

# **MACEP Risk Management Course**

## **Module 3: Wound Care**

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### **Course Objectives**

- Understand the risk management issues of emergency wound care.
- Recognize high risk situations in patients presenting with wounds.
- Know the high risk wounds are tendon injuries, foreign bodies, puncture wounds, mammalian bites and closed fist injuries.
- Be able to discuss the various risk factors that make these high risk wounds.
- Know the pertinent history, physical findings, management, and documentation needed when evaluating a patient with one of these high risk diagnoses.

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### **Wound Risk Management**

Traumatic wounds are one of the most common reasons for Emergency Department visits. Although the majority of these wounds are not life-threatening and may be assigned a low acuity level, they are associated with a high number of malpractice claims. The most common causes of litigation resulting from wound care include failure to diagnose foreign bodies, failure to diagnose damage to underlying nerve, tendon or joint capsule, and wound infections. Proper documentation of a thorough history, standard examination, appropriate referral or consultation, treatment and clear discharge instructions is essential in wound care risk management.

### **Wound History**

A thorough history is important in recognizing wounds that may be at increased risk of infection, poor healing, or poor cosmetic outcome, and failure to consider medical history continues to be one of the top risk management issues for malpractice insurers. The circumstances of how and why a wound was inflicted are important not only in determining the management, but in predicting possible sequelae. The Emergency Physician must determine if there is a chance of contamination, suspicion of foreign body, associated crush injury or damage to underlying structures. Likewise, a patient's underlying disease may have significant impact on wound healing. Diabetes mellitus, alcoholism, tobacco use, chronic renal or hepatic failure, malnutrition, protein and vitamin C deficiency, connective tissue disease and immunosuppressive illness (or treatment) can impair nutrient and oxygen delivery to the wound. Certain medications (steroids, anticoagulants, NSAIDs, colchicine, antineoplastic agents) impact the inflammatory response and ability of the body to suppress bacterial growth in the wound.

### **Physical Examination**

Emergency Physicians should follow a standard approach in the examination of a wound, and good documentation in this area is key in preventing litigation. Before anesthesia and before exploration, a thorough neurologic, vascular and functional exam should be performed. If any foreign object or material is suspected by history, appropriate imaging studies such as radiograph or ultrasound should

be ordered and reviewed.

After anesthesia, a thorough wound examination should again be performed, being careful to ensure the examination is conducted with adequate hemostasis and optimal lighting. Wounds should be explored to their depth with blunt instruments. All structures should be carefully visualized looking for foreign bodies as well as injury to vascular, nerve, and musculoskeletal structures, including tendons, ligaments, muscles and joint structures. If visualization of the underlying structures cannot be achieved, extension of the wound margins may be required. Special care must be made in evaluating deep lacerations of the extremities, with diligent exploration to the wound's depth through a full range of motion, to assess for tendon injury.

## Initial Wound Care

With the exception of topical skin glues, wound repair requires anesthesia. Children may require intravenous sedation and analgesia to repair certain wounds. Providing timely and adequate anesthesia is best patient care and will reduce litigation likelihood. Even if there was a bad wound outcome, patients who felt their physician cared about them, and did their best to minimize pain, are less likely to be sued. Being familiar with local anesthetics is important. True allergies to local anesthetics are rare; allergic reactions to local anesthetics are usually in reaction to the preservatives rather than the anesthetic itself. In cases of a known allergy to an anesthetic, preservative free solutions should be used if possible. Additionally, emergency physicians should be familiar with the amide and ester classes, so that they can choose an anesthetic from the alternative class. It is important to remember that local anesthetics can have central nervous and cardiotoxic effects, typically secondary to inadvertent intra-arterial administration. Emergency Physicians should use a variety of strategies to reduce the pain of infiltration: sodium bicarbonate as a buffer, warmed anesthetic agents, small needles, slow rate of infiltration and pretreatment with topical agents.

Since infection is the most common complication of wound care, the critical step in managing any wound is thorough cleansing and, if indicated, irrigation. Normal saline is most commonly used, although tap water has been shown to be just as effective. Adequate irrigation may be obtained using a 35 mL syringe and <19-gauge needle/catheter or other means utilized to generate at least 8 psi. Povidone-iodine based agents and hydrogen peroxide should never be used in any wound due to their cytotoxic effects on fibroblasts resulting in delayed healing. Soaking wounds is also not recommended.

