# Treatment of acute wounds and injuries: Cuts, bites, bruises and sprains

SS Mlambo,[1] H Parkar,[1] L Naude,[2] AD Cromarty[1]

[1] Department of Pharmacology, Faculty of Health Sciences, University of Pretoria, South Africa

[2] Eloquent Health and Wellness, South Africa

**Corresponding author, email:** shamiso.mlambo@up.ac.za

## Abstract

Acute wounds and injuries are a common daily occurrence, and their appropriate care is critical to healing. In South Africa, community pharmacists are often the first to encounter acute wounds and injuries such as cuts, bites, bruises and sprains, due to the accessibility and cost constraints associated with primary healthcare facilities. Since pharmacists assist with first aid, refer the patient for further management if necessary, and provide the appropriate dressings during the later healing phase, it is imperative for pharmacists to stay informed on developments in wound care. This review aims to highlight some of the more common acute wounds and injuries encountered by pharmacists, such as cuts, bites, bruises and sprains, and the associated therapeutic strategies.

**Keywords:** cuts, bites, sprains, bruises, snakebites, spider bites, dog bites



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## Introduction

Acute wounds and injuries are a common daily occurrence, and their appropriate care is critical to healing and minimises scar formation as well as the occurrence of infections.[1] An injury is defined as damage to the body caused by impact such as from accidents and falls, or from use of weapons, while a wound is a breach in the integrity of the skin, mucosal surfaces or organ tissue. Wounds may be accidental, intentional or result from a disease process.[2-4] Injuries can be classified as minor or life-threatening, while wounds are classified as either acute or chronic. Acute wounds progress through sequential but overlapping phases of wound healing within four to six weeks, whereas chronic wounds still demonstrate delayed healing twelve weeks after the initial insult.[3,5,6] Due to various factors, including patient reluctance to get initial hospital/primary care facility treatment, lack of financial resources and the wound/injury being deemed less severe, community pharmacists are often the first point of contact for treatment.[6] Although patients with chronic wounds may present at the local pharmacies, it is highly recommended that they are referred to a wound care nursing sister, doctor or hospital.[6,7] This article aims to highlight some of the more common acute wounds and injuries encountered by pharmacists, such as bites, cuts, bruises and sprains, and the associated treatment strategies.

## Management of acute wounds and injuries

### *Cuts*

A cut is a break or opening in the skin and may also be referred to as a laceration. A cut may be smooth or jagged and may be shallow, involving just the upper skin layers or deeper. A deep cut can affect muscles, blood vessels, tendons, ligaments, nerves, or bone.[8] Cuts are common occurrences in most households and are classified as acute wounds, which will vary in severity depending on the object that created the cut, wound depth, location and patient factors such as comorbidities and infection.[9] These factors determine whether a cut will heal timeously or be stalled, resulting in a chronic wound. There are various preventative measures that the patient can take at home by using freely available or over the counter (OTC) products. For this article, cuts have been divided into shallow and deep, infected or uninfected wounds, and treatments recommended accordingly, as detailed in Table I. Deep wounds requiring stitches or if a potential infection is suspected (cut with dirty/rusty object) should be referred to a doctor, and elderly patients with comorbidities should always be encouraged to seek specialist wound care.

### *Bites*

Bites are considered to be trauma wounds and the treatment of these wounds is dependent on the animal/insect and the severity of the injury. The most common bite injuries of concern sustained by humans are location dependant and include snakebites and dog bites.[14] Less common are spider bites.

#### *Snakebites*

There are 173 identified species of snakes in southern Africa and of those, approximately 11% are considered deadly.[15] In many cases, patients are bitten by nonvenomous snakes and 10– 50% of those bitten by venomous snakes are not envenomed, resulting in a "dry bite" (no antivenom necessary).[15,16] Snakebites by venomous snakes should be treated swiftly and urgently as they may potentially be life-threatening.

