



Fast Facts Core Curriculum

Wounds and Oral Care

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FAST FACTS AND CONCEPTS #37
PRURITUS
Charles von Gunten MD and Frank Ferris MD

Background

Pruritus (itching) is a common and often distressing symptom near the end of life. The itch sensation may arise from stimulation of the skin itch receptor via unmyelinated C fibers, or itch may arise as a central phenomenon without skin involvement (e.g. opioid induced pruritus). Although histamine causes pruritus, many patients with pruritus show no signs of histamine release. Besides histamine, serotonin, prostaglandins, kinins, proteases and physical stimuli have all been implicated as mediators of pruritus.

Common Causes

- Dermatological (dryness, wetness, irritation, eczema, psoriasis)
- Metabolic (hepatic failure, renal failure, hypothyroidism)
- Hematologic (iron deficiency, polycythemia, thrombocytosis, leukemia, lymphoma)
- Drugs (opioids, aspirin, drug reactions)
- Infectious (scabies, lice, candida)
- Allergy (urticaria, contact dermatitis, drug reactions)
- Psychogenic

Management Management of pruritus involves eliminating the cause when possible. Symptomatic strategies include:

- **Moisturizers:** Dryness (xerosis) is very common and may exacerbate other causes. The mainstay of treatment is skin hydration. Note: Most OTC preparations only have small amounts of moisturizer—they are mostly water. Serious dryness requires emollients and moisturizers (such as petroleum jelly) that patients find oily or greasy. Nevertheless, they may be applied after bathing, over damp skin, with a superficial covering.
- **Cooling agents** (e.g. Calamine and/or Menthol in aqueous cream, 0.5%-2%) are mildly antipruritic. They may act as a counterirritant or anesthetic. A more direct way to anesthetize the skin is with the eutectic mixture of local anesthetics lidocaine and prilocaine (EMLA cream).
- **Antihistamines** may be helpful in relieving itch when associated with histamine release. Morphine causes non-immune mediated histamine release from mast cells. Although there is not much supporting research, many report benefits of combining H1 and H2 receptor subtype antihistamines. These may have central effects as well as peripheral antihistaminergic effects. Doxepin (10-30 mg PO at bedtime), a tricyclic antidepressant, is a very potent antihistamine and may help in more refractory cases.
- **Topical steroids** may be helpful in the presence of skin inflammation. These are best applied in ointment rather than cream formulations to alleviate dryness. Systemic steroids have been used in refractory cases.
- **Newer Generation Antidepressants** There are accounts of paroxetine being used successfully to treat pruritus associated with a paraneoplastic process, opioids or cholestasis. Also mirtazapine has been shown to improve pruritus at low doses of 15 mg/day in small case reports; this is likely due to its known antihistamine effects and its blockage of post-synaptic 5HT₂ and 5HT₃ receptors.
- **Opioid Antagonists** Low dose, continuous infusions of IV naloxone has the largest body of data supporting its use in adult and pediatric patients with opioid induced pruritus. There are smaller studies suggest oral naloxone may have less favorable

results. Small studies suggest a potential role for methylnaltrexone in opioid induced pruritus.

- **Other:** An old-fashioned but effective remedy is immersion in an oatmeal bath (e.g. Aveeno). More recent pharmacological treatments include cholestyramine for cholestatic pruritis; ondansetron for patients with cholestatic, opioid-induced, or renally-induced pruritus. Since the pain sensing neurological system seems to be responsible for pruritis, agents like gabapentin have also been reported to be helpful.

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Version History: This *Fast Fact* was originally edited by David E Weissman MD. 2nd Edition published August 2005; 3rd Edition May 2015. Current version re-copy-edited March 2009; then again May 2015.

Fast Facts and Concepts are edited by Sean Marks MD (Medical College of Wisconsin) and associate editor Drew A Rosielle MD (University of Minnesota Medical School), with the generous support of a volunteer peer-review editorial board, and are made available online by the [Palliative Care Network of Wisconsin](#) (PCNOW); the authors of each individual *Fast Fact* are solely responsible for that *Fast Fact's* content. The full set of *Fast Facts* are available at [Palliative Care Network of Wisconsin](#) with contact information, and how to reference *Fast Facts*.

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FAST FACTS AND CONCEPTS #40 PRESSURE ULCER MANAGEMENT: STAGING AND PREVENTION

Frank Ferris MD and Charles F von Gunten MD

Background This *Fast Fact* discusses the staging and prevention of pressure ulcers; *Fast Fact #41* discusses management. Poor attention to skin care in the dying patient will result in pain, odor, swelling, reduced quality of life and increased care demands for family and other caregivers. Skin can withstand 30-60 minutes of poor perfusion, but not longer. Pressure ulcers result from ischemia due to pressure closing the microarterioles, particularly at pressure points such as the heels, sacrum and elbows. Intrinsic risk factors for ulcer development are limited mobility, conditions that reduce tissue oxygenation, age-related changes in skin, and cachexia. Extrinsic factors are physical forces such as friction, moisture, and shear forces.

Prevention of ulcers is the highest level of care; bedbound patients need to be turned regularly and/or need a pressure-reducing surface. Skin should be protected from friction, moisture and shear. High-risk areas should have either a thin film or hydrocolloid dressings applied. Early involvement of a wound care specialist is recommended to assist with education, on-going assessment, and dressing choices tailored for the patient's unique circumstances with regards to comfort, cost, wear time, prognosis, and wound characteristics.

Ulcer Progression

- *Stage I.* The heralding lesion of skin ulceration is *non-blanchable erythema*.
- *Stage II.* Partial-thickness skin loss involving epidermis, dermis, or both. The ulcer is superficial and looks like an abrasion or shallow crater or blister.
- *Stage III.* Full thickness skin loss involving subcutaneous tissue. The ulcer may extend down to, but not through, the underlying fascia. The ulcer looks like a deep crater, with or without undermining of adjacent tissue.
- *Stage IV.* The ulcer is deep enough to include necrosis and damage to underlying muscle, bone, and/or other supporting structures such as tendon or joint capsule. Undermining of adjacent skin and sinus tracts may also be present.

Pressure Reducing Surfaces There are 3 groups of support surfaces that have demonstrated effectiveness; some need to be ordered by a physician.

1. Air or water mattress overlays (e.g. Roho)— ideal for most patients to prevent pressure ulcers. Order for patients at risk for pressure ulcers.
2. Low-air-loss beds (e.g. Kenn-air, Dyna-Care, Sof-Care) can be used for high-risk patients or patients with existing ulcers to prevent worsening or to help with healing.
3. Air-fluidized beds (e.g. Clinatron, Fluid-air) are reserved for patients needing maximum pressure reduction and pressure relief. Patients, however, frequently describe them as overly confining (even “coffin-like”) and they are very expensive (e.g. a Clinatron bed may lease for > \$100/day).

