the organisms will be resistant to all available antibiotics. Can you imagine sending a resident to the hospital with a broken hip and learning that your resident had expired and would not be returning? That was the norm in 1936. None of us want to return to those days. The threat is very real.
Important regulatory compliance alert

§483.80(a) An antibiotic stewardship program that includes antibiotic use protocols and a system to monitor antibiotic use.

Antibiotic Stewardship

Antibiotics are medications that eliminate bacteria. They do not eliminate viruses, fungi, protozoa, etc. Antimicrobials are biocides (in several different product categories) that eliminate all of these. Some products are topical, some are oral, and some are components of environmental cleaning products.

Antimicrobial stewardship is a coordinated program that promotes the appropriate use of antimicrobials (including antibiotics) to improve patient outcomes, reduce microbial resistance, and decrease the spread of infections caused by multidrug-resistant organisms (IDSA, SHEA, & PIDS, 2012). For more comprehensive information, refer to www.idsociety.org/Stewardship_Policy/.

As you can see, an antibiotic stewardship program is mandatory. The State Operations Manual has not defined “antibiotic stewardship” as we go to press.

It appears that CMS is grouping at least some antimicrobial products under the antibiotic umbrella. Long-term care facilities regularly administer drugs from the antimicrobial category in or on the human body. For example:

- Fluconazole is one of several oral antifungals
- Nystatin is an oral and topical antifungal
- Oseltamivir, Zanamivir, and Peramivir are oral antivirals that are given to residents with the flu.
- Acyclovir is an oral and topical antiviral.
- Numerous oral antiretrovirals are FDA approved for persons with HIV.
- You will administer oral, injectable, and topical antibiotics in the care of persons with infected wounds.

Rather than splitting hairs, follow your facility policies. If your policies do not address this issue, manage all drugs that prevent and treat infection as part of the antibiotic category. CMS is facing a monumental task with implementing new regulations. When they learn of the problem, they will define and clarify the terminology.

Osteomyelitis

Osteomyelitis is an infection of the bone that is usually caused by *Staphylococcus aureus*. *Staphylococcus epidermis, Staphylococcus aureus, Pseudomonas aeruginosa, Serratia marcescens*, and *E. coli* are commonly isolated in persons with chronic osteomyelitis. Infection
spreads to the bone from infected skin, muscles, and tendons. Osteomyelitis is a serious but common complication of pressure injuries that can result in delayed healing, extensive tissue damage, and higher mortality. When the bone is infected, pus creates an abscess, which uses the bone’s blood supply. The condition may become chronic, causing intermittent signs and symptoms for years.

Signs and symptoms:

- Bone pain
- Fever
- General discomfort, uneasiness, or malaise
- Local swelling, redness, and warmth
- Nausea
  - As the condition progresses, additional symptoms develop:
    - Chills
    - Diaphoresis
    - Low back pain
    - Edema of the ankles, feet, and legs

**Diagnosis**

Experts have suggested that up to 25% of nonhealing pressure injuries have underlying osteomyelitis (Allman, 1989; Lewis, Bailey, Pulawski, Kind, Bashioum, & Hendrix, 1988). Osteomyelitis is accurately diagnosed through a bone biopsy, but many physicians prefer not to do one unless the area is being opened for surgical repair. Diagnosis is based primarily on the history and clinical findings. Lab, X-rays, and other imaging studies (such as CT scan, MRI, and ultrasound) are also helpful.

**Treatment**

Early recognition and effective treatment of osteomyelitis are critical. This condition results in loss of limb function, and amputation may be necessary. Treatment consists of IV antibiotics. Antibiotic therapy may last four to six weeks or more, and more than one antibiotic is given at a time. Surgery may be necessary for debriding and removing dead bone tissue.
Wound Culture

The Agency for Health Care Policy and Research Pressure Ulcer Guidelines state that swab cultures are not necessarily accurate in determining the presence of a pathogen in the wound (Bergstrom, Bennett, et al., 1994). Needle biopsy is reported to be more accurate, but it is also time-consuming, costly, and painful. One study showed a 25% chance of missing the causative organism when this method is used (Woolfrey, et al., 1981). This may be due to uneven distribution of organisms in the wound bed.

Needle aspiration of fluid is done by inserting a needle into the periwound tissue and aspirating fluid into a syringe. If the fluid is withdrawn correctly, the culture results will be similar to those obtained from a biopsy. These procedures are not realistic in long-term care, where swab culture is the standard practice. However, if a nurse practitioner, physician, or other qualified professional is willing to perform the needle biopsy, it may produce more accurate results.

Culture technique

The most accurate swab culture will likely be obtained by cleansing the wound bed with normal saline first. Doing so will help ensure that the culture results represent the microbiology in the deep wound compartment. Although the swab may identify colonizing organisms, the presence of *Staphylococcus aureus* in a superficial swab has been shown to correlate with the presence of that pathogen in the deeper tissues as well (Perry, et al., 1991). Follow your facility policies and procedures for culturing the wound. Sample the part of the wound with the most intense signs of infection.

Rotate and press down on the swab when obtaining the culture to express wound fluid from viable tissue (Ayello, et al., 2005; Sarvis, 2007). This is called Levine’s technique, and studies have shown that its results are the most accurate (Gardner, et al., 2006). Roll the tip of the swab on its side for one full rotation over the area. Most nursing literature recommends swabbing the wound using a 10-point zigzagging technique. If you use this technique, avoid touching the wound edges or surrounding skin. One study contends that the zigzagging method has never been validated and is likely to reveal superficial colonizers (Cooper & Lawrence, 1996).

Procedure for swab wound culture

Supplies needed:

- Lab requisition form
- Sterile culturette
• ID label
• Gloves
• Wound cleanser or normal saline
• Treatment supplies
• Dressing materials
• Plastic bag for trash

Actions:

1. Perform your initial procedure actions. (Cleanse hands, apply gloves, explain procedure, position resident.)

2. Remove and discard dressing in plastic bag.

3. Cleanse wound.

4. Remove gloves.

5. Cleanse your hands.

6. Apply clean gloves.

7. Hold the culturette tube in one hand. Remove the cap and applicator with the other hand.

8. Apply gentle pressure, and swab wound gently to obtain a sample of drainage on applicator. Do not culture purulent or necrotic debris or drainage over hard eschar. Roll the applicator completely over in a one-centimeter-square area (Figure 11.2A). Return applicator to culture tube without contaminating the applicator or outside of container. Apply cap.

9. Break the liquid capsule at the bottom of the culture tube. Be sure that the culture medium surrounds the swab.

10. Apply treatment product, and redress wound.
11. Perform your procedure completion actions. (Position resident, ensure call light and needed personal items are in reach, remove gloves, and cleanse hands.)

12. Label specimen, and send to the lab with the appropriate requisition form.

13. Record date specimen collected in nursing notes.

Figure 11.2B represents the zigzag technique required by some facilities. The Levine method mentioned earlier is the preferred method.

Under most conditions, a properly obtained swab after thorough cleansing and debridement of the wound bed should provide sufficient information to direct antimicrobial therapy. In fact, one study revealed that qualitative results obtained with swabs are similar to tissue biopsy results (Wheat et al., 1986). Diagnosing wound infection is a clinical skill, not a microbiologic technique (Dow, 2003). Many factors affect the viability and quality of the culture.

Despite the usefulness of such cultures, however, the most important indicator of infection is the local and systemic response of the resident. Each resident is different, and signs and symptoms will vary depending on underlying medical problems.

**Risk of Tetanus in Pressure Injuries, Skin Tears, and Chronic Wounds**

Tetanus is not usually associated with pressure injuries and wounds in long-term care residents, but the risk is very real. Tetanus is an acute, often fatal infectious condition caused by the release of *Clostridium tetani*, a neurotoxin. It is rare in the United States because of mandatory childhood immunizations. However, the risk of tetanus may not be considered in adults. Facilities seldom have an immunization history for geriatric residents. Most residents do not know or do not remember their immunization histories, and many have not had vaccines or booster shots in years. This places residents with pressure injuries at risk of yet another serious problem.
Tetanus is caused by spores, which cannot be eliminated with the usual cleansing and disinfecting agents, including alcohol-based hand cleanser. These spores enter the body through breaks in the skin, such as pressure injuries. Open areas can be small, minor, and uninfected—they need not be huge, gaping wounds. Tetanus may also result as a complication of chronic conditions, including pressure injuries, gangrene, abscesses, frostbite, burns, middle ear infections, and surgery. Although tetanus is infectious, it is not contagious and is not transmitted from person to person. Note that the usual wound culture and sensitivity test will not reliably identify *Clostridium tetani*.

The risk of developing tetanus is related to wound characteristics. Uncontaminated, recently acquired wounds with sharp edges and good blood flow are at the lowest risk. All other wounds are considered predisposed to tetanus. Those at highest risk are wounds with gross contamination and those caused by blunt trauma or bites (Tolan, 2008).

**Immunization**

Active immunization causes activation of the immune system and induction of an immune response against a specific antibody or antigen. It stimulates the immune system to create antibodies that provide long-term or permanent protection. Active immunizations do not work instantly, so passive immunization is also needed. Passive vaccines provide an immediate but temporary immunity and must be repeated frequently unless active immunization is also given. Tetanus is preventable by active immunization. Recommendations are as follows:

Children: Tetanus toxoid (usually in the form of diphtheria, tetanus, and acellular pertussis vaccine) at 2 months, 4 months, 6 months, 12–15 months, and 4–6 years; tetanus, diphtheria, and pertussis (Tdap) booster given at 11–12 years and every 10 years thereafter.

Adults (primary immunization): Tetanus toxoid (TT)—two doses, given four to six weeks apart. Administer a third dose six to 12 months later. Give booster doses every 10 years and/or any time a major injury occurs five or more years after the most recent dose. Diphtheria toxoid and pertussis vaccines may also be given in a combined vaccine because most adults do not keep up with booster doses. Tetanus immune globulin is used for passive immunization if an adult with a contaminated wound is not immunized or the immunization status is not known. Note that this is not the same product as tetanus toxoid, which is given for initial and booster doses. It will not provide long-term protection. Recommended booster doses are listed in Table 11.6. You will find an immunization schedule in the appendix of your book.
Table 11.6

<table>
<thead>
<tr>
<th>Wound type</th>
<th>Tetanus history not known or fewer than 3 doses received</th>
<th>Less than 5 years since last booster dose</th>
<th>5-10 years since last booster dose</th>
<th>Greater than 10 years since last booster dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean, minor wounds</td>
<td>Tetanus toxoid vaccine series</td>
<td>No tetanus vaccine needed</td>
<td>No tetanus vaccine needed</td>
<td>Tetanus toxoid vaccine series</td>
</tr>
<tr>
<td>Any other wounds that are not clean and minor</td>
<td>Tetanus toxoid vaccine series and 250 units tetanus immune globulin</td>
<td>No tetanus vaccine needed</td>
<td>Tetanus toxoid vaccine series</td>
<td>Tetanus toxoid vaccine series</td>
</tr>
</tbody>
</table>

Resources


REFERENCES


*Nursing Home Law & Litigation Alert, 5*(6): 420.


What Are Biofilms?

Biofilms are complex colonies of bacteria and other microorganisms that adhere to the human body and to environmental surfaces (Figures 12.1A and 12.1B). Many healthcare professionals are not familiar with them. They are typically pathogenic on the body, but they may be helpful in the environment (“Lesson 1: Wastewater Treatment,” n.d.). Research has evolved rapidly and has shown that a working knowledge of biofilms and their effects on the human body is essential for nurses.