Venomous snakes in South Africa can be classified into three broad groups: cytotoxic, neurotoxic and haemotoxic.[16] The South African Vaccine Producers (SAVP) produce a polyvalent antivenom

**Table I:** Treatment of cuts[9-13]

| Classification | Characteristics | Treatment strategy |
|---|---|---|
| **Shallow uninfected** | • Superficial<br>• Signs of inflammation<br>• Painful<br>• Does not need sutures, but skin must be re-aligned<br>• Complications:<br>◦ Maceration<br>◦ Infection<br>◦ Wound dehiscence | • Clean wound with antiseptic agent<br>• Promote moist wound healing and wound closure<br>• Pain relief (e.g. paracetamol or ibuprofen)<br>• Prevent dehiscence<br>• Prevent infection<br>• Dressings:<br>◦ Steristrips<br>◦ Hydrocolloids<br>◦ Hydrogel sheets |
| **Deep uninfected** | • Deep wound penetrating through dermis, can affect blood vessels, ligaments, muscles, tendons and bone<br>• Signs of inflammation<br>• Painful<br>• Requires closure<br>• Complications:<br>◦ Maceration<br>◦ Lack of healing<br>◦ Infection<br>◦ Wound dehiscence<br>◦ Nerve damage | • Stop bleeding<br>• Clean wound with antiseptic agent<br>• Pain relief (paracetamol or ibuprofen)<br>• Wound closure with sutures, staples or glue depending on location<br>◦ Procedure may require anaesthetic<br>• Prophylactic antimicrobial cream<br>• Dressings:<br>◦ Hydrocolloids<br>◦ Hydrogel sheets<br>◦ Foam (exuding wounds) |
| **Shallow infected** | • Scratch or scrape caused by dirty object (e.g. rusted nail)<br>• Clinical signs of infection<br>• Increased pain<br>• Complications:<br>◦ Spread of infection<br>◦ Lack of healing | • Flush the wound and clean with appropriate antiseptic agent<br>• Topical antimicrobials to treat infection (silver, copper)<br>• Pain relief (paracetamol or ibuprofen)<br>• Promote moist wound healing<br>• Dressings:<br>◦ Iodine<br>◦ Chlorhexidine<br>◦ Honey<br>◦ Hydrophobic dressings |
| **Deep infected** | • Deep puncture caused by dirty object (e.g. rusted nail)<br>• Increased exudate<br>• Odour<br>• Necrotic tissue<br>• Complications:<br>◦ Spread of infection<br>◦ Lack of healing<br>◦ Pain<br>◦ Nerve damage | • Remove necrotic tissue<br>• Fill dead space<br>• Treat infection (oral antimicrobial)<br>• Tetanus vaccine recommended<br>• Pain relief (paracetamol or ibuprofen)<br>• Sharp debridement where necessary<br>• Contaminated and infected wounds should not be closed immediately, but left open to heal by secondary intention<br>• If wound is more than six hours old, manage with surgical toilet, leave open and then close 48 hours later<br>• Dressings:<br>◦ Cadexomer iodine<br>◦ Honey<br>◦ Silver<br>◦ Polyhexamethylene biguanide (PHMB)<br>◦ Hydrophobic dressings<br>◦ Hypochlorous acid (HOCl) soaked dressings |

effective against the cytotoxic effects of puff adder, gaboon adder, and rinkhals venom, as well as the neurotoxic venom of mambas and neurotoxic cobras. They also produce two monovalent antivenoms for the haemotoxic effects of the boomslang and the exotic saw-scaled viper.[15,16] General first aid for snakebites that should be conducted prior to referral to an emergency room is highlighted in Table II.

### *Dogs, cats and other wild animals*

The most common complication arising from animal bites are initial blood and tissue loss with later skin infections, while the most feared complication is rabies.[17] Severe animal bites can result in serious long-term complications such as osteomyelitis and septic arthritis, these are especially seen in bites on the hands.[17] According to the World Health Organization (WHO), bites from dogs and wild animals can be divided into three categories based on the need for post-exposure prophylaxis (PEP).[18] The first category where skin penetration is not obvious requires no treatment, while the second (minor scratches or abrasions) and the third categories (single or multiple transdermal punctures, tears or scratches) require PEP, which may include treatment with rabies immunoglobulin (RIG) and vaccination[18] as detailed in Table II.