Note: Simple foam pads are often ineffective. If they are used, particularly in the home, they should be laid one on top of the other. If a hand is placed under the pads, there should be at least 1 inch of non-compressed foam between the hand and the patient. Never use round cushions (a.k.a. donuts); they occlude blood flow and do not prevent ulcers. Professional assessment and design is needed for special pressure reducing cushions (e.g. for wheelchairs).

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Version History: This *Fast Fact* was originally edited by David E Weissman MD. 2nd Edition published August 2005; 3rd Edition June 2015. Current version re-copy-edited March 2009; then again in May 2015.

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FAST FACT AND CONCEPT #41 PRESSURE ULCERS: DEBRIDEMENT AND DRESSINGS

Charles von Gunten, MD and Frank Ferris, MD

Background *Fast Fact #40* discussed the staging and prevention of pressure ulcers; this *Fast Fact* discusses their management. The first step in deciding how to manage pressure ulcers is an assessment of whether or not the wound is likely to heal. If the patient has a prognosis of months to years, adequate nutrition, and blood flow to the tissue, then healing is possible. If the patient has a prognosis of days to weeks, anorexia/cachexia, and/or the wound has inadequate perfusion, then symptom control alone is appropriate and uncomfortable/burdensome treatments are not appropriate.

Debridement Always provide adequate analgesia! Necrotic tissue must be removed for ulcer healing; surgical debridement is the fastest and most effective method when there is healthy surrounding tissue. Note: If the patient is close to dying, and/or the wound will never heal, then debridement should not be attempted. Debridement gels (such as Hypergel, Santyl, Nu-gel) are applied onto an ulcer under an occlusive dressing (such as DuoDerm), are available for ulcers that don't require surgery or when surgical debridement is incomplete. These products come with or without enzymes to encourage autolytic or enzymatic debridement. For minimally necrotic ulcers, occlusive dressings such as DuoDerm, changed weekly, promote autolysis.

A commonly prescribed form of mechanical debridement is the use of saline, wet-dry dressings. This treatment actually retards healing by pulling off new epithelial cells as part of healthy granulation tissue; its use for the treatment of skin ulcers should be abandoned.

Antimicrobials Ulcer healing is delayed if there is bacterial infection within the wound bed. Erythema, purulent exudate and fever are signs of infection. Cleansing and application of topical antibiotics may be sufficient for superficial infection with minimal surrounding erythema. Systemic antibiotics are indicated for deep/surrounding tissue infection, or if ulcer healing is delayed.

Cleanse wounds that are expected to heal with non-cytotoxic fluids (e.g. saline). Cytotoxic fluids (e.g. Betadine) will kill granulation tissue. **Clinical Pearl:** do not cleanse an ulcer with any fluid you wouldn't put in your eye if you want the ulcer to heal.

Dressings Living tissue requires moisture for transport of oxygen and nutrients. A moist ulcer environment promotes the migration of fibroblasts and epithelial cells; growth factors are present in the serous exudate that speed healing. In contrast, a dry environment is conducive to necrosis and eschar.

There are 6 classes of dressings distinguished by the wear time and whether you want to add or remove fluid in order to maintain the ideal moist, interactive ulcer-healing environment. A dry ulcer needs to have moisture added through a hypotonic gel (donates water). With wet exudates, a hypertonic gel or foam is used to remove water.

1. *Polyurethane foams* (LYOfoam, Allevyn, Nu-Derm, Flexzan): most absorptive; used under a covering secondary dressing.
2. *Alginates* (Kaltostat, Sorbsan): desiccate an overly wet wound, prevent maceration of surrounding skin from excess fluid, and are hemostatic and may reduce infection risk.
3. *Hydrogels* (IntraSite, Elasto-Gel, ClearSite, Aquasorb): used for wounds with larger volumes of exudate. Require a secondary dressing to secure.
4. *Hydrocolloid wafers* (DuoDerm, Comfeel, Tegisorb, Restore): promote autolysis, angiogenesis and granulation. Self-adhesive. Remain in place for 5-7 days. Often used

to “seal” a wound that is otherwise clean in order to promote healing. Can also be used to seal an underlying dressing in order to maintain a moist environment in which the wound can heal. Note: do not to use an occlusive dressing if there is a substantial risk of infection.

5. *Thin films* (OpSite, Tegaderm): for skin at risk or Stage I pressure ulcers. Can also hold another type of absorbent dressing in place.
6. *Cotton Gauze*: used to cover the primary dressing. Rarely an appropriate dressing for a significant skin ulcer. Note: Saline wet-to-dry dressings are only useful for mechanical debridement.

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FAST FACTS AND CONCEPTS #46
MALIGNANT WOUNDS
Frank Ferris MD and Charles F von Gunten MD

Introduction

Few things can worsen a patient's quality of life greater than an oozing, odorous, painful, and bleeding malignant skin wound. The pathology of a primary or metastatic cancer to the skin leading to an open wound is a combination of neovascularization, necrosis and inflammation, leading to pain, bleeding, odor and exudate. As with other chronic wounds, a fundamental decision whether the wound can eventually heal or not should be made. The choice of dressing is generally the same as with pressure ulcers (see *Fast Fact #41*). However, malignant wound management raises additional issues that deserve comment. Note: for any complex wound, it is recommended that you seek professional consultation from a wound care expert.

Exudates

Exudates can be substantial from malignant wounds. The overall goal is to prevent exudate macerating other normal tissues or dripping off the patient into clothes and bedclothes. This serves both infection control as well as cosmetic goals. One can use absorbent foams to minimize the frequency of dressing changes and maximize absorption. Typically a gauze pad (such as an 'ABD' pad) is placed on top of the foam. Alginate dressings have a role in wounds that have exudates and/or are bleeding. They are absorptive, hemostatic, and help to control infection. They do not have to be pulled off and can be simply washed off in the shower.

Infection

Malignant wounds carry a high risk of superficial infection, especially with anaerobic or fungal species. Odor is frequently the first sign of anaerobic infection along with a purulent exudate. If the infection is only superficial, topical treatment (metronidazole, silver sulfadiazine) may be sufficient. However, if there is evidence of deeper tissue infection, then systemic metronidazole should be used. If the wound is determined to be non-healing, then topical agents like povidone can be used; some patients find it irritating and painful, however. Povidone is cytotoxic to bacteria and will help keep the wound clean. Povidone should not be used for wounds that are expected to heal because it is cytotoxic to normal granulation tissue.

Odor

Managing odor can be accomplished by using odor absorbers; kitty litter or activated charcoal can be placed on a cookie tray underneath the bed. In addition, there are charcoal dressings that can be used to cover a particularly malodorous wound. Additional approaches include putting a burning flame (such as a candle) in the room in an attempt to combust the chemicals causing the odor. One can also introduce a competing odor; bowls of vinegar, vanilla, or coffee. Fragrances and perfumes are often poorly tolerated by patients and should be avoided.