Figure 12.1A  
Biofilm

This little organism looks like a sea urchin, but it is part of a biofilm colony containing many unidentified microbes, including bacteria, protozoa, and algae.

Courtesy of the Centers of Disease Control and Prevention.

Figure 12.1B  
Biofilms

This is the organism in Figure 12.1A magnified 2500 times. It is still unidentified.

Courtesy of the Centers of Disease Control and Prevention.


**Background**

Research in the U.S. began in earnest in 1990, when the Center for Biofilm Engineering was established at Montana State University in Bozeman. The importance of the subject exploded. It did not take long before the significance of biofilms was identified in cystic fibrosis *P. aeruginosa* lung infection, foreign body infections, chronic osteomyelitis, chronic wounds, and dental infections. The pathogens are very complex, and we still have much to learn. For additional information and resources, refer to [www.biofilm.montana.edu/](http://www.biofilm.montana.edu/).

In a biofilm, bacteria attach themselves to a wound with a protein that resembles glue. Next, they cement themselves together with a different protein. After the colony is established, they cover themselves with a shell made of proteins and sugar molecules. This shell is strong and very difficult to penetrate or remove.

The sticky substance that protects the pathogens is very difficult to remove. Its formal name is *extracellular polymeric substance* (EPS), but it is also referred to as glue, cement, concrete, matrix, or slime. After the cells secrete this substance, it hardens quickly and forms a protective barrier. It may also facilitate communication between the pathogens. The finished residence may be called a castle. A clever new imaging technique discovered at the University of California, Berkeley, uses time-lapse photography to record a single bacterium while it lays down glue, attaches itself to a surface, has “children” by dividing several times, builds a biofilm “castle,” and then cements the castle in place—all in a six-hour period (Sanders, 2012). This fascinating video has been condensed to one minute and 34 seconds and is available at [http://news.berkeley.edu/2012/07/12/discovery-opens-door-to-attacking-biofilms-that-cause-chronic-infections/](http://news.berkeley.edu/2012/07/12/discovery-opens-door-to-attacking-biofilms-that-cause-chronic-infections/). It is well worth your time to watch it.

**Biofilm today**

As described, the slime associated with biofilms is very difficult to breach. Its community includes cells of the same and different species that work cooperatively and coordinate their activity. The ultimate goal of the community is survival, even if some cells must be sacrificed for the good of the whole. Dental plaque is a good example of a visible biofilm, and it is so hard that it must be scraped off with a dental instrument. It is also the most studied human biofilm. The pathogens in a biofilm must do the following:

- Ensure that they have a source of food
- Defend against other invading organisms competing for the same food source
• Avoid the toxic treatment products that are used to eliminate them
• Coordinate their actions and regroup if the biofilm is damaged
• Communicate with each other

To succeed, the pathogens must mount a coordinated response and synchronize their actions by releasing chemical signals to communicate. This communication is called **quorum sensing**, and it enables each cell to sense the density (number of pathogens) in the wound. They must rapidly coordinate their activities in changing environmental conditions to ensure survival. They are trying to avoid toxic products, escape the host’s immune response, ensure that sufficient nutrients are available, and ensure survival of the community despite the changing (and potentially dangerous) conditions.

Biofilm construction (Figure 12.2A) is triggered when one or more cells of one species begins to produce the sticky, slimy matrix. This substance makes the colony difficult to penetrate with the following:

• Antiseptics (if the biofilm is on the human or animal body)
• Antimicrobials (if the biofilm is on the human or animal body)
• Disinfectants (if the biofilm is in the environment)

The residence progressively grows and changes, becoming thicker and stickier and transforming into a much more complex structure that includes pathogens from many different species (Figure 12.2B). The source of the slime is unclear, and this is an important subject of research. The immune
system will not recognize the biofilm as a foreign substance if chemicals from the body are used in its construction. If this is the case, the biofilm will perform its activities unabated, without interference from the immune system, and cause significant damage. Biofilms can do the following:

- Avoid detection and resist the usual defense mechanisms of the immune system
- Rapidly adapt to the environment and resist stressors
- Create an almost impenetrable barrier to resist eradication (and therefore healing)
- Break apart, spreading to other areas
• Regroup if the biofilm has been damaged by debriding
• Hibernate; hibernating pathogens cannot be eradicated with antimicrobials
• Resist:
  – Antibiotics
  – Biocides
  – Ultraviolet light
  – The host’s immune defenses

A polymicrobial infection is caused by two or more organisms, so this definition applies to biofilms. Biofilms are much more virulent than individual pathogens, and they seem to trigger or contribute to the development and ongoing presence of a chronic inflammatory state that is painful and inhibits healing.

“There is strength (and safety) in numbers” is an old adage that we can apply here. The polymicrobial biofilm communities are much stronger than the individual microbes. The cement-like matrix they create together prevents the topical treatments and antibiotics from reaching the bottom of the biofilm, healing the wound, and eradicating the assortment of pathogens living there.

Most chronic wound biofilms contain numerous anaerobes from various species (Sun, et al., 2009). This is of interest because the anaerobic pathogens (organisms that can live without oxygen) appear to be thriving in aerobic conditions (air containing oxygen). These are facultative bacteria. They can live in both aerobic and anaerobic environments (i.e., they can survive with and without oxygen).

The necrotic, superficial, upper layer of the wound serves as a warehouse for continual bacterial seeding and promotes biofilm repair, growth, and development. Organisms in biofilm communities are often drug-resistant (to traditional antibiotics) and probably delay new growth of the epidermis.

**Signs and symptoms**

Biofilm communities have numerous ways of interfering with the immune system, which causes inflammation of the chronic wound, promotes development of additional communities of pathogens, and resists healing.
Aside from dental plaque, biofilms must grow to an enormous size to be visible. Because of this, their presence and effects seem to be underestimated. The biofilm resides deep in the wound bed and looks like a slimy, sticky, viscous film (Figure 12.3). (Note, however, that the presence of film or slime does not always signify presence of biofilms.)

Some biofilms, such as those containing a high concentration of *Pseudomonas*, will change color. *Pseudomonas* is very common and is the “poster child” organism for biofilms. Wounds with such biofilms may appear green, or the microbe may cause the wound bed to take on a blue-green or greenish hue. It fluoresces under ultraviolet light and has a sweet, fruity odor, which some describe as similar to that of a wet taco or a grape. *Pseudomonas* has an affinity for necrosis and burns, and it is one of the leading causes of death in burn victims. *Pseudomonas* has an affinity for necrosis and burns, and is one of the leading causes of death in burn victims. *Pseudomonas* is a virulent Gram-negative organism that is a common cause of many different types of nosocomial infections. *Staphylococcus* is a common Gram-positive microbe that is commonly seen in infected wounds.

Surprisingly, both pathogens live synergistically with each other and an assortment of other microbes in biofilms. This is unusual, because until recently most of us believed that Gram negative and Gram positive microbes could not coexist in a wound. In this situation, the pathogens work together to ensure that as many as possible survive. Although many wounds contain *staphylococci*, they are seldom the only pathogen in infected wounds. They typically live in synergistic relationships with other organisms.

Maintain a high degree of suspicion that biofilms are causing the problem if oral antibiotics are ineffective and a chronic wound does the following:

- Initially seems to heal but then stops
- Is not healing (and has not healed after several appropriate treatments have been used)
• Appears very inflamed (the periwound tissue is usually inflamed as well) (Figure 12.4)
  – Inflamed tissue is hot to touch
  – The entire wound area is severely painful; pain has worsened
• Contains heavy exudate
• Contains stringy, fibrinous slough that is very hard to remove (Figure 12.5)

Biofilms may also adhere to substances such as catheters, sutures, tracheostomy tubes, feeding tubes, and implanted medical devices. They have been associated with numerous persistent infections, including periodontal disease, osteomyelitis, cystic fibrosis, otitis media, conjunctivitis, prostatitis, endocarditis, urinary catheter infections, contact lens and corneal infections, and infections associated with medical devices and surgical (sterile) instruments. You may wish to review the photos of biofilms on medical equipment:

  - [www.nature.com/nrurol/journal/v5/n11/fig_tab/ncpuro1231_F2.html](http://www.nature.com/nrurol/journal/v5/n11/fig_tab/ncpuro1231_F2.html)

**Biofilm Identification**

The introduction of biofilms means most of us have a great deal of unlearning and relearning to do, because much of what we have learned about infection is wrong. We need rapid, reliable, and cost-effective methods of detecting them. Researchers now believe that 99.9% of all bacteria
live in communities and attach to surfaces as biofilms. According to the National Institutes of Health, 80% of all infections in humans are related to biofilms (Mather, 2012).

A **planktonic bacterium** is an individual, free-floating or passively floating organism, whereas a biofilm consists of many microbes that are glued tightly together. The microbes that are firmly anchored in the biofilm are called **sessile bacteria**. This is important, because the single bacterium that occasionally breaks off and floats freely may be susceptible to antibiotics, but the films are at least a thousand times more resilient and resistant. We have been treating that single bacterium with antibiotics for years, but the biofilm must be removed, which may not be possible.

More specifically, we can debride wounds on the surface of the skin, but internal biofilms cannot be debrided and must be cut out surgically. The presence of biofilms explains in part why cystic fibrosis is such a problem. Antibiotics help by eliminating the planktonic bacteria, but as long as the biofilm is present, the person will never recover completely and will eventually succumb to infection. At the present time, lung transplant is the only truly effective treatment.

These loose individual (planktonic) bacteria are also the only ones picked up by a regular culture swab, so a culture rarely identifies all of the pathogens in the wound bed. Acquiring an accurate swab from the biofilm is much more difficult (Australian Wound Management Association, Inc., 2011). Scraping and penetrating the matrix substance (the “concrete” noted above) to collect a sufficient specimen is all but impossible. Although the swab may collect one type of bacterium, it is likely that many others will remain glued to the biofilm, uncollected and unidentified.

James et al. were the first to identify the presence of bacterial biofilm in chronic skin wounds (2008). Their studies revealed biofilms in approximately 60% of the chronic wounds studied, compared with only 6% of healing acute wounds (Wu, 2010). This research changed the way that healthcare workers view chronic wounds, but we still have much to learn. The glue and cement are proteins, and we know that proteins are very strong—we call them “building blocks” of the human body. The new photography techniques will help find vulnerable targets in the biofilm that will enable site-specific antibiotics to enter and dissolve the adhesive protein substances that hold the colony together.

Complete and accurate identification of the offending pathogen(s) in a wound is essential to selecting an effective treatment but, as mentioned, accurately identifying pathogens can be a problem. Biofilms make obtaining accurate cultures much more difficult. Because the traditional culture techniques that we have used for years may not identify all the microbes, wounds that
have bacteria on their surface can culture negative when a biofilm is present (i.e., the organisms are viable but not culturable) (Wolcott & Rhoads, 2008).

One study checked biofilms to see whether resident pathogens could be identified by DNA sequencing. The study revealed many species that had never been identified through traditional cultures (Phillips, et al., 2008). That’s in part because our lab tests are most successful in identifying aerobic organisms, but most of the organisms found in pressure injuries and diabetic ulcers were anaerobic. It is not likely that standard cultures will ever successfully identify all of the organisms in chronic wound biofilms. Other studies were conducted using polymerase chain reaction (PCR), molecular testing, and combination DNA testing to identify the offending microbes, and the results were even more abysmal.