Devitalized tissue increases the risk of infection, thus debridement is crucial to wound healing. Removing nonviable tissue around the wound margins must be done cautiously, however, to ensure that the wound can still be closed without placing undue tension on the skin, underlying structures are not damaged, and cosmetic result is taken into consideration.

The optimal length of time between injury and laceration repair has not been defined. Primary closure of old wounds may lead to increased risk of infection. Each patient and wound must be evaluated for all variables and the patient informed of risks and benefits. In general, wounds at low risk of infection can be closed 12 to 24 hours after injury, but high-risk wounds (heavily contaminated, poor vascular supply, immunocompromised patient) should be closed within six hours. Consider delayed closure (tertiary intention) after four to six days of observation in high risk wounds arriving for care after that time period.

## Tendon Injuries

Tendon injuries account for approximately 20% of malpractice suits related to wound care. Emergency Physicians evaluating hand and forearm wounds should have a high level of suspicion for damage as tendons with apparently normal function can have significant injury. Explore every wound to its depth and if a tendon is visualized, put the tendon through range of motion so the proximal and distal portions are visualized. If a tendon is injured, determine the extent, inform the patient, and involve the appropriate consultant.

## Foreign Bodies

Foreign bodies are problematic; they are difficult to diagnose and hard to find. They increase the incidence of infection in the short term and may cause disability in the long term. Historically, forty percent of wound care litigation in emergency medicine in Massachusetts is the result of missed foreign body. Emergency Physicians should consider foreign bodies in any wound caused by glass or teeth, wounds contaminated by organic materials, or wounds through clothing that may result in material in the wound. Patients may have foreign body sensation and simply asking may prompt more extensive evaluation. A number of imaging techniques can be used for foreign body detection, but their effectiveness is variable and depends on the material. Radiography may locate metal, bone, teeth, pencil graphite, certain plastics, glass, gravel, sand, some fish bones, some wood and some aluminum. A negative radiograph does not rule out a foreign body, however. CT scanning can detect more types of materials but expense and radiation exposure limit its usefulness. MRI is useful for detection of small organic matter but rarely indicated in the emergency setting. Ultrasound detection is variable, depending on the anatomic region, material, and operator ability, but a growing body of clinical data suggests that this may best be the imaging test of choice. Sensitivities and specificities vary but can be as high as 98% in some studies. (3) Foreign bodies should be removed once detected, especially organic matter. Some non-organic foreign bodies, such as metal, may be left in place if removal may cause damage to underlying structures. In this situation, appropriate consultation may be indicated.

Unfortunately some foreign bodies remain invisible to imaging studies and so the best defense is to document inspection in a bloodless field, review imaging tests, and explain to the patient that you have ruled out a foreign body to the best of your abilities.

## Puncture Wounds

Puncture wounds are difficult to explore well and have a high risk of infection and abscess. Puncture wounds on the plantar surface of the foot should be evaluated for foreign body contamination as well as injury to deep structures. Wounds sustained through the sole of an athletic shoe are at increased risk of *Pseudomonas aeruginosa* infection. Patients with these wounds should be given explicit discharge instructions with warnings to be reevaluated at the first sign of a problem. Inability to bear weight 48 hours after the injury may be the only symptom of infection. Diabetics with neuropathy require close follow up as they may not have the ability to sense pain resulting in delayed presentation. They are at increased risk of osteomyelitis and are five times as likely to require surgery and amputation.

## High Pressure Injection Injuries

High pressure injection injuries are medical emergencies that require prompt surgical consultation. These injuries are caused by accidental injection of paint, grease, or liquid from a high pressure nozzle. There may be minimal external damage but the materials quickly spread along fascial planes and cause widespread inflammation. Initially patients may not have significant pain but a delay in diagnosis can lead to ischemia, vascular injury, compartment syndrome and necrosis.

## Bites

Mammalian bites, especially of the hand, are responsible for many wound infections. While cat and dog bites are the most common, human bites are the most likely to become infected. While there is some debate regarding treatment of bites, it is reasonable to treat all cat, dog and human bite wounds that penetrate into deep tissues with antibiotic prophylaxis. Generally these wounds, unless on the face, should not be closed primarily. Patients should also be warned that even with careful wound cleaning and antibiotics, infection is still possible and that expeditious reevaluation for signs of infection is critical. Document tetanus and rabies status and prophylax according to CDC guidelines.