Bleeding

Bleeding is common; the surface of a malignancy may be friable and predispose to bleeding. It may either present as oozing (microvascular fragmentation) or vascular disruption from necrosis or sloughing leading to "a bleeder." Any dressing that comes into contact with the surface may adhere and tear the surface when it is pulled off (e.g. saline wet-dry dressings). This can be prevented by using a mesh synthetic polymer, non-stick, non absorptive dressing (e.g. Mepitel). Other options to control bleeding are alginate dressings, topical low dose (100 U/ml) thromboplastin, silver nitrate, or cautery. In addition to systemic treatments for pain (e.g. oral or parenteral opioids), local anesthetics can also be helpful.

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Version History: This *Fast Fact* was originally edited by David E Weissman MD. 2nd Edition published August 2005; 3rd Edition May 2015. Current version re-copy-edited April 2009; then again May 2015.

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FAST FACTS AND CONCEPTS #121 ORAL MUCOSITIS: DIAGNOSIS AND ASSESSMENT

Clarissa F Henson and Robert Arnold MD

Background The term mucositis refers to the inflammatory response of the oral-pharyngeal mucosa resulting from systemic chemotherapy or from radiotherapy that includes the oral-pharyngeal mucosa within the radiation field. The term stomatotoxicity is specific to mucositis affecting the oral mucosa. Mucositis results from the destruction of rapidly dividing epithelial cells of the oral-pharyngeal mucosal epithelium and the secondary release of inflammatory mediators such as TNF-alpha and interleukin-1 beta. This *Fast Fact* discusses the diagnosis and assessment of mucositis; *Fast Fact* #130 discusses its prevention and treatment.

The Radiation Therapy Oncology Group (RTOG) describes five grades of acute mucositis:

- Grade 1: Injection; may experience mild pain not requiring analgesics.
- Grade 2: Patchy mucositis which may produce an inflammatory serosanguinitis discharge; may experience moderate pain requiring analgesia.
- Grade 3: Confluent fibrinous mucositis; may include severe pain requiring opioid analgesics.
- Grade 4: Ulceration, hemorrhage or necrosis.
- Grade 5: Death resulting from mucositis.

Causes Both patient-related factors and treatment-related factors influence the severity of mucositis. Increased total dose of radiation, fraction size, and volume of normal tissue in the irradiated field all increase the risk of mucositis. Not all chemotherapy agents produce the same risk of mucositis; 5-fluoruracil, doxorubicin and methotrexate commonly cause mucositis while vincristine does not. The simultaneous combination of radiation and chemotherapy used in head and neck cancer will cause more intense mucositis than single-modality therapy. Patient-related factors such as the overall condition of the oral mucosa prior to therapy, pre-existing xerostomia, pre-existing collagen-vascular disorders, the underlying nutritional status, and the development of neutropenia during therapy all impact the development and severity of mucositis.

In head and neck cancer, virtually all patients undergoing radiation, with or without chemotherapy, will develop grade 1 and 2 mucositis. More severe mucositis (grade 3 or higher) develops in approximately 41% of patients receiving combined radiation and chemotherapy to the head and neck and in 21% of patients receiving radiation therapy alone.

Clinical Findings & Natural History Clinical signs of mucosal damage and cell death appear after the first 1 to 2 weeks of radiation therapy and as early as 3 days after chemotherapy. Initial mucosal damage results in patchy erythema, edema, atrophy and whitening of the mucosal tissue with increased sensitivity—patients report a burning sensation in the mouth. Further loss of mucosal epithelium becomes most prominent in the fourth or fifth week of standard fractionation radiation resulting in fibrinous exudation, confluent inflammation, and ulceration (see *Fast Facts* # 66, 67). The mouth sores and swelling can lead to significant oral pain, pain with swallowing, weight loss and dehydration. Mucosal damage predisposes the patient to oral superinfection leading to further pain and alterations in taste and appetite and decreased quality of life. Resolution of oral mucositis occurs several weeks after the completion of RT and chemotherapy.

Assessment A thorough assessment of the patient with mucositis should include:

- Pain assessment to include thorough review of analgesics used, effect and toxicities.
- Nutritional assessment.
- Quality of life assessment including screening for depression.
- Complete oral examination; assessment for local fungal (see *Fast Fact* #147), bacterial, or viral infections.

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Version History: This *Fast Fact* was originally edited by David E Weissman MD and published in September 2004. Version re-copy-edited in April 2009; revised again July 2015.

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FAST FACTS AND CONCEPTS #130

ORAL MUCOSITIS: PREVENTION AND TREATMENT

Clarissa Febles Henson and Robert Arnold MD

Introduction Radiation and chemotherapy-induced mucositis causes pain, difficulty swallowing, and decreased oral intake. *Fast Fact* #121 explores the diagnosis and assessment of mucositis; this *Fast Fact* focuses on prevention and treatment of radiation (XRT) and chemotherapy-induced oral mucositis.

Background There are many treatments to choose from with mucositis, but unfortunately, there is no gold standard protocol. A systematic review of therapeutic approaches for mucositis suggested that no intervention is proven to prevent or treat mucositis on its own. Instead, multi-modal therapy is often best.

Prevention

- **Oral care:** At least two weeks prior to the start of radiation to the head and neck region, or the use of chemotherapy that is expected to cause severe and prolonged neutropenia (e.g. for acute leukemia), patients should undergo a thorough oral/dental exam with appropriate dental extraction and repair or removal of dental prostheses. Patients should be educated on maintaining good oral hygiene including daily brushing with a soft bristle tooth brush, flossing, use of fluoride plaques, and avoiding denture use. Mouth rinses that contain a chlorhexidine or a mixture of baking soda, salt, and water can prevent the build-up of bacterial overgrowth and remove dead cells. Patients may also want to consider adding povidine iodine rinses to their standard oral care regimen, as doing so has been shown to reduce the severity, incidence, and duration of radiation-induced mucositis. Patients should avoid caustic and drying agents: alcoholic beverages, mouth rinses with alcohol, hot beverages, and acidic foods.
- **Radiation therapy technique:** Advanced radiotherapy techniques such as 3D-conformal therapy and intensity modulated therapy decrease radiation toxicity by limiting doses to the normal oral mucosa. Other XRT modifications that decrease toxicity include using shields over normal tissues, decreasing the radiation fraction size, and decreasing overall treatment time. Severe mucositis may require a 5 to 7 day radiation treatment break to allow for tissue recovery. However, a prolonged break is associated with inferior local control rates and survival.

Treatment

- **Treatment of infection:** Prophylactic use of antifungal, antibacterial or antiviral medications does not decrease the incidence of mucositis. However, clinicians should consider potential super-infection, and have a low threshold to obtain cultures, especially for fungal and viral infections. Of note, viral infections such as herpes may not present with classic physical examination findings.