Knowing what pathogens are in the wound is essential for treatment and is a key to developing effective, targeted therapy. Finding an accurate method of culturing the wound (obtaining an accurate microbe/pathogen sample) is also high on the priority list.

Infection control alert: Understanding culture and sensitivity testing

A culture is obtained to identify the causative agent when a wound infection is suspected. A sterile swab collects a sample from the wound and then is applied to a culture dish, which is stored in an environment that is conducive to microbe growth for three days. After 72 hours have elapsed, the lab will identify the microbes in the wound and list all of those with 100,000 colonies or more on the lab report.

After the organisms have been identified, a sensitivity test is conducted to learn the minimum inhibitory concentration (MIC) of various antibiotics. This is the minimum concentration of the antibacterial agent that will eliminate the pathogen. Values below the MIC will not inhibit bacterial growth.

The minimal biofilm eliminating concentration (MBEC) provides data similar to the MIC, but it is used to identify antibiotics that will eliminate the organisms in a biofilm. Unfortunately, the test is costly and not readily available everywhere. Worse yet, the MBEC of many antibiotics exceeds the maximum prescription levels available (Xu, et al., 2007). Although the antibiotics eradicate the individual colonies of bacteria in vitro (i.e., in a container in the laboratory), they have little to no effect on the community biofilm bacteria in vivo (i.e., in the body of a living person). The pathogens in biofilm communities prevent healing and predispose the wound to complications, including amputation.
Biofilm Treatment

If active signs of infection are present, healing has stalled, or the wound is worsening, treatment must be seriously considered. Notify the healthcare provider.

If the biofilm family is well established and mature, treating with systemic antibiotics will have only a temporary effect on inflammation and healing. Some of the antiseptics that are currently available will suppress biofilm on the wound surface, but they will not eradicate biofilms residing deep within the wound bed. Biofilms develop resistance quickly, so use caution in selecting treatment products: It may be necessary to rotate products frequently, or to combine two or more compatible products to confuse the microbes and prevent development of resistance.

Sharp debridement is the most effective method of removing biofilms and is the treatment of choice. Always apply an anesthetic such as lidocaine liquid, gel, or spray prior to sharp or mechanical debridement. If sharp debridement is not possible, use mechanical or chemical debridement. Applying topical antibiotics without adequate debridement will not eliminate well-established biofilms.

The struggle to eliminate a biofilm

Mature biofilms reestablish themselves rapidly after sharp debridement (Wolcott, et al., 2010). This poses a dilemma, because sharp debridement starts the clock ticking on a very narrow remedial window (usually about 24 hours) in which topical antiseptics and antimicrobial dressings will be effective in changing the chronic inflammatory phase to a healing repair phase. Treatment must be concurrent, rapid, and aggressive. By the 72-hour point, the biofilm has repaired itself and has returned to the original level of resistance. Nevertheless, the antimicrobial treatment should be carefully monitored and adjusted, changed, or discontinued based on clinical response, not strictly by time elapsed. Biofilms are believed to do the following:

• Attach (or reattach) to a wound within minutes.
• Form strong micro-colonies within two to four hours.
• Begin developing EPS in 6–12 hours; this is the protective matrix or “slime” described previously. The biofilm community uses EPS for cell aggregation, adhesion, protection, and drug resistance.
• Resist the body’s immune defenses.
• Begin developing resistance to antiseptics and antibiotics in 6–12 hours (due to EPS formation).

• Re-create mature biofilms in as little as 24 hours (debrided wounds).

• Become fully mature in two to four days (new biofilms).
  – May take five to seven days to mature in a dry, ischemic wound bed.

Keep the wound covered after debridement to prevent introduction of new contaminants. Use a broad-spectrum topical treatment product. The microbes in biofilm are up to 1,000 times less susceptible to antibiotics than are those in an infected wound without biofilm (Bjarnsholt, 2007), and MIC is not reached in chronic wound fluid. Because of this, use systemic antibiotics very judiciously. Administering antibiotics promotes resistance and favors biofilm-capable bacteria. Debriding the wound and removing debris reduces the bacterial load and is an important part of many treatment protocols, including the TIME (or DIME) treatment protocol (Phillips, et al., 2008):

  T = Debridement of necrotic TISSUE

  I = Control of INFLAMMATION and INFECTION

  M = Maintain MOISTURE balance

  E = Assessment of the epithelial EDGE of the wound

One suggested approach is to rotate topical antimicrobial products over a brief period of time to reduce the ability of the film to adapt to the product (Fux, et al., 2005). This makes a great deal of sense if several broad-spectrum products are available to eradicate the known or suspected organisms. In any event, products with antibiofilm activity are badly needed (Brackman, et al., 2013). Review the rapid deterioration in the chronic wound after sharp debridement (Figures 12.6A–12.6E).
This wound did not respond to the few approved prescription and non-prescriptions debrid-ing agents available in the United States.

Source: Barbara Acello, MS, RN.

Figure 12.6B

24 hours after sharp debridement: Slough has increased.

Source: Barbara Acello, MS, RN.
Figure 12.6C  72 hours after sharp debridement: Slough has increased.

Source: Barbara Acello, MS, RN.

Figure 12.6D  120 hours (five days) after sharp debridement: Slough has increased.

Source: Barbara Acello, MS, RN.
Biocides are common topical antiseptic products that eradicate microbes in wounds. They contain one or more active chemical molecules that will (at very small doses) repel, control growth, or destroy microorganisms. Targeting a variety of areas reduces the risk of emerging resistance. Early biocides included natural pyrethrum (from Chrysanthemum flowers), bitumen, camphor, vinegar and rose water. Today, products such as alcohol, iodine, peroxide, and acetic acid are nonspecific biocides.

Selective biocides have specific effects on cells, such as inhibition of cell growth. This category includes products such as silver and Cadexomer iodine. Of these, ionic silver (Ag+) is the best studied. It has been used extensively for the treatment of burns in the form of silver sulphadiazine. Silver has been used in medicine for hundreds of years, and it continues to have significant killing power and a broad spectrum of action. In addition to being applied directly to wounds, silver has been manufactured into dressings, catheters, and medical devices.

Povidone iodine was introduced in the 1960s and is now the most common iodophor in clinical use. Healthcare professionals who are not familiar with Cadexomer iodine may be reluctant to use it to prevent unpleasant side effects they associate with povidone iodine, which include pain, burning/stinging, irritation, skin staining, destruction of granulation tissue, and potential for...
systemic absorption and toxicity. Cadexomer iodine, however, is an iodine and polysaccharide complex, and it is free from the unpleasant side effects associated with povidone iodine.

Check the indications and contraindications for all products that you put in a wound. There is no guarantee that any product will eliminate the unknown combination of pathogens in a biofilm, but silver and Cadexomer iodine are two excellent nonprescription antimicrobials in the wound care arsenal. However, both are incompatible with some other products. Check all topical products for compatibility before using them.

**Protective communication**

Quorum-sensing inhibitors are in the scientific pipeline. Until they have been developed, perfected, and approved, biocides will be the mainstay of wound biofilm management. View topical antiseptics and antibiotics as a preliminary step to some of the excellent wound care products and advanced therapies.

Antimicrobials are for eradicating infection, not healing wounds. A wound does not have to be free from all microbes to heal successfully, and there is no reason to leave an antimicrobial product in the wound until healed. In fact, doing so is inappropriate, except in very specific circumstances. If nothing else, it promotes further drug resistance. Use the antimicrobials only to obtain a red-clean injury. When signs and symptoms of infection are gone and the wound begins granulating, switch to a treatment or dressing product that is individualized and appropriate for the wound.

Biofilms can regenerate if the colony is almost but not completely destroyed, so careful assessment and use of common sense are indicated. Any remaining fragments can become active, reattach, and then use quorum sensing to communicate with other microbe fragments to recreate the biofilm in exactly the same composition as before. The good news is that a reconstituted biofilm is more susceptible to treatment products and host immunity, at least for a brief (and undefined) period of time. This provides an opportunity for prompt and aggressive treatment.
Less Common Biocide Treatments

Several other methods are occasionally used to treat biofilms, usually after other methods have failed.

**Maggot (larval) therapy**

Many people associate maggots with filth. In fact, however, sterile, medical-grade insects for human therapy are used effectively in wound care. Use of maggots may be called *larval therapy (LT)*, *medical larval therapy (MLT)*, or *maggot debridement therapy (MDT)* to be more aesthetically acceptable and reduce the negative connotation. A newer term is *biosurgery*, which by definition means the medical use of maggots to clean infected wounds (Oxford Dictionaries, n.d.; TheFreeDictionary.com, n.d.). Maggots reduce odor and clean infected, gangrenous, and necrotic wounds. This therapy was used in the 19th and early 20th centuries. It was common during World War I, and then it was all but forgotten until the end of the 20th century. It has proven to be an important tool in the wound care arsenal.

Maggots secrete an enzyme that liquefies necrotic tissue, which the larvae subsequently ingest. This enzyme also kills *Streptococcus* and *Staphylococcus* bacteria (Thomas & Andrews, 1999). Larvae are left in place for three days. A second application may be used, if necessary. Removal of Gram-positive bacteria is more efficient than the removal of Gram-negative bacteria, so additional larvae or applications may be necessary if Gram-negative bacteria are causing the infection (Steenvoorde & Jukema, 2004). Hydrogel products should not be used concurrently because it suffocates the larvae; make sure to flush all traces of hydrogel from the wound before beginning treatment.

**Bioelectrical stimulation**

Tissue damage stimulates internal forces that send neutrophils and fibroblasts to the wound to stimulate healing. Passing an electrical current into the tissue can accelerate healing in wounds that have stalled.

**Negative pressure wound therapy systems**

Negative Pressure Wound Therapy (NPWT) provides a closed, moist healing environment. This treatment is also called *Vacuum-Assisted Closure (VAC, wound VAC)*. It increases oxygen and nutrients to the tissues; stimulates granulation; removes necrosis, drainage, debris, and potentially
infectious materials; relieves edema; and improves circulation. FDA has issued several warnings related to wound pump issues. For additional information, refer to http://tinyurl.com/NPWT-FDA.

**Hyaluronic acid**

Hyaluronic acid (HA) dressings are reported to accelerate healing and have been used successfully in the care of chronic wounds. HA may be used in dressings or in combination with other products because it is excellent for enhancing absorption. Change the dressings every two to three days.

**Low-level laser therapy (LLLT)**

Low-level laser therapy (LLLT) reduces inflammation, relieves pain, and promotes and accelerates healing by applying red and near infrared light (600nm to 1,000nm) over wounds, which is not hot enough to burn the skin. The laser is small, and it can identify and focus on areas that other treatments cannot reach. It is a pain-free and non-invasive treatment that does not damage surrounding tissue. Identifying the correct dosage for treatment is an ongoing topic of research. The FDA considers LLLT an experimental treatment, which affects the insurance companies’ willingness to pay for it.

**Selecting a Treatment**

In order to heal the wound, you must do the following:

- Reduce the bioburden
- Prevent biofilm attachment or reattachment

Necrotic tissue must be debrided and moisture balance addressed by wetting dry tissue and drying wet tissue. Dressings for these tasks include films, hydrocolloids, hydrogels, foams, hydrofibers, composites, and alginites. Do not debride stable, dry, uninfected heel eschar.

