

Wounds

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Definition: a physical injury to the body consisting of a laceration or breaking of the skin or mucous membrane often with damage to underlying tissue (after Merriam-Webster medical dictionary)

Causes: Several, including:

- Burns
- Ischemia (peripheral arterial disease; digital artery obstruction, as in Raynaud's)
 - Neuropathy, usually diabetic
 - Pressure (decubitus, a.k.a., bed sore; deep tissue injury)
 - Venous hypertension (stasis), e.g., post-phlebotic syndrome
 - Surgery, i.e., post-operative wounds
 - Skin neoplasms (e.g., basal, squamous cell; melanoma; potentially pre-neoplastic- actinic keratosis)
 - Toxic exposure (e.g., urushiol sap of poison ivy, sunburn)
 - Hypertensive ischemia (a.k.a., Martorell's ulcer)
 - Microbial:
 - **Viral:** herpes zoster
 - **Fungal:** Candidiasis, e.g., tinea pedis (athlete's foot)
 - **Bacterial:** e.g., leg edema with cellulitis (evaluate for spinal stenosis causing poor vascular tone, cardiopulmonary dysfunction, hepatic anasarca, venous insufficiency, other causes of edema); Buruli ulcer, via *Mycobacterium ulcerans*.
 - Trauma: stab, gun shot, compound bone fracture.

Wound healing occurs via a series of cellular and biochemical events as follows:

- 1) Hemostasis phase – bleeding is stopped by a combination of vasoconstriction, platelet adhesion, aggregation & other mechanisms.
- 2) Inflammatory phase – inflammatory cells activate: neutrophils debride injured tissue; macrophages phagocytose debris and release mediators that attract fibroblasts, smooth muscle cells and promote angiogenesis; lymphocytes release further growth factors to help in wound healing.
- 3) Proliferative phase – inflammatory cell activity decreases while fibroblasts produce collagen and other materials to give the wound structure and epithelial cells migrate from wound edges to cover the wound.
- 4) Remodeling phase – collagen fibers crisscross to strengthen the wound.

Chronic wound:

- Wound that does not heal in a timely fashion (30 to 90 days, depending on the definition).
- Labeling a wound as 'chronic' implies that it has failed to heal in spite of being treated appropriately.
- Has usually stagnated in its inflammatory phase because fibroblasts fail to build up wound structure. Use of the term 'chronic wound' implies that the wound persists in spite of proper care.
- Ask pertinent questions about a wound that appears to be chronic. For example, if a foot wound, has the ankle/arm index been obtained to determine the status of blood supply? If a pressure wound, have frequent repositioning and serial sharp debridements been instituted to facilitate healing?

Factors contributing to poor wound healing include:

- diabetes
- malignancies
- smoking
- dementia, other neuropathies
- poor nutrition
- obesity
- ischemia

- other metabolic derangements (alcoholism, etc.)

Scope of problem: Wounds are more prevalent with advancing age and chronic debilitating conditions such as diabetes, dementia, impaired mobility, smoking. Prevalence in hospitalized patients likely > 5%.

Diagnostic workup and treatment are usually customized to the probable cause of the wound.

Initial evaluation: All wounds should likely undergo the following assessment regardless of cause:

1. Size measurement. Use 3 dimensions:
 - length, along the long axis of the body or limb
 - width, perpendicular to the length
 - depth, from the likely skin level to the deepest part of the wound
2. Wound bed composition:
 - % of granulation (beefy red)
 - % slough or non-viable debris (yellow, green or gray)
 - % eschar (hard: black or dark brown)
3. Obtain culture of the wound, preferably deep tissue, as superficial swab material may not reflect underlying pathogens; prn blood cultures if suspicion of systemic involvement.
4. If a pressure wound, determine the stage, unless unstageable, due to a covered wound bed.

Determine the likely cause of the wound. The location of a wound often indicates its cause.

For example:

- Pressure wounds are typically located over bony prominences, e.g., heel, buttocks, ear.
- Ischemic wounds are typically located at the end of the arterial tree – toes, foot.
- Neuropathic wounds are typically located at areas of high pressure – metatarsal heads.
- Stasis wounds are typically located at areas of high venous pressure – distal medial leg.
- Surgical wounds are located at site of recent surgery.
- Skin neoplasms have a predilection for areas of high UV light exposure from sun.

Treatment Fundamentals

- 1) Maintain moist wound environment, via, e.g., hydrocolloid dressing.
- 2) Reduce microbial load, via
 - antibiotics, e.g., topical mupirocin; systemics based on cultures, wound characteristics.
 - remove non-viable debris, with, e.g., wet to dry dressings, sharp excisional debridement.
- 3) Reverse underlying pathology, e.g.,
 - off-load wounds that are due to pressure, ischemia or neuropathy.
 - use total non-weight bearing for neuropathic wounds until closed and healed.
 - revascularize ischemic wounds, via, e.g., angioplasty or surgical bypass.
 - unusually soft pedal tissues in diabetics, especially if fluctuant upon palpation, may reflect ischemic cellulitis, and can be considered an ischemic ulcer equivalent.
 - reduce or counteract venous hypertension in stasis wounds; use adjunctive pentoxifylline, aspirin.
 - Buerger's – smoking cessation.
- 4) Use methods to stimulate wound healing, e.g.,
 - Serial sharp debridements to trigger bleeding and bring platelets with growth factor into the wound.
 - enzymatic debridement with collagenase
 - consider implementing 'newer' treatment modalities on a case by case basis, e.g., negative pressure, hyperbaric oxygen.

Wounds in most hospitalized patients are not acute and their out-patient care can be continued during their brief hospital stay.

Clinical Pearl: Label a wound 'chronic' **only** after the cause has been determined and standards of care treatments for the cause have failed.