- **Pain Management:** Local anesthetics such as lidocaine and diphenhydramine are routinely used to relieve pain but do not provide mucosal protection nor hasten recovery. Local anesthetics decrease taste and can impact oral intake. Some patients find addition of carafate slurry or a liquid antacid to a lidocaine/diphenhydramine mixture provides temporary analgesia. Liquid oral or parenteral opioids may be required for adequate pain management (see *Fast Fact #185*). Topical application of honey may help soothe mucositis due to radiotherapy.
- **Topical agents:** A number of topical agents are available to provide symptomatic relief. These include commercial and non-commercial preparation: *Gelclair*, topical lidocaine, Maalox, diphenhydramine and nystatin, etc. Benzydamine is a mouth rinse with analgesic, anesthetic, anti-inflammatory, and antimicrobial properties and has been shown in randomized controlled trials to reduce ulcer rate and incidence as well as reduce need for opioids.
- **Low-energy Laser Therapy:** Some studies have shown pain relief with the use of low power laser therapy delivered in a fractionated course three times a week. Its mechanism of action is thought to be due to anti-inflammatory effects of the laser irradiation on local tissue; however, its use remains experimental and data has been mixed with regards to wound healing.

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Version History: This *Fast Fact* was originally edited by David E Weissman MD and published in January 2005. Version re-copy-edited in April 2009; revised again July 2015 by Sean Marks with references #2, #4, and #5 added and incorporated into the text.

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FAST FACTS AND CONCEPTS #147 OROPHARYNGEAL CANDIDIASIS

Drew A Rosielle MD and Ann M Hoff MD

Background Oropharyngeal candidiasis (thrush) occurs commonly in seriously ill and dying patients.

Risk Factors Risk factors include a) either acquired (HIV-AIDS) or drug-induced (chemotherapy, inhaled or systemic glucocorticoids) defects of cell-mediated immunity; b) disruption of the oropharyngeal mucosa by cytotoxic chemotherapy (See Fast Fact #121) or radiation that includes the oropharynx; c) xerostomia (dry mouth) from any cause; d) diabetes mellitus; e) recent antibiotic use; f) dentures; g) advanced age; h) poor oral hygiene; and i) poor nutritional status.

Diagnosis Thrush is often asymptomatic but can lead to oral pain, oropharyngeal dysphagia, halitosis, alterations in taste, diminished appetite, and reduced oral intake. Thrush may or may not be present in cases of esophageal candidiasis, which presents as odynophagia and esophageal dysphagia. Most cases of thrush are caused by *Candida albicans*; *C. krusei*, *C. glabrata*, or *C. tropicalis* are sometimes implicated in AIDS and cancer patients. Diagnosis is made on clinical findings: white or yellow, cottage-cheese like plaques on the buccal mucosa, tongue, or palate. The plaques are easily removed, leaving a red or bleeding and often painful base. A less common presentation – seen in AIDS or in patients with poorly fitting dentures – involves red, edematous, and sometimes eroded mucosal lesions, but without plaques. If diagnostic doubt exists, confirmation can be made by KOH staining a wet-prep of a plaque scraping, revealing pseudohyphal Candidal forms. Culture is not recommended, as *Candida* species are common colonizers of the mouth.

Treatment The decision to treat thrush should be based on the patient's overall condition, prognosis, symptoms, and goals of care. Treatments include either systemic or topical anti-fungal drugs. All regimens should be continued for 7-14 days. Meticulous attention to denture cleaning, if applicable, is important to prevent recurrence. If esophageal candidiasis is suspected, systemic therapy is necessary as topical treatment is ineffective. Topical drugs are the most commonly used but problems can occur due to patient objections to taste and compliance with multiple daily dosing.

- Nystatin suspension (“swish and swallow”) is dosed as 200,000-500,000 Units 4 - 5 times a day. It is substantially less effective in immunocompromised patients than the azole anti-fungals (30-50% vs 70-90% effective) and should not be used in this population.
- Clotrimazole (10 mg troches 5 times a day) is nearly as effective as the systemic azole anti-fungals; however, it is associated with a higher recurrence rate of thrush.
- Systemic drugs are more effective than the topicals. However they are more expensive and have significant drug-drug interactions—especially with macrolide antibiotics, anticonvulsants, benzodiazepines, methadone, and coumadin.
- Fluconazole is the systemic treatment of choice; it is more effective with fewer drug interactions than ketoconazole. Many dosing regimens have been described: 200 mg once, then 100 mg daily for 14 days total is most commonly used.

- Itraconazole suspension (200 mg daily) is an alternative to fluconazole. It is better absorbed and more effective than itraconazole capsules.
- **Note:** Fluconazole resistant candidiasis is rare, but becoming more common. Itraconazole, IV or oral amphotericin, voriconazole, and caspofungin have all been used with success.

Recommendations Clotrimazole troches are a reasonable first line therapy for patients in the palliative care setting if the troches are tolerable and 5 times a day dosing is acceptable. If not, and/or if the patient has problems with recurrent thrush, fluconazole should be used.

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Version History: This *Fast Fact* was originally edited by David E Weissman MD and published in December 2005. Copy-edited in April 2009. In September 2015 it was re-copy-edited with reference #6 was added and reflected in the text.

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FAST FACTS AND CONCEPTS #182
XEROSTOMIA**Gary M Reisfield MD, Drew A Rosielle MD, and George R Wilson MD**

Background Xerostomia (dry mouth) is a common symptom at the end of life – affecting more than 75% of hospice patients – and is a cause of significant morbidity and diminished quality of life. This *Fast Fact* will review the causes and treatments of xerostomia.

Salivary Functions include hydration, lubrication, and antimicrobial defense of the oral mucosa. Decreased salivation can lead to oral pain; accelerated dental morbidity; oral infections, fissures, and ulcerations; halitosis; alteration in taste and enjoyment of food; chewing and swallowing difficulties; nutritional impairment; trouble producing intelligible speech; and denture-related problems. Xerostomia is usually—although not always—associated with diminished salivary secretion (hyposialia).

Etiologies

- *Medications* with anticholinergic activity are the most common pharmacologic causes of xerostomia; these include many antiemetics, antihistamines, antipsychotics, antispasmodics, antidepressants (especially the tricyclics), and bronchodilators. Sympatholytics are also common culprits, including alpha-blockers (e.g. terazosin), alpha-2 agonists (e.g. clonidine), and beta-blockers (e.g. metoprolol). Medication-induced xerostomia may also result from direct interference with or damage to salivary tissue (as with some cancer chemotherapies). Opioids and benzodiazepines cause dry mouth, although the mechanisms are not known.
- *Radiation* for head and neck malignancies.
- *Medical comorbidities* such as HIV/AIDS, diabetes, renal failure, and Sjögren's syndrome.
- *Psychiatric comorbidities* such as mood and anxiety disorders.
- *Dehydration* from any cause including drug-induced.