**Table II:** Classification, characteristics and treatment strategies of medically important bites

| Classification | Characteristics | Treatment strategy |
|---|---|---|
| **Snakebites**[15,16] | | |
| ***Neurotoxic***<br>Black mamba, green mamba, and some non-spitting cobras | Neurotoxic effects:<br>• Drowsiness<br>• Vomiting<br>• Increased sweating<br>• Blurred vision<br>• Drooping eyelids<br>• Difficulty in swallowing, speaking and breathing<br>• Muscle weakness/paralysis<br>• Progressive paralysis of the respiratory muscles leading to respiratory failure<br>• Respiratory failure is usually the primary cause of death<br>• Neurotoxic snakes can cause life-threatening paralysis and death within 1–8 hours | General first aid:<br>• Patient should be safely transported to a hospital as soon as possible<br>• Patient should be kept calm and immobilised as movement accelerates the spread of venom in the lymphatic system<br>• Remove rings and tight clothing<br>• Apply pressure bandages<br>• Cardiopulmonary resuscitation (CPR) may be needed<br>• Intravenous fluids should be administered to shocked, hypotensive patients and pressor agents (dopamine or phenylephrine) can be considered in certain cases<br>• Oral analgesia such as paracetamol or paracetamol/codeine combinations can be administered<br>◦ Aspirin and other nonsteroidal anti-inflammatories (NSAIDs) are contraindicated in patients with haemostatic disorders<br>◦ Monitor respiratory function when opioids are given to patients with neurotoxic snake bite<br>• Snakebite patients who are asymptomatic should be admitted to a medical facility and monitored 12–24 hours<br>• Snakebite can introduce pathogenic bacteria increasing the risk of local infections<br>◦ Clean bite wound with an antiseptic<br>◦ Aspirate blisters and tense bullae only if rupture seems imminent<br>◦ Do not elevate snake bitten limbs excessively (increased risk of ischaemia)<br>◦ Debride necrotic and gangrenous tissue<br>◦ Appropriate antimicrobial treatment<br>• **Avoid the following contraindicated measures:**<br>◦ Cauterisation, local incision or excision, immediate prophylactic amputation of the bitten digit, suction by mouth or vacuum pumps or 'venom-ex' (venom extractor) apparatuses, instillation of chemical compounds such as potassium permanganate, application of petrol, ice packs, "snake stones" and electric shocks<br>• Antivenom is available for bites of some neurotoxic and cytotoxic snakes (SAIMR Polyvalent Snakebite Antiserum SAVP)<br>• Antivenom is available for boomslang bite (SAIMR Boomslang Snakebite Antiserum SAVP)<br>• Contact 24-hour Poisons Information Helpline on **0861 555 777** |
| ***Cytotoxic***<br>Puff adder, rhombic night adder, Mozambique spitting cobra and stiletto snake | Cytotoxic effects:<br>• Symptoms may include immediate burning pain at the site of the bite followed by local swelling, blistering and oedema, which may continue for several days<br>• In severe cases, the entire limb may swell<br>• Local tissue necrosis or gangrene may occur and may result in the loss of a limb | |
| ***Haemotoxic***<br>Boomslang | Haemotoxic effects:<br>• Affects blood coagulation<br>• Usually little/no swelling and pain initially<br>• Headache, mental confusion, nausea, vomiting, abdominal pain, increased sweating<br>• Persistent oozing of blood from the fang punctures<br>• After several hours, bleeding from small cuts, the mucous membranes of the mouth and nose, purple patches under the skin<br>• Eventually, severe internal bleeding resulting in vomiting of blood and haemorrhage from the bowels<br>• Kidney failure and brain haemorrhage may occur after a few days | |
| **Bites (Dogs, cats and wild animals)**[17,18] | | |
| ***Category II:***<br>• Animal nibbles uncovered skin<br>• Minor scratches or abrasions without bleeding | • Superficial wounds<br>• Irritation<br>• Inflammation<br>• Infection caused by animal saliva or teeth<br>• Rabies<br>• Tetanus | • Wound should be immediately and thoroughly flushed and washed with mild soap and water or antiseptic solution<br>• Application of virucidal agent such as povidone-iodine or similar<br>• Immediate rabies vaccination if appropriate<br>• Tetanus vaccine and antibiotic treatment administered for contaminated wounds<br>• Antimicrobial dressings, if required:<br>◦ Cadexomer iodine, honey, silver, copper, PHMB, hydrophobic dressings, HOCl<br>• Application of local remedies is discouraged |
| ***Category III:***<br>• Single/multiple transdermal bites or scratches<br>• Contamination of mucous membranes with saliva from licks<br>• Licks on broken skin<br>• Exposure due to direct contact with bats: severe exposure | • Severe bite wounds<br>• Deep wounds<br>• Puncture<br>• Pain<br>• Bleeding<br>• Inflammation<br>• Infection caused by animal saliva or teeth<br>◦ Osteomyelitis<br>◦ Septic arthritis<br>• Rabies<br>• Tetanus<br>• Odour | • Bleeding can be slowed/stopped by compression with a clean towel or gauze<br>• Thorough cleaning and deep irrigation of the wound<br>• Application of a potent antiseptic agent<br>• Rabies immunoglobulin (RIG) should be administered with the rabies vaccine into and around the wound site<br>• Most severe bite wounds are best treated by a daily dressing, followed by secondary suturing when necessary<br>• Recommended dressings:<br>◦ Antimicrobial: Cadexomer iodine, honey, silver, copper, PHMB, hydrophobic dressings, HOCl<br>◦ Other: High absorbent dressings<br>• If the wound occurs in the lower limb, compression may be required<br>• If sutures are required, it is advised to delay the closing of the wound for several hours to allow adequate diffusion of the RIG into the tissues<br>• Tetanus vaccine and antibiotic treatment administered for contaminated wounds<br>• Pain management |