At this point, the keys to effective management are maintaining a therapeutically moist environment but preventing maceration, managing bacterial balance in the wound, and managing exudate. The choice of dressing is essential to making this happen. Selection of dressings should be based on the following:

- Manufacturer’s recommended use
• Wound location
• Absorbency of the dressing
• Ability to conform and secure the dressing to the area
• Wound characteristics
• Antimicrobial properties
• Nature and volume of drainage
• Ability to manage exudate
• Ability to manage moisture and prevent maceration
• Tissue in the wound bed
• Presence of slough or eschar
• Condition of the periwound skin
• Goals for healing
• Minimize pain
• Manage odor
• Prevent drying and fissure formation
• Compatibility with other treatment products being used
• Ensure highest possible quality of life

Remember that debridement alone is not enough because the biofilms try to resist destruction and are difficult to debride adequately. They marshal their forces and regroup as quickly as possible (see Figures 12.6A–12.6E, which is a series of photos taken over seven days). This is a major issue, because debridement is presently the treatment of choice—in fact, it is the most effective treatment we have. Some type of follow-up is needed right away. Several researchers have had good lab results using silver and Cadexomer iodine for destroying existing biofilms and preventing the formation of new biofilms (Akiyama, et al., 2004). The concentration of silver was important to its ability to eradicate pathogens. Honey is also useful, if its UMF concentration is high enough (Percival, et al., 2008), as is lactoferrin/xylitol hydrogel (Ammons, et al., 2011; Wolcott & Rhoads, 2008; Hoffman, 2010).
Combination treatments

Sometimes a variety of treatments will provide an effective approach, especially in refractory wounds. For example, systemic antibiotic therapy may be combined with products containing hydrofera blue, silver, or Cadexomer iodine in clean wounds, post-debridement. Less common antibiofilm agents include the following:

- A polyhexamethylene biguanide (PHMB) antimicrobial agent (0.1%), such as Prontosan, to remove debris and disrupt the action of the biofilm (Figure 12.7).

- Metronidazole has a synergistic action with several other antimicrobials. Topical metronidazole is designated an orphan drug by FDA for use in treatment of Stage 3 or 4, anaerobically infected pressure injuries (Food and Drug Administration, 2001).

Evidence-Based Care

Wound care is the subject of continuous research. The information in this book is current at the time of this writing. However, recommendations change rapidly. When considering a new treatment, check to be sure that you are following the current guidelines and recommendations. See Table 12.1 for sources of additional information.
<table>
<thead>
<tr>
<th>Website</th>
<th>Overview</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>A Pressure Ulcer Assessment Tool</td>
<td>A tool based on the mnemonic A-S-S-E-S-S-M-E-N-T that was developed in a checklist format to provide a snapshot of the pressure injury’s location, size, sinus tracts, tunneling, exudate, necrotic tissue, epithelialization, and presence or absence of granulation tissue.</td>
<td><a href="http://endolifecare.tripod.com/imbbeddedlinks/id11.html">http://endolifecare.tripod.com/imbbeddedlinks/id11.html</a></td>
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<td>AHRQ pressure ulcer prevention and treatment protocol</td>
<td>Quality measure is used to assess the percentage of residents with documentation of a pressure injury.</td>
<td><a href="http://www.qualitymeasures.ahrq.gov/summaries/summary/36725">www.qualitymeasures.ahrq.gov/summaries/summary/36725</a></td>
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<td>AHRQ’s Safety Program for Nursing Homes: On-Time Pressure Ulcer Prevention</td>
<td>AHRQ created this program to help nursing homes with electronic medical records reduce the occurrence of in-house pressure injuries.</td>
<td><a href="http://www.ahrq.gov/professionals/systems/long-term-care/resources/ontime/pruprev/index.html">www.ahrq.gov/professionals/systems/long-term-care/resources/ontime/pruprev/index.html</a></td>
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<tr>
<td>American Professional Wound Care Association (APWCA)</td>
<td>Offers a refresher course for all providers in wound care and as a review for Wound Care Certification preparation.</td>
<td><a href="http://www.apwca.org/">www.apwca.org/</a></td>
</tr>
<tr>
<td>Arjo Huntleigh Pressure Ulcers Clinical Guidelines</td>
<td>Numerous preventive resources; good explanation of microclimate.</td>
<td><a href="http://www.arjohuntleigh.com/pressure-ulcers/clinical-guidelines/">www.arjohuntleigh.com/pressure-ulcers/clinical-guidelines/</a></td>
</tr>
<tr>
<td>Biofilm Based Wound Care</td>
<td>Through trial and error, laboratory and clinical studies, multiple tools have been developed to treat wound biofilm. In treating wounds as if biofilm is a major barrier to wound healing, it is important that the treatments suppress biofilm but not damage host defenses and/or host healing mechanisms.</td>
<td><a href="http://southwestwoundcare.com/biofilm-based-wound-care/">http://southwestwoundcare.com/biofilm-based-wound-care/</a></td>
</tr>
<tr>
<td>Canadian Association of Wound Care (CAWC)</td>
<td>Links to resources on all aspects of wound management and prevention.</td>
<td><a href="http://cawc.net/">http://cawc.net/</a></td>
</tr>
<tr>
<td>Carbapenem-resistant Enterobacteriaceae: Deadly superbugs on the rise</td>
<td>APIC overview of CRE.</td>
<td><a href="http://www.apic.org/Resource_/TinyMceFileManager/Periodical_Images/CRE.pdf">www.apic.org/Resource_/TinyMceFileManager/Periodical_Images/CRE.pdf</a></td>
</tr>
<tr>
<td>Dressings.org</td>
<td>Contains an exhaustive list of wound care products, including the Surgical Materials Testing Lab (SMTL) dressings, data cards, technical papers, and test reports from SMTL.</td>
<td><a href="http://www.dressings.org/">www.dressings.org/</a></td>
</tr>
<tr>
<td>European Pressure Ulcer Advisory Panel</td>
<td>NPUAP counterpart. Collaborated with NPUAP to develop pressure injury prevention and treatment clinical guideline. News and additional resources on their website.</td>
<td><a href="http://www.epuap.org/">www.epuap.org/</a></td>
</tr>
<tr>
<td>Healthcare Improvement Scotland</td>
<td>Wide range of resources from evidence based reports to best practice and improvement guides.</td>
<td><a href="http://www.healthcareimprovementscotland.org/">www.healthcareimprovementscotland.org/</a></td>
</tr>
<tr>
<td>How to Apply the Unna Boot Application</td>
<td>Simple instructions for applying an Unna Boot; discussion about healing venous injuries.</td>
<td><a href="http://www.ehow.com/how_5642473_apply-unna-boot-application.html">www.ehow.com/how_5642473_apply-unna-boot-application.html</a></td>
</tr>
<tr>
<td>National Alliance of Wound Care</td>
<td>Information for persons who are considering becoming wound specialists through wound care certification.</td>
<td><a href="http://www.nawccb.org/">www.nawccb.org/</a></td>
</tr>
<tr>
<td>Website</td>
<td>Overview</td>
<td>Location</td>
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<tr>
<td>National Pressure Ulcer Advisory Panel (NPUAP)</td>
<td>Wide variety of information, resources, and links.</td>
<td><a href="http://www.npuap.org/">www.npuap.org/</a></td>
</tr>
<tr>
<td>Nursing Home Help</td>
<td>Educational materials provided by the University of Missouri, Sinclair School of Nursing.</td>
<td><a href="http://www.nursinghomehelp.org/edmat.html">www.nursinghomehelp.org/edmat.html</a></td>
</tr>
<tr>
<td>Practicing Smart Wound Care</td>
<td>Full text article from <em>Infection Control Today</em>. The advice is excellent and relevant, but the article was published in 2000.</td>
<td><a href="http://www.infectioncontroltoday.com/articles/2000/12/practicing-smart-wound-care.aspx">www.infectioncontroltoday.com/articles/2000/12/practicing-smart-wound-care.aspx</a></td>
</tr>
<tr>
<td>Prevention Plus</td>
<td>“Home of the Braden scale.”</td>
<td><a href="http://www.braden">www.braden</a> scale.com/</td>
</tr>
<tr>
<td>Pressure Ulcer Prevention Project</td>
<td>Evidence-based information on preventing pressure injuries in persons with spinal cord injury.</td>
<td><a href="http://pups.usc.edu/index.html">http://pups.usc.edu/index.html</a></td>
</tr>
<tr>
<td>SCALE: Skin Changes at Life’s End</td>
<td>Physiologic changes that occur as a result of the dying process may affect the skin and soft tissues and may manifest as observable (objective) changes in skin color, turgor, or integrity, or as subjective symptoms such as localized pain.</td>
<td><a href="http://www.woundsresearch.com/files/wounds/pdfs/Consensus_Dec09.pdf">http://www.woundsresearch.com/files/wounds/pdfs/Consensus_Dec09.pdf</a></td>
</tr>
<tr>
<td>Skin Care: Preventing Pressure Injuries</td>
<td>Current information from Rehabilitation Institute of Chicago—Nursing Practice Council. Includes links to other information.</td>
<td><a href="http://www.sralab.org/search/lifecenter?topic=4629&amp;cid=19&amp;tid=top414&amp;tray=content">www.sralab.org/search/lifecenter?topic=4629&amp;cid=19&amp;tid=top414&amp;tray=content</a></td>
</tr>
<tr>
<td>Understanding the Kennedy Terminal Ulcer</td>
<td>Comprehensive information about the Kennedy Terminal Ulcer, written by Karen Lou Kennedy Evans.</td>
<td><a href="http://www.kennedyterminalulcer.com/">www.kennedyterminalulcer.com/</a></td>
</tr>
<tr>
<td>Vein Treatment Center</td>
<td>Comprehensive information about venous disorders and their treatment.</td>
<td><a href="http://www.veinseinsveins.com/">www.veinseinsveins.com/</a></td>
</tr>
<tr>
<td>What are leg ulcers?</td>
<td>UK website with comprehensive leg ulcer information.</td>
<td><a href="http://www.thewhiteleyclinic.co.uk/conditions/leg-ulcers/">http://www.thewhiteleyclinic.co.uk/conditions/leg-ulcers/</a></td>
</tr>
<tr>
<td>World Wide Wounds</td>
<td>The mission of World Wide Wounds is to be the premier online resource for peer-reviewed information on dressing materials providing practical guidance on all aspects of wound management to health professionals worldwide.</td>
<td><a href="http://www.worldwidewounds.com/">www.worldwidewounds.com/</a></td>
</tr>
<tr>
<td>Wound, Ostomy and Continence Nurses Society (WOCN)</td>
<td>Educational, clinical, and research information to advance the practice and guide the delivery of expert healthcare to individuals with wounds, ostomies, and incontinence.</td>
<td><a href="http://www.wocn.org/">www.wocn.org/</a></td>
</tr>
<tr>
<td>Wounds</td>
<td>WOUNDS is the most widely read peer-reviewed journal focusing on wound care and wound research.</td>
<td><a href="http://www.woundsresearch.com/">www.woundsresearch.com/</a></td>
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</table>
REFERENCES


CHAPTER 13

Documentation

What to Document

Pressure injury documentation should include the following:

- All assessment information listed in Chapter 3.
- Wound observations made during treatments and routine skin checks. Remember to be specific. Avoid documentation such as “healing well,” which is not objective or legally defensible. Describe what you saw and what you did.
- Treatments and procedures.
- Pain assessments.
- PRN or routine analgesics given and resident response.
- Premedication prior to treatments and resident response.
- Notifications, such as to the healthcare provider, family, and consultants.
- Resident and family education.
- Wound location.
- Description of wound bed.
- Size (length, width, depth) of wound.
- Wound stage (avoid backstaging).
- Odor, drainage, necrosis, tunnels, etc.
- Presence of granulation tissue.
• Nursing interventions.
• Resident response to care.
• Other pertinent information and observations.