Treatment

- **Address underlying causes.** Eliminate unnecessary drugs or substitute less drying ones. If this is not feasible, titrate to lowest effective dose or modify dosing schedule. Replacing immediate-release with controlled-release formulations of some drugs may help (e.g. with oxybutynin and tolterodine for overactive bladder).
- **Stimulate residual gland function.**
 - *Sugarless gums and candies* can stimulate salivary reflexes. Products sweetened with xylitol are anticariogenic; those containing vitamin C may reduce salivary viscosity.
 - *Cholinergic agonists* such as pilocarpine and cevimeline. Therapeutic effect is rapid for drug-related xerostomia; latency is greater (often 8-12 weeks) for xerostomia related to radiotherapy. Pilocarpine is started at 5 mg po tid and can be titrated to 10 mg po tid. Cevimeline is dosed at 30 mg po tid. Urinary frequency, dizziness, and sweating are common side effects and may be attenuated with intake of dairy products. These agents are contraindicated in asthma, acute iritis, and narrow-angle glaucoma, and should be used with caution in COPD and cardiac disease.
- **Saliva substitutes.** Most have limited efficacy; many patients find frequent sips of water more useful and convenient. Topical products containing olive oil, betaine, and xylitol have been found effective for medication-induced xerostomia (e.g. Xerostom® products). Newer products with enzyme systems such as lactoperoxidase, lysozyme, and glucose oxidase (e.g. Biotène® Oralbalance Dry Mouth Gel)—offer potential antimicrobial and moisturizing

benefits. Due to limited duration of action, they may be particularly useful before eating, speaking, and sleeping. Recently, custom oral appliances with artificial saliva reservoirs have become available and may be particularly useful at night.

- **Encourage oral hydration.** Humidifiers, especially during sleep, may also be helpful.
- **Optimize oral hygiene.**
 - Antimicrobial mouthwashes (alcohol-free). Chlorhexidine gluconate oral rinse, USP 0.12%, twice daily, may be effective in preventing dental caries and oral infections.
 - Most toothpaste products contain the surfactant sodium lauryl sulfate (SLS), which can irritate dry mucosa and inactivate the enzyme systems of the newer artificial salivas. Biotène® Dry Mouth Toothpaste contains salivary enzymes and is SLS-free.

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Version History: Originally published June 2007. Revised, and 2nd edition published, December 2008. Version re-copy-edited in May 2009; then again July 2015.

Fast Facts and Concepts are edited by Sean Marks MD (Medical College of Wisconsin) and associate editor Drew A Rosielle MD (University of Minnesota Medical School), with the generous support of a volunteer peer-review editorial board, and are made available online by the [Palliative Care Network of Wisconsin](#) (PCNOW); the authors of each individual *Fast Fact* are solely responsible for that *Fast Fact's* content. The full set of *Fast Facts* are available at [Palliative Care Network of Wisconsin](#) with contact information, and how to reference *Fast Facts*.

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FAST FACTS AND CONCEPTS #218

MANAGING WOUND ODOR

Bansari Patel APN and Deon Cox-Hayley DO

Background Foul-smelling non-healing wounds are common in patients nearing the end-of-life, whether from pressure ulcers, vascular disease, or tumors. Strong wound odors can lead to social and physical isolation, altered patient body image and self-worth, and can challenge caregivers. This Fast Fact will discuss a practical approach to ameliorating wound odors. See also *Fast Facts* #40 and #41 (pressure ulcers), #46 (malignant wounds), and #185 (topical opioids).

Pathophysiology Foul odors from wounds result from the metabolic by-products of anaerobic and certain gram negative organisms. Deeper infection (e.g. cellulitis, necrotizing infections) are not necessary for significant odor generation.

Management While it should be addressed, treatment of the underlying cause of the wound is often limited in patients with advanced illnesses. In all circumstances, attempts at ameliorating wound odor are important – whether by treating the cause of the odor or hiding the odor.

- Addressing the cause of the odor:
 - *Remove the wound bed contaminants* (e.g. debride the wound of necrotic tissue).
 - *Control infection.* There are several approaches, all aimed at controlling anaerobic growth.
 - Topical Metronidazole is available as a commercially produced gel. Metronidazole functions as an anti-inflammatory as well as anti-infective agent against anaerobes which reduces odors. Metronidazole gel is applied directly to the wound once or twice daily. Studies have shown decreases in wound odor in 2-3 days, and application is usually continued for up to 2 weeks. Courses can be repeated if needed. In one study, 63% of patients had complete eradication of odor after a course of metronidazole gel, with the remainder reporting improvements. Costs can range from a few dollars for compounded gels to ~\$90-150 for 45 gm of commercial gel. Metronidazole tablets can also be broken and the powder contents sprinkled into the wound. Applying dressings soaked in a mixture of normal saline and intravenous metronidazole solution has also been reported as helpful for controlling odor.
 - Systemic Metronidazole can be used if there is evidence of deep tissue infection causing foul odor. 500 mg 3 or 4 times daily IV or orally is used, instead of or in addition to topical metronidazole. Systemic side effects such as nausea and diarrhea can occur.
 - Topical Silver Sulfadiazine (\$4-\$20) has been shown to be helpful in controlling odors of superficial wounds. In several studies, silver containing dressings were more effective than nonsilver dressings in reducing odors.
 - Cadexomer Iodine is an antimicrobial agent containing slow release iodine and has been shown to decrease bacterial counts and odor from venous ulcers. Ointment, powder and impregnated bandage forms are available. Cadexomer iodine has the added benefit of absorbing exudate and can be particularly helpful when exudate absorption and odor control are both needed. It can cause a burning sensation upon application.
 - Yogurt or buttermilk, applied for 15 minutes after a wound is cleaned, have been reported to control malignant wound odor, though studies are limited. They are thought to control bacterial proliferation by lowering a wound's pH.
 - Honey can be bactericidal, and has been increasingly studied for wound healing. There is some evidence that it may be effective in managing odor as well as wound pain.
- Hiding the odor:
 - Aromatics: Scented candles, air freshener sprays, peppermint and other essential oils, coffee beans or grounds, and cider vinegar in a pan are all used to hide odors.

- **Adsorbents:** Charcoal adsorbs aromatic molecules. A basket of charcoal (briquettes) can be placed discreetly in a patient's room. Various commercially available charcoal dressings are also available, although expensive. These dressings are applied over the primary dressing and may be re-used as long as they remain dry. Baking soda can be applied between dressing layers to help absorb odor. Cat litter can also be used similarly to charcoal briquettes.

Support and Education There can be great psychosocial distress associated with malodorous wounds: embarrassment, shame, and isolation. In addition to wound care specialists, psychological and spiritual support services can be important in helping patients and families cope with a chronic wound. Educate the patient and caregivers about the management of chronic wounds, and commit to controlling odor as much as possible. Health care providers should be trained to avoid demonstrating distress at odors in front of or in hearing distance of patients or families.

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Version History: Originally published August 2009; copy-edited August 2015 by Krista Wiger MD: reference #8 added and incorporated into the text.