## Closed Fist Injury

When a patient presents with a wound over a hand joint (particularly a metacarpal-phalangeal joint) that occurred during an altercation, suspect a closed fist injury (CFI). A CFI occurs when an individual throwing a punch sustains a wound on their hand from the teeth of the other individual. The wounds often seem insignificant but even small wounds and breaks on the skin over the MCP joints can become contaminated with skin and oral flora. They are prone to infection because of the close proximity of the skin to the joint capsule and, because of the force involved, bacteria may be deposited into deep tissue (especially a MCP joint). If unrecognized, these injuries can cause severe infections with devastating disabilities. The first step in caring for these injuries is to recognize them. The second step is to call your consultant.

## Skin Tears

Elderly and chronically ill patients are particularly vulnerable to skin tears which typically result from minor trauma but can have significant morbidity. Aging not only thins the skin tissue, predisposing the elderly to tears, but is also associated with delayed wound healing. Management of these wounds typically does not involve sutures as the fragile skin does not have enough elastin to hold the thread. These wounds should be washed with normal saline and dried, and then have the wound edges re-approximated as best as possible. Steri-strips, skin glue, or a variety of dressings such as hydrogels or hydrocolloid sheets can be applied.

## Antibiotics

Since infections account for 25% of malpractice suits related to wounds, it is tempting to use prophylactic antibiotics as a routine part of wound care. However, there have not been any studies demonstrating benefit of antibiotic prophylaxis in immunocompetent patients. Antibiotics should be used selectively on those few wounds where there is a high degree of contamination and a patient with

significant risk factors for infection. Even patients with cardiac lesions at a high risk of endocarditis do not require antibiotics as routine wound repair does not induce transient bacteremia. Thorough wound cleaning, debridement and decontamination are the keys to preventing wound infections.

Antibiotics should be reserved for special situations, including mammalian bites (particularly of the hand), intraoral lacerations (probably not necessary for simple intraoral wounds), open fractures, and exposed joints or tendons. For most high risk wounds a first-generation cephalosporin or a *penicillinase*-resistant penicillin adequately cover the *staphylococci* and *streptococci* that are responsible for most infections. Dog and cat bites commonly contain *Pasteurella multocida* as well as *staphylococci* and *streptococci*. Human bites may contain *Eikenella corrodens* in addition to *staphylococci* and *streptococci*. All of these bites can be treated prophylactically with a broad-spectrum antibiotic such as amoxicillin with clavulanic acid. When treating puncture wounds through shoe soles, especially sneakers, one should consider starting an anti-*pseudomonas* antibiotic such as a quinolone. In addition, every patient should have tetanus status determined and documented. Older patients, immigrants, intravenous drug users and uninsured patients are at risk for under-immunization.

## Discharge Instructions

Discharge instructions are critical in reducing risk of litigation. Giving thorough instructions, particularly concerning care of the wound including dressings, splints (if used), and appropriate use of the injured area is key to preventing litigation. All patients, especially those with the potential for foreign body, bite wounds and contaminated wounds, should be given detailed information on the signs of infection and other potential complications and how to follow up if any occur. Discharge instructions should also include a caution regarding sun exposure of wounds and use of adequate sun protection. Because wound infections and retained foreign bodies occur so frequently and result in frequent litigation, in addition to the standard provision of written discharge instructions and nursing review of the discharge instructions, the emergency physician should personally review the discharge instruction regarding these complications with the patient and document those discussions. Ask the patient if they have any concerns or questions, and assess their ability to comply with instructions. High risk wounds should be rechecked in 2-3 days regardless of symptoms. Be sure to provide all patients with location and timing specific information on appropriate follow-up for wound checks, if necessary, and suture removal.

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## Summary Points

- Although typically not life-threatening injuries, traumatic wounds have a high malpractice rate.
- A careful history including past medical history and mechanism of injury is needed to alert the provider of any issue that would increase the risk of a complication.
- A thorough physical exam should be documented as failure to diagnose foreign body or damage to underlying nerve, tendon or joint capsule remains the most common cause of litigation.

- Antibiotics are typically not necessary for wound prophylaxis unless the wound is a mammalian bite wound, intraoral laceration, open fracture or exposed joint or tendon, or puncture wound to the foot.
- Use expert consultation.
- Discharge instructions are critical in reducing the risk of litigation.

### Module 3: Wound Care References

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