If you are documenting on a flow sheet, write any problems or abnormalities in the nurses’ notes, in detail. Simply describing an abnormality is inadequate. Similarly, describe what nursing action was taken, in detail. In most cases, a notation that says “will continue to monitor” is also inadequate. The nursing process and plan of care should guide all care and documentation.

**What Not to Document**

Little can be said about documentation that you do not already know; documentation is integrated into various chapters throughout this book. This section discusses common documentation problems to avoid.

The medical record is a true, complete, and accurate record of care given. However, many nurses document care that is “supposed to be done” instead of care that was actually given. Documenting care that is supposed to be done may undermine your credibility if a surveyor or a plaintiff attorney determines the care was not given. Avoid meaningless statements such as “turned q 2 hours,” “toileted q2h,” or “call light in reach” unless you personally know that this was done as documented.

**CMS Study**

One Centers for Medicare & Medicaid Services study (Bates-Jensen, et al., 2003) provides an example of documenting pressure injury care that is supposed to be done but was not.

This study involved 16 nursing homes and 329 residents, and at the time, pressure injuries were one of the quality indicators. Some of the facilities had a low prevalence of skin breakdown indicators, whereas others had a high prevalence reported on the MDS.

In this study, residents’ movement was measured by wireless thigh monitors, which were applied to dependent bedfast and chairfast residents who could not reposition themselves. The study revealed that nurses charted that turning and repositioning were being done every two hours in 95% of high-risk residents but there was a wide discrepancy between documentation and actual care delivery. Few residents (both high- and low-risk) were routinely repositioned every two
hours, despite the fact that nurses had documented this care for most residents. Twenty-three percent of high-risk residents were actually being turned every three hours, and the longest time measured with no moves was about four hours.

All facilities scored poorly on pressure injury prevention and screening process indicators. None of the facilities complied with the screening indicator that calls for a pressure injury risk assessment on admission and weekly for four weeks.

As you can see, the findings of this study are abysmal. The researchers noted, “These data raise questions about the usefulness of this indicator for improvement, survey, or consumer education purposes. In particular, it should not be assumed that nursing homes that score well (low prevalence) on the MDS pressure injury quality indicators are providing better care than facilities that report a high prevalence. A more accurate interpretation is that all nursing homes provide relatively poor preventive care and that improvement is needed in most care process areas other than treatment once a pressure injury is present” (Springhouse, 2001).

In the study mentioned above, nurses inaccurately documented in the medical record that scheduled repositioning occurred every two hours for almost all of the study residents (97% in low-pressure injury homes, 93% in high-pressure injury homes). Such failure to provide accurate and honest documentation of resident care is potentially harmful to the residents. Other nurses, healthcare providers, consultants, and professional team members depend on your documentation to learn about the resident and his or her care. They trust that the information is accurate and use it to complete their assessments and develop care plan approaches.

Additionally, your documentation validates the care you have given. Many other professionals trust that it is an accurate and complete record of what has been done and the resident’s response to care (Richards, 2001). If you are involved in a lawsuit or questioned by an attorney, avoid using the excuse that care plans and documentation are nothing more than paper compliance. You can be certain that the opposing attorney has one or more credible, convincing expert witnesses to persuasively testify why properly maintained medical records are essential to the residents’ welfare.

Documentation in one part of the medical record must be consistent and not contradict information in other parts. For example, the resident’s weight may be documented on a weight record, in the nursing notes, in the dietary notes, and in the MDS. Make sure that the weight is identical in all of these areas. If the resident is underweight, overweight, or consistently losing or gaining weight, address that issue on the care plan as well. Inconsistencies can create serious problems. The person who is auditing the charts and finds such inconsistencies will likely dig deeper to see if they can find others.
Survey and Certification Issues

Pressure injuries and documentation are often in the list of most frequently cited deficiencies. At the time of this writing, the most recent survey list is for the year 2015 (Survey and Certification Letter 17-06-NH), and pressure injuries are cited at F314—Treatment/Services to Prevent/Heal Pressure Injuries:

Pressure injuries:

- Coding inconsistent with residents with and without pressure injuries.
- Pressure injuries not coded at the correct stages.
- Coded as healed when not healed.
- Incorrect number of pressure injuries coded.
- Nurses write, “Healing well.” The measurements of the injury are getting larger and deeper every week. This is a common contradiction that invites deficiencies.

Little else can be said other than accurate documentation of pressure injuries is essential.

Half Truths or Outright Falsification

Tampering and falsification are illegal and can cause the entire record to be inadmissible as evidence in court (Springhouse, 2001). At the very least, such actions call the credibility of the facility and its personnel into question. You may find that common practices you have seen in your facility fall into this category. At best, the following practices are simple errors; at worst, they are falsification:

- Documenting care that has not been given.
- Charting “assessment done” without describing the assessment findings.
- Making up, misstating, or overstating information. A common documentation problem is saying that a resident was “eased to the floor” when in fact she fell and shattered a hip. Residents who are eased to the floor are not likely to break a hip. You may be surprised to learn that this is a very common documentation problem. Nurses think they are protecting themselves and the facility, but in fact they are opening themselves up to significant legal exposure.
- Using a different treatment product, cleanser, or dressing than ordered by the physician.
• Not doing treatments, tube feedings, irrigations, etc., but charting that they were done.

• Writing a phone order for the treatment you want to use and burying it in the pile of telephone orders for the physician to sign. Remember that legally, you must advocate for the residents. If, in your professional judgment, you believe the physician orders place a resident in jeopardy, you must intervene. If the physician is nonresponsive, contact your supervisor, and go up the chain of command from there. Document the actions taken to advocate for the resident. Please do not write your own orders.

• Filling in gaps (omissions) on flow sheets; some facilities have end-of-the-month “charting parties.” This is not a legal practice.

• Charting medication administration, treatments, or other care in advance. Keep in mind that writing your initials on a medication or treatment record indicates that you have given the medication or treatment, not merely removed it from the drawer. (The same principle applies for all other flow sheet charting.) By placing your initials on the record before giving the medication or treatment, you are increasing your risk of legal exposure.

• Errors, omissions, and questionable or inaccurate entries diminish your credibility. This becomes an issue if the nursing care is questioned or negligence is alleged, affecting both the reliability of your chart and the strength of your case if you end up in court. Covering up minor errors that were not negligent damages your credibility. An accurate and concise record shows that you are conscientious. It implies that you have given quality care. In contrast, errors suggest that you are careless. If you are careless with your documentation, the reader may assume that you are careless in the care you provide as well.

Fraud and Abuse

Tampering with, altering, or falsifying the medical record in any manner is fraud. Any individual tampering with a medical record is subject to criminal, civil, and licensure action. Fraud has a longer statute of limitations than medical malpractice in some states. Additionally, the nursing licensure board is not bound to the statute of limitations when investigating and punishing nurses for fraudulent documentation. The message is clear: Do not alter or destroy the medical record.

Removing and rewriting pages of the medical record must be for a justifiable purpose and done in a specific manner. On rare occasions, liquid or another substance may be spilled on a medical record, or a page may be damaged so that it is illegible. If this happens, retain the original page. Note the reason for recopying. Make a notation that the original was damaged and on what date. Recopy the
Medicaid and Medicare pay for the lion’s share of care provided by facilities. Each resident’s MDS is electronically submitted to the government, where it is evaluated for caregiving and payment. Auditors will visit the facility periodically to ensure that the care they paid for was actually given. If it was not, the facility will be expected to repay the money, in addition to paying hefty fines. This places the old adage “If it wasn’t documented, it wasn’t done” in a new light that nurses frequently do not consider.

State and federal laws both address falsification of documentation. Examples are:

§483.20(j) Penalty for Falsification.

(1) Under Medicare and Medicaid, an individual who willfully and knowingly—

(i) Certifies a material and false statement in a resident assessment is subject to a civil money penalty of not more than $1,000 for each assessment; or

(ii) Causes another individual to certify a material and false statement in a resident assessment is subject to a civil money penalty or not more than $5,000 for each assessment (Centers for Medicare & Medicaid Services, 2017).

Grounds for Discipline:

Fraud, deception, or misrepresentation, including, but not limited to:

1. Committing fraud or deceit in the practice of nursing.

2. Submitting false documentation or information, such as credentials, letters of recommenda-
tions, resumes, curriculum vitae, certificates, educational certificates or transcripts, or licenses
to an employer or potential employer for the purpose of securing or maintaining employment.

3. Submitting false documentation or information to an employer for the purpose of receiv-
ing remuneration or reimbursement of costs to which the licensee is not entitled.

4. Submitting false information in the course of an investigation or as part of any application.
5. Failing to document and maintain accurate records, includes, but is not limited to:
   
a. Falsifying reports, patient documentation, agency records, or other essential health documents; and

b. Knowingly making incorrect entries a patient’s medical record or other related documents.


**Guidelines for General Nursing Documentation**

Nursing documentation should be as follows:

- Based on the requirements of your state’s nurse practice act. If you have not read it lately, you may wish to do so. It is probably on your board of nursing’s website.

- Objective—not critical or subjective.

- Clear, concise, and comprehensive.

- Accurate, truthful, and honest. It should not appear self-serving, especially if an incident or injury occurs.

- Relevant and appropriate.

- Reflective of observations, not unfounded conclusions.

- Reflective of resident education.

- Reflective of resident response to care and actions taken to rectify unsatisfactory responses.

- Timely and completed only during or after giving care.

- Chronological.

- Internally consistent.

- A complete record of nursing care provided, including assessments, identification of health issues, a plan of care, implementation, and evaluation.

- Legible and non-erasable.

- Unaltered.
• Permanent.
• Retrievable.
• Confidential.
• Resident-focused.
• Outcome-based.
• Completed using forms, methods, systems provided, or methods and systems consistent with these standards, facility policies, and state laws.

Clinical documentation is the element of resident care that contributes to identification and communication of residents’ problems, needs, and strengths; that monitors their conditions on an ongoing basis; and that records treatment and response to treatment. It is a matter of good clinical practice and an expectation of licensed healthcare professionals (Morris, et al., 2002). Note that documentation cannot be separated from resident care. It is an element of comprehensive care and must be consistent with the care plan. Avoid documenting information that contradicts the information and approaches listed on the plan.

**Changing Terminology on Medical Records**

It is time to start changing terminology on medical records, forms, and documentation and in computer programs. All documentation going forward should reflect the new terminology. In other words, use “pressure injuries” instead of “pressure ulcers.” How you do this is determined by the type of medical record system you are using.

The National Pressure Ulcer Advisory Panel (NPUAP) recognizes that making changes in literature and electronic medical records is time-consuming and costly. Because the changes to the six stages of pressure injury were changes only to title and wording, the stages are still the same. *What was formerly a stage II is still a stage 2, and the treatment has not changed*—the changes within local facilities need not be made in a hurried manner. The pressure injury terminology changes can be made when routine updates of the policies, procedures, and EMR documentation are done within institutions and organizations.
AHRQ’s Safety Program for Nursing Homes: On-Time Prevention

Facilities across the country are in varying stages of changing their medical records to an electronic system. The Agency for Health Care Research and Quality (AHRQ) has created tools for facilities with electronic medical record systems. Their program identifies residents with increasing risk and provides a list of these residents weekly. It also provides information with which to update the care plan. AHRQ has numerous resources for long-term care facilities. You will find links on this page: www.ahrq.gov/professionals/systems/long-term-care/resources/ontime/pruprev/index.html

The Last Word

The National Pressure Ulcer Advisory Panel (NPUAP)

Time marches on and so does change. The NPUAP first announced the changes in terminology one year ago. Since then, they have updated many resources on their websites and added a great deal of new material. Research also marches on and you can expect new evidence-based practices to be part of life.