Fast Facts and Concepts are edited by Sean Marks MD (Medical College of Wisconsin) and associate editor Drew A Rosielle MD (University of Minnesota Medical School), with the generous support of a volunteer peer-review editorial board, and are made available online by the Palliative Care Network of Wisconsin (PCNOW); the authors of each individual *Fast Fact* are solely responsible for that *Fast Fact's* content. The full set of *Fast Facts* are available at Palliative Care Network of Wisconsin with contact information, and how to reference *Fast Facts*.

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**FAST FACTS AND CONCEPTS #249
TOPICAL NONSTEROIDAL ANTI-INFLAMMATORY DRUGS**

Sarah Merriam MD and René Claxton MD

Background Nonsteroidal anti-inflammatory drugs (NSAIDs) are among the most commonly prescribed drugs in the treatment of musculoskeletal pain. Two topical NSAID formulations are commercially available in the United States: diclofenac sodium gel (Voltaren), diclofenac topical solution (PENNSAID) and diclofenac epolamine topical patch (Flector) (1). This *Fast Fact* reviews the pharmacology, clinical efficacy and adverse effects of topical NSAIDs for the treatment of musculoskeletal pain.

Pharmacology High plasma concentrations of oral NSAIDs are required to achieve effective tissue concentrations at the site of pain and inflammation. Topical NSAIDs are believed to deliver adequate local tissue concentrations with minimal systemic absorption. Plasma concentrations following topical administration of diclofenac sodium gel and the diclofenac epolamine patch are far lower than levels found following oral administration of diclofenac (0.6%-2.2%, and less than 1%, of oral systemic levels, respectively). Time to peak serum concentration for both topical formulations is approximately 10-20 hours (2).

Clinical evidence NSAIDs are often recommended as first-line treatment for mild-to-moderate musculoskeletal pain (3). A Cochrane review of the efficacy of topical NSAIDs in the treatment of acute musculoskeletal pain (sprains, strains, contusions) found that compared to placebo, the number needed to treat (NNT) was 4.5 to achieve 50% pain relief over treatment periods of 6-14 days (4). The effectiveness of topical NSAIDs for the treatment of acute low back pain or chronic conditions including chronic back pain is unknown (5). Several systematic reviews report trials of poor quality with most trial lengths lasting less than 4 weeks and demonstrating inconclusive results (6). Head-to-head trials comparing oral NSAIDs and their topical equivalents show conflicting results with regards to efficacy and there are insufficient data to perform meta-analysis (4). There are virtually no data about topical NSAID use in patient populations commonly seen in palliative care settings. A literature review in June 2011 identified a single study which showed no benefit from a topical NSAID cream over placebo in the relief of pain related to pressure ulcers (7).

Adverse Effects Patients taking oral NSAIDs for ≥ 5 days at least twice annually have a 4.21 relative risk of gastrointestinal events compared to those who do not (8). Conversely, topical NSAIDs have a high margin of safety and have not been associated with acute renal failure or upper GI adverse events. Mild local adverse effects occur at approximately the same rate (6%) in patients treated with topical NSAIDs or topical placebo (5).

Summary In the treatment of acute musculoskeletal pain, excluding low back pain, topical NSAIDs are more effective than placebo and are associated with fewer adverse events than oral NSAIDs (although this has not been demonstrated in head-to-head trials with oral NSAIDs). Current data suggest topical NSAIDs are appropriate for patients with a flare of single joint arthritis or acute musculoskeletal injury. Given the expense of topical NSAIDs (approximately \$36 for one 100 gm tube of diclofenac gel and \$170 for thirty diclofenac epolamine patches), unclear clinical benefit over prolonged time periods, and unknown efficacy compared to oral preparations, they are not recommended for chronic musculoskeletal pain. Their use for cancer-related pain syndromes and other indications is entirely empiric.

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Authors' Affiliation: University of Pittsburgh Medical Center, Pittsburgh, PA.

Version History: Originally published January 2012; Copy-re-edited August 2015 with reference #1 added and incorporated into the text.

Fast Facts and Concepts are edited by Sean Marks MD (Medical College of Wisconsin) and associate editor Drew A Rosielle MD (University of Minnesota Medical School), with the generous support of a volunteer peer-review editorial board, and are made available online by the Palliative Care Network of Wisconsin (PCNOW); the authors of each individual *Fast Fact* are solely responsible for that *Fast Fact's* content. The full set of *Fast Facts* are available at [Palliative Care Network of Wisconsin](#) with contact information, and how to reference *Fast Facts*.

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FAST FACTS AND CONCEPTS #250 TRACHEOSTOMY CARE

Elliott Kozin MD, Joseph Straton MD, and Jennifer Kapo MD

Background Many patients with advanced illness have tracheostomies, which require careful observation and specialized management. Common indications for tracheostomies in patients being seen in palliative care and hospice settings include chronic long-term ventilation, aid with ventilation weaning, and upper airway obstruction (from, for instance, head and neck cancer). A working knowledge of tracheostomy equipment and the basic handling procedures can avoid complications and improve a patient's comfort.

Tracheostomy Equipment 101 At its most basic level, a tracheostomy appliance consists of a cannula (or tube), cuff, obturator, and ties. The cannula maintains the patency of the stoma and airway, and it facilitates movement of air into the trachea. Tracheostomy cannulas can be cuffed or uncuffed. The inflatable cuff, typically filled with air by a syringe, surrounds a portion of the cannula inside the trachea. The inflated cuff occludes the trachea around the cannula, which allows for increased protection against aspiration and also for greater degrees of positive pressure ventilation. Cuffs require monitoring to maintain a pressure of 20-25 mmHg. Higher pressures can produce tracheal ischemia, mucosal injury, and difficulty swallowing; lower pressures can potentially aggravate aspiration around the cannula (1,2,3). Obturators, usually packaged with new tracheostomy tubes, are inserted into the lumen of the cannula and provide for increased rigidity during placement of the tracheostomy tube. Tracheostomy ties secure the tracheostomy tube to the patient and typically wrap around the back of the patient's neck.

Complications of Tracheostomy Placement *Short-term complications* include bleeding from surgical site (~5%), wound infection, subcutaneous emphysema, pneumothorax, tracheostomy tube obstruction, recurrent laryngeal nerve damage, and posterior tracheal wall injury (4, 5). *Long-term complications* include dysphagia, airway obstruction from secretions, infection, rupture of the innominate artery, tracheo-innominate artery fistula (<0.7%), tracheoesophageal fistula, tracheal dilation, tracheal stenosis (1-2%), granuloma formation, and tracheal ischemia and necrosis (4, 5).