| Spider bites[19, 20] | | |
|---|---|---|
| ***Neurotoxic***<br>Button or widow spiders | • Latrodectism<br>• Pain and burning at bite site<br>• Within an hour patient may develop generalised muscular pain and cramps, usually in the abdomen, chest, back and thighs<br>• Abdominal pain is usually so intense it may be mistaken for appendicitis or ruptured appendix<br>• Chest tightness and difficulty breathing<br>• Elevated blood pressure<br>• Headache, nausea, vomiting<br>• Numbness, restlessness<br>• Anxiety and profuse sweating<br>• Systemic intoxication may last a week or longer, causing the patient to become exhausted, dehydrated and prone to the development of complications | • Monovalent spider antivenom available for *Latrodectus indistinctus* (black button spider) is the only effective treatment for severe latrodectism<br>• In severe cases, patient should be kept hydrated by use of IV fluids<br>• Calcium gluconate IV can be administered for muscle cramps<br>• Oral antimicrobial therapy (if required)<br>• Administration of tetanus vaccine recommended<br>• Cortisone<br>• Pain relief<br>◦ Opioids and benzodiazepines: monitor for respiratory depression<br>• Do not use antihistamines |
| ***Cytotoxic***<br>Violin, recluse, and sac spiders | • Necrotic arachnidism<br>• Appears as redness or a red mark<br>• Local swelling is not significant soon after the bite<br>• Prominent itching<br>• Within 12–24 hours, the bite site becomes erythematous, oedematous, painful, and may develop mottled haemorrhagic areas or blisters<br>• After a couple of days, the lesion may resemble a furuncle or carbuncle, which may be complicated by aggressive, spreading cellulitis with discharge<br>• Necrotic tissue may develop at the bite site within 3–7 days<br>• Necrotic tissue detaches after about 2–3 weeks, leaving a slow-healing ulcer which can take months to heal.<br>• In rare cases, violin spider bites may present with severe, sometimes life-threatening systemic complications such as haemolysis, coagulopathy, shock, renal failure, and multiple organ damage | • The majority of lesions are self-limiting and will heal spontaneously<br>• There is no antivenom for cytotoxic spiderbite in South Africa<br>• Primary treatment involves management of the symptoms and prevention/treatment of secondary infections with antimicrobial agents<br>• Occasionally spreading cellulitis may develop, requiring aggressive parenteral antibiotic therapy and hospitalisation<br>• Wound cleansing is useful in decreasing the toxin and bioload:<br>• Betaine/polyhexanide (Prontosan®)<br>◦ Hypochlorous acid (Trifectiv®, Hydrocyn®, Noxmaria®, Veriforte®)<br>◦ Moist wound dressings can absorb the excess exudate and toxins<br>◦ Hydroactive innovation dressings (HydroClean plus®)<br>◦ Hydroconductive dressings (Drawtex®)<br>◦ Hydrophobic dressings (Sorbact®/Sorbact active®)<br>◦ Hydrofibre dressings (Aquacel®, Biosorb®, Durafibre®, KerraCel®)<br>◦ Super absorbent hydroactive dressings (Sorbion Sachet S®, Eclypse®, Kliniderm® superabsorbent)<br>◦ Foam dressings (Allevyn®, Biatain®, Cutimed Siltec®, Tegaderm foam®)<br>• Development of an abscess or suspected necrotising fasciitis is an indication for surgical intervention<br>• Antimicrobial dressings appear to be beneficial in management and prevention of infection:<br>◦ Cadexomer iodine, honey, silver, PHMB, hydrophobic dressings<br>• Topical haemoglobin (Granulox®) has been found to enhance oxygen uptake at the wound site resulting in enhanced wound healing and granulation tissue formation<br>• Large areas of necrosis may require excision with primary or secondary closure or a skin graft<br>• Sulfone antibiotics such as dapsone has been used with some success in cases of recurrent, chronic necrotic skin lesions, especially those non-responsive to surgical interventions |
| ***Painful bites which may cause infection***<br>Wandering or rain spiders and baboon spiders | • Inflict quite a painful bite<br>• Penetration of skin by fang may cause infection<br>• Specific systemic effects have not been documented | • Management includes:<br>◦ Reassurance<br>◦ Pain management<br>◦ General wound care<br>◦ Tetanus vaccine<br>◦ Prevention of infection |