The NPUAP website continues to be your best source of current information. You may wish to check there before looking elsewhere. This is a subject in which education is essential. The website has a nursing curriculum, current pictures, PowerPoint slides, and many miscellaneous items. Some are free, and there is a nominal charge for others.

What is apparent is that NPUAP has not finished making changes and adding new material. Check their site often: http://www.npuap.org/

State Operations Manual (SOM)

If your facility accepts any federal funding from Medicare or Medicaid, you are operating under both states and federal rules. The federal rules are found in the State Operations Manual. However, there are numerous sections in the manual. The one you want is Appendix PP. You will also need Appendix Z.

• To access these manuals, go to: http://tinyurl.com/y98oepbu

• Click on 100-07 State Operations Manual

• Scroll to the bottom and click Appendices Table of Contents. This will give you the two page Table of Contents (TOC). Download it and save it to a location you can find.
• Open the TOC file.
• Scroll down and click on Appendix PP.
• Save the file. This is a 739 page download at the present time.
• Return to the TOC.
• Scroll down and click on Appendix Z. This is a 72 page emergency preparedness download.
• Save the downloads. You probably will need them again. However, return and check the link periodically. The manuals are updated regularly and right now changes are at laser fast speed.

Keep the table of contents and the manuals you just downloaded. You will need them again. However, return and check the link periodically. The manuals are updated regularly. At the present time, changes are occurring at laser fast speed.

Memos to providers and additional information are available from CMS’ Policies & Memos website, found at http://tinyurl.com/qypofyl. Be assured that many more changes will follow.

Thank you for your commitment to our geriatric residents. Providing preventive skin care and knowing how to manage pressure injuries are essential skills in the care, health, wellness, and quality of life of the residents in your facility.

REFERENCES


# Appendices

## Table of Contents

Appendix 1: 10 Most Common Pathogens ................................................................. 231
Appendix 2: Adult Immunization Schedule .......................................................... 233
Appendix 3: Common Aerobic Microorganisms Seen in Wounds ...................... 235
Appendix 4: Common Anaerobic Microorganisms Seen in Wounds ................. 237
Appendix 5: Antimicrobial Resistance Patterns for Healthcare-Associated Infections (HAIs) Reported to the National Healthcare Safety Network (NHSN) ......................................................... 239
Appendix 6: ESKAPE Acronym ........................................................................... 241
Appendix 7: Essential Oils in Wound Care ......................................................... 243
Appendix 8: Gram Stain Quick Reference ............................................................ 245
Appendix 9: Overview of Wound Management .................................................. 249
Appendix 10: Nosocomial Infection Criteria ....................................................... 251
Appendix 11: Tissue Tolerance Procedure .......................................................... 253
10 Most Common Pathogens

The pathogens listed here account for 84% of all nosocomial infections:

1. Coagulase-negative staphylococci (15%)
2. Staphylococcus aureus (15%)
3. Enterococcus species (12%)
4. Candida species (11%)
5. Escherichia coli (10%)
6. Pseudomonas aeruginosa (8%)
7. Klebsiella pneumoniae (6%)
8. Enterobacter species (5%)
9. Acinetobacter baumannii (3%)
10. Klebsiella oxytoca (2%)

REFERENCE
### 2016 Recommended Immunizations for Adults: By Age

**If you are this age,** talk to your healthcare professional about these vaccines:

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Flu (Influenza)</th>
<th>Tetanus, diphtheria, pertussis (Td/Tdap)</th>
<th>Shingles</th>
<th>Pneumococcal</th>
<th>Meningococcal</th>
<th>Measles, mumps, rubella (MMR)</th>
<th>HPV</th>
<th>Chickenpox</th>
<th>Varicella</th>
<th>Hepatitis A</th>
<th>Hepatitis B</th>
<th>Haemophilus influenzae type b (Hib)</th>
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<td>19 - 21</td>
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<td>PCV13</td>
<td>PPSV23</td>
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<td>MenB</td>
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**More Information:**

- You should get flu vaccine every year.
- You should get Td booster every 10 years. You also need 1 dose of Tdap. Women should get a Tdap vaccine during every pregnancy to protect the baby.
- You should get a shingles vaccine even if you have had shingles before.
- You should get 1 dose of PCV13 and at least 1 dose of PPSV23 depending on your age and health condition.
- You should get the HPV vaccine if you are a woman through age 26 years or a man through age 21 years and did not already complete the series.
- You should get the HPV vaccine if you did not get it when you were a child.

For more information, call 1-800-CDC-INFO (1-800-232-4636) or visit [www.cdc.gov/vaccines](http://www.cdc.gov/vaccines)

- **Recommended For You:** This vaccine is recommended for you unless your healthcare professional tells you that you cannot safely receive it or that you do not need it.
- **May Be Recommended For You:** This vaccine may be recommended for you if you have certain risk factors due to your health, job, or lifestyle that are not listed here. Talk to your healthcare professional to see if you need this vaccine.

If you are traveling outside the United States, you may need additional vaccines. Ask your healthcare professional about which vaccines you may need at least 6 weeks before you travel.
Common Aerobic Microorganisms Seen in Wounds

1. Acinetobacter calcoaceticus
2. Acinetobacter baumannii
3. Actinobacillus actinomycetemcomitans
4. Bacillus anthracis
5. Bacillus cereus
6. Bacillus sp.
7. Beta-hemolytic streptococcus (group C)
8. Beta-hemolytic streptococcus (group G)
9. Bifidobacterium bifidum
10. Bordetella pertussis
11. Brucella sp.
12. Campylobacter sp.
13. Candida krusei
14. Candida parapsilosis
15. Capnocytophaga sp.
16. Cardiobacterium hominis
17. Citrobacter freundii
18. Citrobacter sp.
19. Coagulase-negative staphylococci
20. Coliforms
21. Corynebacterium diphtheriae
22. Corynebacterium sp.
23. Corynebacterium xerosis
24. Eikenella corrodens
25. Enterobacter aerogenes
26. Enterobacter cloacae
27. Enterobacter sp.
28. Enterobacteriaceae (glucose-fermenting Gram-negative rods)
29. Enterococcus faecalis
30. Enterococcus sp. (Formerly classified in Streptococcus genus. Has been reclassified as Enterococcus genus.)
31. Erysipelothrix rhusiopathiae
32. Escherichia coli
33. Escherichia hermanii
34. Francisella tularensis
35. Haemophilus ducreyi
36. Haemophilus influenzae
37. Helicobacter pylori
38. Kingella kingae
39. Klebsiella oxytoca
40. Klebsiella pneumoniae
41. Lactobacillus sp.
42. Legionella pneumophila
43. Listeria monocytogenes
44. Micrococcus sp.
Appendix 3 | Common Aerobic Microorganisms Seen in Wounds

45. Moraxella catarrhalis
46. Morganella morganii
47. MRSA
48. Neisseria gonorrhoeae
49. Neisseria meningitidis
50. Nocardia sp.
51. Pasteurella multocida
52. Propionibacterium acnes
53. Proteus mirabilis
54. Proteus sp.
55. Proteus vulgaris
56. Providencia stuartii
57. Pseudomonas aeruginosa
58. Rhodococcus equi (coccobacillus)
59. Salmonella enteriditis
60. Salmonella typhi
61. Serratia liquefaciens
62. Serratia marcescens
63. Shigella sp.
64. Sphingobacterium multivorum
65. Staphylococcus aureus
66. Staphylococcus epidermidis
67. Staphylococcus sp. (Coagulase-negative)
68. Stenotrophomonas maltophilia
69. Streptococcus agalactiae (group B)
70. Streptococcus pneumoniae (Viridans group)
71. Streptococcus pyogenes (group A)
72. Streptococcus pyogenes
73. Streptococcus spp. (viridans)
74. Streptococcus spp. (fecal)
75. Yersinia pestis
76. Yersinia enterocolitica
Common Anaerobic Microorganisms Seen in Wounds

1. Actinomyces sp.
2. Bacteroides caccae
3. Bacteroides capillosus
4. Bacteroides fragilis
5. Bacteroides ovatus
7. Bacteroides stercoris
8. Bacteroides thetaiotaomicron
9. Bacteroides uniformis
10. Bacteroides ureolyticus
11. Clostridium baratii
12. Clostridium bifermentans
13. Clostridium botulinum
14. Clostridium cadaveris
15. Clostridium clostridioforme
16. Clostridium difficile
17. Clostridium histolyticum
18. Clostridium limosum
19. Clostridium perfringens
20. Clostridium ramosum
21. Clostridium septicum
22. Clostridium sporogenes
23. Clostridium tertium
24. Clostridium tetani
25. Eubacterium limosum
26. Fusobacterium necrophorum
27. Fusobacterium spp.
28. Gram-negative pigmented bacillus
29. Peptostreptococcus anaerobius
30. Peptostreptococcus asaccharolyticus
31. Peptostreptococcus indolicus
32. Peptostreptococcus magnus
33. Peptostreptococcus micros
34. Peptostreptococcus prevotii
35. Peptostreptococcus spp.
36. Porphyromonas asaccharolytica
37. Porphyromonas spp.
38. Prevotella bivia
39. Prevotella buccae
40. Prevotella corporis
41. Prevotella disiens
42. Prevotella intermedia
43. Prevotella melaninogenica
44. Prevotella oralis
45. Prevotella oris
46. Prevotella spp.
47. Propionibacterium acnes
48. Streptococcus intermedius
49. Veillonella spp.
Eight pathogen groups accounted for about 80% of reported pathogens:

1. Staphylococcus aureus (16%)
2. Enterococcus spp. (14%)
3. Escherichia coli (12%)
4. Coagulase-negative staphylococci (11%)
5. Candida spp. (9%)
6. Klebsiella pneumoniae (and Klebsiella oxytoca) 8%
7. Pseudomonas aeruginosa (8%), and Enterobacter spp. (5%)
8. The percentage of resistance was similar to that reported in the previous 2-year period, with a slight decrease in the percentage of S. aureus resistant to oxacillins (MRSA).

Nearly 20% of pathogens reported from all HAIs were the following multidrug-resistant phenotypes:

- MRSA (8.5%)
- Vancomycin-resistant Enterococcus (3%)
- Extended-spectrum cephalosporin–resistant:
  - K. pneumoniae and K. oxytoca (2%)
  - E. coli (2%) and Enterobacter spp. (2%)
- Carbapenem-resistant P. aeruginosa (2%)
- K. pneumoniae/oxytoca (<1%)
- E. coli (<1%)
- Enterobacter spp. (<1%)

Among facilities reporting HAIs with 1 of the above gram-negative bacteria, 20%–40% reported at least 1 with the resistant phenotype.