Approach to Complications and Emergencies

- **Acute Dyspnea.** If a patient with a tracheostomy becomes acutely dyspneic, it may be due to partial or complete blockage by retained secretions. Ask the patient to cough and then attempt to suction the tracheostomy in place with a flexible suction catheter. If the tracheostomy stoma and tract is not fully matured, do not attempt to remove the cannula as it may be difficult to re-insert. (3)
- **Bleeding.** Bleeding from the surgical site is among the most common early complications. Treatments include packing around the edges of the stoma with gauze, correction of coagulopathies, and cautery or suturing of site of bleeding (3,5). Massive pulsatile bleeding may indicate erosion of the innominate artery, which can occur days to weeks after a tracheostomy procedure. This can rapidly lead to airway compromise and/or exsanguination. To minimize bleeding, place a gloved finger in the stoma, feel for a pulsatile mass, and apply forward motion on the backside of the upper border of the sternum thereby compressing the pulsatile artery against the posterior surface of the sternum (6). Other techniques include overinflating the cuff. If the patient's goals of care allow this, the patient should be transported emergently to the operating room for management (3). See *Fast Fact #251* for further details about caring for hemorrhaging patients who do not want further invasive treatments.

- **Accidental Decannulation.** Don't panic. Reassure the patient. If the tube has been in place less than 5 days, consider endotracheal intubation if a tracheostomy tract cannot be immediately re-established (5). If the tube has been in place for 5-10 days, the tract should be well formed and should not suddenly close (2). To reinsert the tracheostomy tube, insert the obturator (if applicable) into the cannula. Slowly insert the cannula with obturator into the tracheostomy, following the path of the airway. When reinserting, be mindful of any resistance. If met with resistance, it is possible to create a false passage, and one should reevaluate the entry approach. After insertion, remove the obturator while keeping the cannula in place. Listen for and feel for air movement through the tracheostomy tube and ensure that there is no subcutaneous emphysema, which may indicate improper placement.

If you cannot insert a new cannula and the patient cannot breathe comfortably on their own through the stoma, use a bag-valve mask to ventilate the patient through the upper airway. Ventilate gently to prevent air from escaping through the stoma or carefully occlude the stoma with a gloved hand to maximize oxygenation. Next steps depend on the patient's current indication for a tracheostomy (airway patency vs. ventilation vs. secretion management) and goals of care. If the patient has a patent airway and is not on a ventilator there may be time to have the patient evaluated by a specialist to replace the cannula. If the patient is ventilator dependent or has an upper airway obstruction, endotracheal intubation and/or emergency transport is indicated.

- **Resuscitation via Tracheostomy Tube.** Treat the patient like patients without tracheostomy, with the following exceptions. Do not remove the tracheostomy. Check that the cannula is patent. Ventilate by using a manual resuscitation bag attached directly to tracheostomy tube. If unable to ventilate, try suctioning. If still unable to ventilate, try to change tracheostomy tube. The last resort is oral intubation.

Conclusion Careful discussions with dying patients and their families about options and preferences if there are tracheostomy complications can help prevent chaotic, emergency decisions about urgent transportation, surgeries, or oral intubation.

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Version History: Originally published February 2012; Copy-re-edited August 2015.

Fast Facts and Concepts are edited by Sean Marks MD (Medical College of Wisconsin) and associate editor Drew A Rosielle MD (University of Minnesota Medical School), with the generous support of a volunteer peer-review editorial board, and are made available online by the Palliative Care Network of Wisconsin (PCNOW); the authors of each individual *Fast Fact* are solely responsible for that *Fast Fact's* content. The full set of *Fast Facts* are available at Palliative Care Network of Wisconsin with contact information, and how to reference *Fast Facts*.

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FAST FACTS AND CONCEPTS #281 CARE OF THE POST-LARYNGECTOMY STOMA

Shweta Garg PA-C, Elliott Kozin MD, Daniel Deschler MD

Background Many patients with laryngeal cancer require a laryngectomy. While laryngectomies are typically done as a curative cancer surgery, some patients will have recurrences and be seen in palliative care and hospice settings. Laryngectomy stomas differ from tracheostomies (see *Fast Fact #250*) in important ways, which can profoundly impact a patient's well being. A working knowledge of the basic management and equipment used in patients with a stoma after laryngectomy can avoid complications and improve a patient's comfort and safety (1).

Laryngectomy Stoma versus Tracheostomy There are a few key differences between a post-laryngectomy stoma and tracheostomy. At the most basic level, a post-laryngectomy stoma is created after a patient undergoes a total laryngectomy, which involves the removal of the larynx, including vocal cords and associated structures. A *permanent*, direct connection between the trachea and the skin of the neck is made sewing the open end of the trachea to the neck skin forming an opening through which the patient breathes. After a laryngectomy, the patient no longer has a communication between the lungs and oral cavity or nose. These patients are casually referred to as "neck breathers" (2). In contrast, a tracheostomy, also referred to as a tracheotomy, is surgical opening into the trachea to bypass the upper airway, which is not necessarily permanent. A tracheostomy tube is inserted and stents the tracheostomy open, thereby facilitating air exchange. In patients with tracheostomies, the larynx remains present and there is still a connection between the oral cavity and nose to the lungs.

One can differentiate a post-laryngectomy stoma from a tracheostomy based on physical exam (Reference 6 has helpful illustrations available online). A post-laryngectomy stoma does not typically require any stenting and appears as a circular opening above the clavicles directly midline in the neck. Although similar in position to a tracheostomy, a post-laryngectomy stoma will only track inferiorly into the chest and have no connection superiorly to the throat and mouth as a tracheotomy will. Post-laryngectomy stomas, however, may have a moisture exchange device (see below) and may be confused for a tracheostomy. In contrast, tracheostomies have a tracheostomy tube in place and will readily close without a supportive stenting mechanism. If there is any question about a patient's airway anatomy, consultation with an otolaryngologist is warranted.

Routine / Preventive Care The basic equipment for a laryngectomy stoma includes 1) a suction device, 2) a humidified air device, 3) a personal mirror and, in some cases, 4) a soft laryngectomy tube. Although most post-laryngectomy stomas do not require a tube to keep them patent, some patients use a laryngectomy tube to assist with hygiene and minimize stenosis. Suctioning is performed to remove excess mucus or crusting near the opening of the stoma and to facilitate clearance of mucus from the lungs. Stomas require warm humidification to prevent buildup of thick mucus, and humidification can be achieved with saline nebulizers or a portable heat and moisture exchange (HME) device. The HME is a disposable small, round filter device, which inserts into the opening of the laryngectomy tube. Patients generally replace the HME every 24 hours (2). Patients with post-laryngectomy stomas will often use a small personal mirror to assist with crust removal at the stoma site. Other patients may have a tracheoesophageal puncture (TEP) prosthesis, which is a small circular device that is placed at the back wall of the stoma to allow for speech (3, illustrations in Reference 6).

Approach to Complications and Emergencies As with all clinical situations, decision-making at the time of emergency will depend on a patient's overall health status, goals of care, and code status.