It is recommended that patients with serious wounds be given first aid treatment and referred to an emergency room.

### *Spider bites*

Spiders of medical importance in southern Africa can be divided into neurotoxic, cytotoxic as well as those that cause a painful bite which may lead to infection.[19] Neurotoxic spiders such as the button or widow spiders belong to the *Latrodectus* genus and may cause a syndrome known as latrodectism, a term used to describe the systemic symptoms and signs of envenoming in humans. Cytotoxic spiders such as violin, recluse (genus: *Loxosceles*) and sac (genus: *Cheiracanthium*) spiders can cause a syndrome called necrotic arachnidism. The wandering or rain spiders (genus: *Palystes*) and baboon spiders (family: *Theraphosidae*) are non-toxic but cause particularly painful bites, which may result in infection.[19,20] The general symptoms associated with spider bites are initial pain, but then the symptoms subside and return as a painful red area with a black or necrotic centre, inflammation, itching or rash, but those associated with the medically important spiders can be more serious.[20] Treatment strategies and characteristics of medically important spider bites have been summarised in Table II. Advice on snake and spider bites in

South Africa can be sought from the 24-hour Poisons Information Helpline, which is serviced by both Tygerberg Hospital and Red Cross War Memorial Children's Hospital on **0861 555 777**.[21]

### *Bruises*

Bruises present as bluish, purple, grey-green or black marks due to trauma (e.g. from sporting activities, falls, heavy bumps) which causes the blood capillaries underlying the skin's surface to rupture, resulting in blood infiltration into the subcutaneous interstitial tissues.[22,23] These injuries are often associated with pain, swelling and inflammation, and the time they take to appear at the surface of the skin is highly dependent on the depth of injury.[24] The tendency to bruise is increased in certain disease states such as bleeding disorders, in patients taking anticoagulant or corticosteroid medication and certain herbal supplements.[24-26] In the older adult population, bruising is prominent due to falls and thinning of skin.[27,28] Women tend to bruise easily because of a large distribution of adipose tissue, which is in contrast to children who bruise easily as a result of a lesser distribution.[24] Healing of bruises can be enhanced using the RICE procedure, which involves resting the bruised area and protecting it from further harm, placing ice on the bruise repeatedly as needed, compressing the bruise to prevent swelling, and elevating the affected area above the heart if applicable.[29] Pharmacists may prescribe pain relief and anti-inflammatory drugs to treat the bruise. If there is no pain relief and swelling does not subside after three days, the bruise enlarges and a lump forms over it, it should then be referred to a doctor or specialist.[22,24] The treatment modalities for bruises are highlighted in Table III.