Conclusion. While the proportion of resistant isolates did not substantially change from that in the previous 2 years, multidrug-resistant gram-negative phenotypes were reported from a moderate proportion of facilities.
APPENDIX

ESKAPE Acronym

The ESKAPE bacteria are resistant to multiple medications:

- Enterococcus, including E. faecium
- Staphylococcus aureus (S. aureus)
- Klebsiella, including K. pneumoniae
- Acinetobacter baumannii (A. baumannii)
- Pseudomonas aeruginosa (P. aeruginosa)
- Enterobacter species, including E. cloacae

REFERENCES


The World Health Organization (WHO) notes that most of the world’s population uses traditional medicine for primary healthcare. In addition to food items such as sugar and honey, plants and oils are principal sources of natural organic compounds. Essential oils (volatile oils) contain many biologically active compounds. These oils are derived from different sections of plant like leaves, flowers, bark, wood, resin, seeds and roots. Each has a distinctive fragrance from the plant from which they are manufactured. After the oil has been extracted, it is reduced (similar to being cooked down) to a concentrated state. The concentrate is used to add a pleasant fragrance to soaps, perfumes, cosmetics, lotions, and a number of other products. Approximately 300 oils are used commercially, but 3000 are known. They are sold individually or can be mixed with other oils.

Some essential oils have antibacterial, antifungal, antiviral, insecticidal, and antioxidant properties. They have many other applications, and are being used in hospitals throughout the U.S. for various purposes. Aromatherapy has become very popular in health care. Since drug resistant pathogens are such a serious threat, there is great potential for use of essential oils in wound care practice. However, we need evidence-based information, and little research has been done. This is probably due to the lack of profitability in CAM products, and the fact that research is expensive. Investors will fund it only if they perceive there is a worthwhile return on the investment.

Some physicians prefer to use absolute oils for wound care. Absolute oils are more concentrated than essential oils. The differences lies in the method used for extracting the oil. Lower temperatures are used, causing the fragrance to be more intense. The fragrance more closely resembles the original source, and the oil is more concentrated.

Some essential oils have antibacterial, antifungal, antiviral, insecticidal, and antioxidant properties. They have many other applications, and are being used in hospitals throughout the U.S. Drug resistant pathogens are a serious threat, so there is potential for use of essential oils in the wound care. However, we have a long way to go, and little research has been done. This is probably due to the lack of profitability in CAM products, and the fact that research is expensive. Investors will fund it only if there is a potential return on the investment.

Exploring the essential oils is well beyond the scope of this book, although it’s a fascinating subject. However, you may be familiar with Granulex and Xenaderm. Both were used successfully for wound care for years until they were removed from the market in 2009 due to an FDA action. (Other products containing these ingredients were also removed.) Granulex remains in
the veterinary market, and many people purchase it there. The ingredients in these products were balsam of peru, castor oil, and trypsin. Balsam of Peru increases blood flow to the wound and has an antimicrobial action. Castor oil maintains skin integrity to prevent cells from breaking down, and trypsin cleans and debrides the wound.

Castor oil and balsam peru are both essential oils. FDA had no issue with these ingredients. The problem was with the trypsin, which is extracted from the pancreas of pigs. FDA conducted studies using trypsin as a debriding agent in 1972. They determined it was ineffective and rescinded its approval for that purpose. Subsequently, concerns were voiced about the sterility of the raw material due to its source. Fear of disease transmission. The product is widely used in Europe, and the European Medicines Agency has guidelines that could be adopted by the U.S. The point is that you have probably used these two products at one time or other. Both stood the test of time. Draw your own conclusions regarding the efficacy of this combination.

Many others are used throughout the world to promote healing and eliminate infection.

Examples of essential oils with antimicrobial action are:

- Tea Tree (Maleluca alternafolia) [Most commonly used. Often combined with Lavender due to fragrance]
- Lavender (Lavendula angistifolia)
- Oregano (Oregano vulgar)
- Geranium (Geranium asperum) [reportedly eliminates MRSA]
- Lemon (Citrus limon)
- Cinnamon bark

For additional information on the use of essential oils in wounds, you may wish to explore these websites:

http://essentialoilsandwounds.com

http://www.aromaweb.com/essentialoils
**APPENDIX**

# Gram Stain Quick Reference

<table>
<thead>
<tr>
<th>Gram Positive Organisms</th>
<th>Gram Negative Organisms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aerobic, Gram-positive cocci</strong></td>
<td><strong>Aerobic, Gram-negative cocci</strong></td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td><em>Neisseria gonorrhoeae</em></td>
</tr>
<tr>
<td><em>Staphylococcus epidermidis</em></td>
<td><em>Neisseria meningitidis</em></td>
</tr>
<tr>
<td><em>Staphylococcus sp. (Coagulase-negative)</em></td>
<td><em>Moraxella catarrhalis</em></td>
</tr>
<tr>
<td><em>Streptococcus pneumoniae (Viridans group)</em></td>
<td></td>
</tr>
<tr>
<td><em>Streptococcus agalactiae</em> (group B)</td>
<td></td>
</tr>
<tr>
<td><em>Streptococcus pyogenes</em> (group A)</td>
<td></td>
</tr>
<tr>
<td><strong>Enterococcus sp.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Aerobic, Gram-positive rods</strong></td>
<td><strong>Anaerobic, Gram-negative cocci</strong></td>
</tr>
<tr>
<td><em>Bacillus anthracis</em></td>
<td><em>Veillonella sp.</em></td>
</tr>
<tr>
<td><em>Bacillus cereus</em></td>
<td></td>
</tr>
<tr>
<td><em>Bifidobacterium bifidum</em></td>
<td></td>
</tr>
<tr>
<td><em>Lactobacillus sp.</em></td>
<td></td>
</tr>
<tr>
<td><em>Listeria monocytogenes</em></td>
<td></td>
</tr>
<tr>
<td><em>Nocardia sp.</em></td>
<td></td>
</tr>
<tr>
<td><em>Rhodococcus equi (coccobacillus)</em></td>
<td></td>
</tr>
<tr>
<td><em>Erysipelothrix rhusiopathiae</em></td>
<td></td>
</tr>
<tr>
<td><em>Corynebacterium diptheriae</em></td>
<td></td>
</tr>
<tr>
<td><em>Propionibacterium acnes</em></td>
<td></td>
</tr>
<tr>
<td>Gram Positive Organisms</td>
<td>Gram Negative Organisms</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Anaerobic, Gram-positive rods</strong></td>
<td><strong>Aerobic, Gram-negative rods</strong></td>
</tr>
<tr>
<td>Actinomyces sp.</td>
<td>Fastidious, Gram-negative rods</td>
</tr>
<tr>
<td>Clostridium botulinum</td>
<td>Actinobacillus actinomycetemcomitans</td>
</tr>
<tr>
<td>Clostridium difficile</td>
<td>Acinetobacter baumannii</td>
</tr>
<tr>
<td>Clostridium perfringens</td>
<td>Bordetella pertussis</td>
</tr>
<tr>
<td>Clostridium tetani</td>
<td>Brucella sp.</td>
</tr>
<tr>
<td></td>
<td>Campylobacter sp.</td>
</tr>
<tr>
<td></td>
<td>Capnocytophaga sp.</td>
</tr>
<tr>
<td><strong>Anaerobic, Gram-negative rods</strong></td>
<td></td>
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<td>Anaerobic, Gram-negative rods</td>
<td></td>
</tr>
<tr>
<td>Anaerobic, Gram-negative rods</td>
<td></td>
</tr>
<tr>
<td>Enterobacteriaceae (glucose-fermenting</td>
<td></td>
</tr>
<tr>
<td>Gram-negative rods</td>
<td></td>
</tr>
<tr>
<td>Citrobacter sp.</td>
<td></td>
</tr>
<tr>
<td>Enterobacter sp.</td>
<td></td>
</tr>
<tr>
<td>Escherichia coli</td>
<td></td>
</tr>
<tr>
<td>Klebsiella pneumoniae</td>
<td></td>
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<td>Proteus sp.</td>
<td></td>
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<td>Salmonella enteriditis</td>
<td></td>
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<td></td>
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<td>Serratia marcescens</td>
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<td></td>
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<td>Yersinia pestis</td>
<td></td>
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<tr>
<td>**Oxidase-positive, glucose-fermenting</td>
<td></td>
</tr>
<tr>
<td>Gram-negative rods</td>
<td></td>
</tr>
<tr>
<td>Aeromonas sp.</td>
<td></td>
</tr>
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<td>Plesiomonas shigelloides</td>
<td></td>
</tr>
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<td>Vibrio cholera</td>
<td></td>
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<td>Vibrio parahaemolyticus</td>
<td></td>
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<tr>
<td>Vibrio vulnificus</td>
<td></td>
</tr>
</tbody>
</table>
## Appendix 8 | Gram Stain Quick Reference

<table>
<thead>
<tr>
<th>Gram Positive Organisms</th>
<th>Gram Negative Organisms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anaerobic, Gram-positive cocci</strong></td>
<td><strong>Glucose-nonfermenting, Gram-negative rods</strong></td>
</tr>
<tr>
<td><em>Peptostreptococcus sp.</em></td>
<td><em>Acinetobacter sp.</em></td>
</tr>
<tr>
<td></td>
<td><em>Flavobacterium sp.</em></td>
</tr>
<tr>
<td></td>
<td><em>Pseudomonas aeruginosa</em></td>
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<tr>
<td></td>
<td><em>Burkholderia cepacia</em></td>
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<tr>
<td></td>
<td><em>Burkholderia pseudomallei</em></td>
</tr>
<tr>
<td></td>
<td><em>Xanthomonas maltophilia</em> or <em>Stenotrophomonas maltophilia</em></td>
</tr>
<tr>
<td><strong>Anaerobic, Gram-negative rods</strong></td>
<td></td>
</tr>
<tr>
<td><em>Bacteroides fragilis</em></td>
<td></td>
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<tr>
<td><em>Bacteroides sp.</em></td>
<td></td>
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<tr>
<td><em>Prevotella sp.</em></td>
<td></td>
</tr>
<tr>
<td><em>Fusobacterium sp.</em></td>
<td></td>
</tr>
<tr>
<td><strong>Gram-negative spiral</strong></td>
<td></td>
</tr>
<tr>
<td><em>Spirillum minus</em> (minor)-</td>
<td></td>
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<tr>
<td>Bacteria which cannot or are difficult to Gram stain</td>
<td></td>
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<tr>
<td>-----------------------------------------------</td>
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<tr>
<td><em>Borrelia burgdorferi</em></td>
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<td><em>Borrelia recurrentis</em></td>
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<td><em>Bartonella henselae</em></td>
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<td><em>Chlamydia trachomatis</em></td>
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</tr>
<tr>
<td><em>Calymmatobacterium granulomatis</em> (Gram negative rod)</td>
<td></td>
</tr>
<tr>
<td><em>Coxiella burnetii</em></td>
<td></td>
</tr>
<tr>
<td><em>Ehrlichia sp.</em></td>
<td></td>
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<td><em>Legionella sp.</em></td>
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<td><em>Leptospira sp.</em></td>
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<td><em>Mycobacterium bovis</em></td>
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<td><em>Mycobacterium tuberculosis</em></td>
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<td><em>Mycobacterium avium</em></td>
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<td><em>Mycobacterium intracellulare</em></td>
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<td><em>Mycobacterium leprae</em></td>
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<td><em>Rickettsia rickettsii</em></td>
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<tr>
<td><em>Treponema pallidum</em></td>
<td></td>
</tr>
</tbody>
</table>
### Overview of Wound Management

<table>
<thead>
<tr>
<th>Bacterial Burden</th>
<th>Treatment Strategy</th>
</tr>
</thead>
</table>
| Contamination          | • Cleanse wound and surrounding skin according to protocol with tap water, sterile water, super oxidized water, or normal saline  
                         | • Some facilities wash with baby shampoo and water  
                         | • Irrigate wound if necessary  
                         | • Dressing appropriate to wound |
| Colonization           | • Cleanse wound and surrounding skin according to protocol with tap water, sterile water, super oxidized water, or normal saline OR  
                         | • Consider using cleansing solutions with surfactants  
                         | • Irrigate wound if necessary  
                         | • Remove debris, including particulate matter, necrotic tissue, etc.  
                         | • Size and shape dressing appropriate to wound  
                         | • Antimicrobials are probably not necessary, because the microbes are not causing clinical problems. If signs & symptoms develop, promptly reevaluate and consider a product such as nanocrystalline silver |
| Critical Colonization  | • Cleanse wound with surfactant  
                         | • Irrigate wound if necessary  
                         | • Debride regularly to eliminate biofilm  
                         | • Antimicrobial dressing - consider silver or cadexomer iodine  
                         | • Consider a slow release/long acting product  
                         | • Dressing appropriate to wound  
                         | • Consider a systemic antibiotic |
| Infection              | • Cleanse wound with surfactant  
                         | • Irrigate wound if necessary  
                         | • Debride regularly to eliminate biofilm  
                         | • Continue antimicrobial dressings  
                         | • Consider a slow release product  
                         | • Consider 2 products or alternate treatments to reduce drug resistance  
                         | • Dressing appropriate to wound  
                         | • Systemic antibiotic |
10 Nosocomial Infection Criteria

Pressure Injury Infection

1. Pressure injury infection, including both superficial and deep infections

2. Pressure injury infections must meet the following criterion:

3. Patient has at least 2 of the following signs or symptoms with no other recognized cause:
   - redness, tenderness, or swelling of wound edges
   - and at least 1 of the following:

   a. Organisms cultured from properly collected fluid or tissue (see Comments)
   b. Organisms cultured from blood.