- *Acute Dyspnea.* If a patient with a post-laryngectomy stoma becomes acutely dyspneic this may be due to a partial or complete blockage of the trachea by retained secretions, such as a mucus plug. Ask the patient to cough, instill 3 mL normal saline, and then attempt to suction the stoma in place with a flexible suction catheter.
- *Resuscitation via laryngectomy stoma.* In a patient with a post-laryngectomy stoma, there is no connection to the airway from the oral or nasal cavity to the trachea. Bag mask, oral, and nasal intubation should *never* be attempted. Instead, a cuffed endotracheal tube (ETT) should be directly inserted into the stoma. Ventilate by using a manual resuscitation bag attached to the ETT tube. The ETT should be placed such that the balloon is nearly visible under the skin. If an ETT is not available then an anesthesia facemask can be placed over the stoma, creating a seal.
- *Pharyngocutaneous fistula.* In the first few weeks after a laryngectomy it is relatively common for there to be breakdown of the mucosal lining resulting in salivary leakage to surrounding tissue. Initial clinical signs include neck erythema, facial and neck edema, and tenderness. Recognition is important to prevent wound complications and potential breakdown of nearby vessels (2,4).
- *Bleeding.* Bleeding from a laryngeal stoma is an airway emergency. While it may be due to dry air irritating the lining of the trachea, it could also be due to a fistula formation. Bleeding may result in airway compromise. An otolaryngologist should evaluate the patient urgently (5).

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Conflicts of Interest Statement: The authors have disclosed no relevant conflicts of interest.

Version History: First published May 2014. Re-copy-edited in September 2015.

Fast Facts and Concepts are edited by Sean Marks MD (Medical College of Wisconsin) and associate editor Drew A Rosielle MD (University of Minnesota Medical School), with the generous support of a volunteer peer-review editorial board, and are made available online by the Palliative Care Network of Wisconsin (PCNOW); the authors of each individual *Fast Fact* are solely responsible for that *Fast Fact's* content. The full set of *Fast Facts* are available at Palliative Care Network of Wisconsin with contact information, and how to reference *Fast Facts*.

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FAST FACTS AND CONCEPTS #327

TOPICAL TREATMENTS FOR ACUTE AND CHRONIC WOUND PAIN

Katherine Steele, DO

Acute and chronic wounds can be a significant source of pain in advanced illness. Systemic opioids have been predominantly utilized for wound-related pain, however, for many patients, dose-limiting side effects can hinder their effectiveness. This *Fast Fact* will discuss topical options for acute and chronic wound pain. See *Fast Facts* #46 & #218 for guidance on malignant wounds and wound odor.

Pain Classification Painful wounds can arise from many sources. Often wound pain is a combination of nociceptive or neuropathic pain (1).

- **Nociceptive pain:** Typically caused by damage to body tissue. Common wound-related etiologies include decubitus ulcers, mucositis, and procedures such as debridement, dressing changes or radiation treatments (2,3). This pain is often described as sharp, aching, or throbbing.
- **Neuropathic pain:** Typically, chronic in nature due to long-term inflammation or injury to nerve fibers (1). This may be seen in certain malignant wounds or refractory mucositis (2,4). This pain is usually described as burning, stabbing, or sharp (4).

Topical Drug Treatment Options

Local anesthetics: A Cochrane review found adequate evidence supporting the use of Eutetic Mixture of Local Anesthetics (EMLA) cream (which is a combination of lidocaine and prilocaine) for pain associated with dressing changes or debridement of a wound (5,6). It is recommended that the cream be applied 20 minutes before the dressing change or debridement procedure to minimize discomfort; open wounds should be avoided (5). As long as no more than 10 grams of 5% EMLA cream are applied, there is little concern for CNS toxicity. Only minor side effects like a burning sensation, local erythema, or pallor have been documented (7). There is some controversy whether local anesthetics negatively impact the first two stages of wound healing at a clinically significant degree (8). A 30 g container of EMLA cream costs approximately \$53.

Ketamine: While there are no high quality controlled trials on the use of topical ketamine for wound pain, anecdotal accounts of the effective use of topical ketamine as a gel, cream, ointment, or spray has been documented with few side effects at concentrations up to 20% (9). Often, ketamine is compounded with other analgesics such as baclofen, amitriptyline, or pregabalin. Coverage by insurance is variable. A 30 gram jar of a 15% ketamine/15% lidocaine cream or a 30 mL bottle of 5-10% ketamine spray mixed with 1% lidocaine and 5% morphine costs about \$70 to \$100 without insurance (10). The spray is typically applied to an entire wound bed prior to dressing changes 4 times per day as needed. Use of the spray has also been described for post-operative pain relief in children (9,10).

Anti-inflammatory foam dressings (*Available in Canada but not in the US*): These treatments commonly utilize diclofenac or ibuprofen as their active ingredient to inhibit synthesis of prostaglandins in body tissues and decrease proinflammatory cytokine activity. In some studies, anti-inflammatory foam dressings have been found to be more effective in treating nociceptive wound pain, such as chronic leg ulcers, than the local best practice (moist healing and antimicrobial dressings) (9).

Tricyclic Antidepressants: Amitriptyline has shown effectiveness for acute nociceptive and chronic neuropathic wound pain (11,12). Similar to ketamine, its topical use requires the

assistance of an experienced compounding pharmacist. The cost of a 30 gram jar of 2.5% amitriptyline cream compounded with 2-4% baclofen and 2-5% gabapentin is estimated to be about \$70 to \$90 per month when used 2-4 times per day as needed.

Topical Opioids: See *Fast Facts* #185 and #325. Applying opioids topically to painful wounds like skin ulcers or calciphylaxis-related wounds has the theoretical advantage of offering a more localized effect with less systemic absorption and side effects. While morphine infused into a gel form is most frequently used in this manner, the use of topical methadone and buprenorphine has also been described (13,14). In several case studies and many, but not all, controlled trials, most patients were able to reduce their systemic analgesic doses when 10 mg diamorphine per 10 mL gel was applied to the entire surface of a wound and covered with gauze twice daily (9). Morphine has also been utilized as a mouthwash to reduce mucositis pain associated with cancer or cancer treatment (15)

Other: Topical aspirin, capsaicin (0.025 to 0.075%), clonidine 0.1% gel, and menthol have all been described to reduce wound pain, but evidence regarding safety and efficacy are lacking. Although the analgesic effect of topical capsaicin is dose dependent, burning associated with the application at higher concentrations (e.g. 2.5 to 7.5%) often limits patient adherence (13).

Summary Complete healing of wounds is often an unrealistic goal in palliative settings. Dose-limiting side effects of systemic opioids can limit their efficacy. Hence, clinicians may turn to empiric options, including topical analgesics. Clinicians should be aware that most of these formulations are not standardized and are poorly researched.

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Conflicts of Interest: None

Version History: Originally edited by Sean Marks MD; first electronically published in December 2016.

Fast Facts and Concepts are edited by Sean Marks MD (Medical College of Wisconsin) and associate editor Drew A Rosielle MD (University of Minnesota Medical School), with the generous support of a volunteer peer-review editorial board, and are made available online by the Palliative Care Network of Wisconsin (PCNOW); the authors of each individual *Fast Fact* are solely responsible for that *Fast Fact's* content. The full set of *Fast Facts* are available at Palliative Care Network of Wisconsin with contact information, and how to reference *Fast Facts*.

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