### *Sprains*

Sprains are common injuries with which patients present in the pharmacy and these are characterised by pain, tenderness or weakness in a localised area or when a joint is stressed, due to a stretched or torn ligament (the elastic, fibrous tissue that connects two or more bones at a joint).[29-31] In severe sprains, tearing of the elastic fibres is usually present,[31] and although they are a common sports injury, they can easily occur during daily activities such as walking, gardening and cleaning.[29] Sprains are often experienced around the ankle, foot, wrist, thumb or knee, and the injured area may be swollen or bruised.[31] The main goals in treating sprains are to limit inflammation and swelling, as well as maintain range of motion (how far one can move or stretch the joint or a muscle), though treatment is highly dependent on the grade of the sprain (refer to Table III).[29,30] Similar to bruises, minor sprains are treated following the RICE procedure in addition to the different treatment modalities highlighted in Table III. Before initiating treatment, it is very important that the pharmacist assesses the cause of severe pain and if signs of bone fracture are visible, a referral to a doctor or specialist should be made.

**Table III:** Treatment of bruises and sprains[23, 29-32]

| | Characteristics | Treatment strategy |
|---|---|---|
| ***Bruise*** | • Pain, swelling, inflammation<br>• Initially look red, then present as black and blue marks, then finally, appear yellow as they fade | RICE procedure:<br>• **R**est and/protect bruised area<br>• **I**ce – stops blood flow to the injury site, limiting the size of the bruise, also minimises swelling and pain<br>• **C**ompression with splint or elastic bandage to prevent swelling<br>• **E**levate affected area<br>• Pain and inflammation management<br>◦ Paracetamol<br>◦ Ibuprofen gel, mousse or spray<br>• Heparinoid – reduces swelling and promotes healing<br>• Vitamin K<br>• Aloe vera cream<br>• Intermittent vacuum therapy (IVT) with vacuumed device |
| ***Sprain*** | • Classified from grade 1 to 3:<br>• Grade 1:<br>◦ Mild stretching of a ligament, with some damage to its fibres<br>◦ Mild swelling and tenderness<br>◦ No joint instability<br>◦ Minimal pain<br>• Grade 2:<br>◦ More severe injury involving a partial tearing of the ligament<br>◦ Moderate pain, swelling and tenderness<br>◦ Mild to moderate joint instability<br>◦ Weight-bearing and walking is painful<br>• Grade 3:<br>◦ Complete tearing of the ligament<br>◦ Severe pain, swelling and tenderness<br>◦ Patients unable to bear weight or walk | • RICE procedure for Grade 1 and 2 sprains<br>• Treat pain with topical opioids or NSAIDs<br>• Systemic OTC medication to reduce pain and inflammation may be used, e.g. paracetamol, ibuprofen<br>• Periodic application of warmth 48 hours after injury may relieve pain and speed up healing<br>◦ **Never apply heat immediately after an injury**<br>• Refer grade 2 and 3 sprains to a doctor<br>• For Grade 3 sprains, a short cast or brace may be used for 2–3 weeks<br>• Intermittent vacuum therapy (IVT) with vacuumed device |

## Conclusion

Pharmacists are often the first point of contact for the treatment of minor wounds and injuries resulting from cuts, bites, bruises and sprains, and in such instances, they are frequently asked for advice on how to treat these wounds and injuries. As wound care is important and often expensive, the role of the pharmacist is critical, and requires an informed and integrated approach with wound care specialists to ensure effective management of wounds and injuries in patients.[6] The primary role of the pharmacist is to provide initial assessment and support (e.g. pain/inflammation relief) to the patient on the management of wounds and injuries. In South Africa, many pharmacists assist with first aid procedures and provide the appropriate dressings during the later healing phase. Therefore, it is important that they receive continuing professional development in the area of acute wound and injury assessment and classification.

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### *ORCID*

SS Mlambo https://orcid.org/0000-0002-5622-2046
H Parkar https://orcid.org/0000-0003-3732-1409
L Naude https://orcid.org/0000-0002-6414-5802
AD Cromarty https://orcid.org/0000-0002-9512-6081


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