Comments:

- Purulent drainage alone is not sufficient evidence of an infection.
- Organisms cultured from the surface of a pressure injury are not sufficient evidence that the injury is infected. A properly collected specimen from a pressure injury involves needle aspiration of fluid or biopsy of tissue from the injury margin.

Skin—Skin Infection

Skin infections must meet at least 1 of the following criteria:

1. Patient has purulent drainage, pustules, vesicles, or boils.

2. Patient has at least 2 of the following signs or symptoms with no other recognized cause:
   - pain or tenderness, localized swelling, redness, or heat

   and at least 1 of the following:

   a. Organisms cultured from aspirate or drainage from affected site; if organisms are normal skin flora (i.e., diphtheroids \([\text{Corynebacterium} \text{ spp}]\), \([\text{Bacillus} \text{ not } B \text{ anthracis}] \text{ spp}, \[\text{Propionibacterium} \text{ spp}, \text{ coagulase-negative staphylococci} \text{ including } S \text{ epidermidis}], \text{ viridans group streptococci, } \text{Aerococcus} \text{ spp, } \text{Micrococcus} \text{ spp}), \text{ they must be a pure culture}
Appendix 10 | Nosocomial Infection Criteria

b. Organisms cultured from blood

c. Positive laboratory test performed on infected tissue or blood (e.g., antigen tests for herpes simplex, varicella zoster, H influenzae, or N meningitidis)

d. Multinucleated giant cells seen on microscopic examination of affected tissue

e. Diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen.

**BONE-Osteomyelitis**

Osteomyelitis must meet at least 1 of the following criteria:

1. Patient has organisms cultured from bone.

2. Patient has evidence of osteomyelitis on direct examination of the bone during an invasive procedure or histopathologic examination.

3. Patient has at least 2 of the following signs or symptoms: fever (>38°C), localized swelling*, tenderness*, heat*, or drainage at suspected site of bone infection* and at least 1 of the following:

   a. Organisms cultured from blood

   b. Positive laboratory test on blood (e.g., antigen tests for H influenzae or S pneumoniae)

   c. Imaging test evidence of infection (e.g., abnormal findings on x-ray, CT scan, MRI, radiolabel scan [gallium, technetium, etc.]).

* With no other recognized cause
Tissue Tolerance Procedure

Supplies

This procedure does not require supplies.

Procedure

1. Identify resident.
2. Verify orders.
3. Explain procedure to resident.
4. Perform hand hygiene according to facility policy/protocol.
5. Don personal protective equipment as appropriate for procedure.
6. Inspect the resident’s skin for red or open areas. Note your findings.
7. Position the resident in chair or bed (note position on side or back) for 1 hour.
8. After an hour has elapsed, reposition the resident off the area. Note and document red areas.
9. If a red area is present, ensure it remains pressure free. Return and recheck the area in 30 to 45 minutes.
10. If the redness persists after 30 to 45 minutes, stop the test. The area is a Stage 1 pressure injury. Notify the health care provider and obtain a treatment order. The resident requires repositioning at an interval shorter than one hour! Review and revise areas of the care plan related to skin care. Adjust the current approaches and add new approaches if necessary. If the care plan does not address skin risk, add this important information. Specify the frequency of skin assessment.

If there is no persistent redness, continue the test:

11. Position the resident in chair or bed (same location as used above) for a 1½ hour interval.
12. After an hour and a half has elapsed, reposition the resident to relieve pressure from the area. Note and document red areas.
13. If a red area is present, ensure it remains pressure free. Return and recheck the area in 30 to 45 minutes.
14. If the redness persists after 30 to 45 minutes, stop the test. The area is a Stage 1 pressure injury. Notify the health care provider and obtain a treatment order. The resident requires repositioning at an interval of no more than 1 hour! Review and revise areas of the care plan related to skin care. Adjust the current approaches and add new approaches if necessary. If the care plan does not address skin risk, add this important information. Specify the frequency of skin assessment.
If there is no persistent redness, continue the test:

15. Position the resident in chair or bed (same location as used above) for a 2-hour interval.

16. After 2 hours has elapsed, reposition the resident off the area exposed to pressure. Note and document red areas.

17. If a red area is present, ensure it remains pressure free. Return and recheck the area in 30 to 45 minutes.

18. If the redness persists after 30 to 45 minutes, stop the test. The area is a Stage 1 pressure injury. Notify the health care provider and obtain a treatment order. The resident requires repositioning at an interval of no more than 1½ hours! Review and revise areas of the care plan related to skin care. Adjust the current approaches and add new approaches if necessary. If the care plan does not address skin risk, add this important information. Specify the frequency of skin assessment.

19. If there is no persistent redness, the resident requires repositioning at an interval of every 2 hours.

20. Document the results of the test.

After completing the test:

21. Develop an individualized turning and repositioning schedule.

22. List individual approaches and the specific turn times on the care plan. List specific positions to avoid, if any.

23. Continue monitoring of tissue tolerance and skin integrity.

24. Perform hand hygiene according to facility policy/protocol.


26. Take appropriate actions for abnormal findings or observations.

27. Review and revise areas of the care plan related to skin care. Adjust the current approaches and add new approaches if necessary. If the care plan does not address skin risk, add this important information. Specify the frequency of skin assessment.
# Downloads

## Table of Contents

Download the following additional materials of this book at: [www.hcpro.com/downloads/12598](http://www.hcpro.com/downloads/12598)

## Inservices

<table>
<thead>
<tr>
<th>Inservice: Appendix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Care Plan Approaches</td>
</tr>
<tr>
<td>2</td>
<td>Chairfast Residents</td>
</tr>
<tr>
<td>3</td>
<td>Documentation</td>
</tr>
<tr>
<td>4</td>
<td>How to Stage, Prevent, and Treat Pressure Injuries</td>
</tr>
<tr>
<td>5</td>
<td>Moving Residents</td>
</tr>
<tr>
<td>6</td>
<td>Pressure Injuries and the MDS</td>
</tr>
<tr>
<td>7</td>
<td>Pressure Injuries on the Feet</td>
</tr>
<tr>
<td>8</td>
<td>Pressure Injury Risk Factors</td>
</tr>
<tr>
<td>9</td>
<td>Skin Layers</td>
</tr>
<tr>
<td>10</td>
<td>Wound Dressings</td>
</tr>
</tbody>
</table>

## Tools

<table>
<thead>
<tr>
<th>Tool: Appendix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Pressure Sore Status Tool</td>
</tr>
<tr>
<td>12</td>
<td>PUSH Tool</td>
</tr>
<tr>
<td>13</td>
<td>Sussman Wound Healing Tool</td>
</tr>
<tr>
<td>14</td>
<td>Tissue Tolerance Test</td>
</tr>
</tbody>
</table>

## Procedures

<table>
<thead>
<tr>
<th>Procedure: Appendix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Alginate Dressings</td>
</tr>
<tr>
<td>16</td>
<td>Assessment and Prevention of Pressure Injuries Related to Medical Devices</td>
</tr>
<tr>
<td>17</td>
<td>Assessment and Documentation</td>
</tr>
<tr>
<td>Procedure: Appendix</td>
<td>Title</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------</td>
</tr>
<tr>
<td>18</td>
<td>Beginning and Ending Procedures</td>
</tr>
<tr>
<td>19</td>
<td>Bioactive Wound Dressings</td>
</tr>
<tr>
<td>20</td>
<td>Cadexomer Iodine Dressings</td>
</tr>
<tr>
<td>21</td>
<td>Clean Dressings</td>
</tr>
<tr>
<td>22</td>
<td>Collagen Matrix Dressings</td>
</tr>
<tr>
<td>23</td>
<td>Composite Dressings</td>
</tr>
<tr>
<td>24</td>
<td>Compression Wrap Dressing for Venous Stasis Wound</td>
</tr>
<tr>
<td>25</td>
<td>Donning Personal Protective Equipment</td>
</tr>
<tr>
<td>26</td>
<td>Hand Checks with Low Air Loss Mattress Overlay</td>
</tr>
<tr>
<td>27</td>
<td>Mucosal Membrane Pressure Injuries</td>
</tr>
<tr>
<td>28</td>
<td>Pressure Injury Prevention Points</td>
</tr>
<tr>
<td>29</td>
<td>Reverse Staging Pressure Injuries</td>
</tr>
<tr>
<td>30</td>
<td>Staging Pressure Injuries</td>
</tr>
<tr>
<td>31</td>
<td>Sterile Dressings</td>
</tr>
<tr>
<td>32</td>
<td>Unstageable Pressure Injuries</td>
</tr>
<tr>
<td>33</td>
<td>Wet-to-Dry Dressings</td>
</tr>
<tr>
<td>34</td>
<td>Zinc Based Hydrophilic Paste Dressing</td>
</tr>
<tr>
<td>35</td>
<td>Powerpoint: Pressure Injuries Identification and Staging</td>
</tr>
</tbody>
</table>
Pressure injuries and documentation are often among the most frequently cited survey deficiencies, and wound care is the subject of continuous research. Most recently, in April 2016, the National Pressure Ulcer Advisory Panel (NPUAP) approved revisions to its Pressure Injury Staging System.

*Pressure Injuries in Long-Term Care: A Toolkit for Clinical Staff* is full of evidence-based strategies and downloadable assessment tools and in-services to educate your staff about preventing, treating, and assessing pressure injuries. Long-term care is shifting its focus from volume to value, with an emphasis on star ratings that result in increased (or decreased) reimbursement. This resource will help staff overcome documentation problems and better assess wounds and infections, saving time in clinical practice and staff training while avoiding errors that could lead to noncompliance.

**This book will help you:**

- Provide evidence-based training and education to staff
- Understand the most up-to-date NPUAP pressure injury stages and staging instructions
- Establish or update your facility’s guidelines through sample policies and procedures
- Increase quality care and reimbursement
- Avoid survey deficiencies at F-tag 314