Clinical Skills

Introduction to Wound Assessment and Management

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Aims & Outcomes

The aim of this module is to facilitate student learning regarding the management of acute wounds. It has been produced using guidance from the National Institute for Clinical Excellence (NICE), ‘Clinical Knowledge Guidance’, and photography from local sources.

The learning outcomes for this module are for the student to be able to:

- Describe the principles of wound healing.
- Assess a wound or laceration and recognise an infected wound.
- Describe how to manage a wound according to the level of risk of infection.
- Define the management of infected wounds.
- Evaluate own knowledge of acute wound care and formulate an action plan to compensate for any deficits.
**Introduction**

Most health care professionals will be asked at some time for advice on the management of minor wounds and lacerations. This module has been designed to help you understand the concept of wound healing and how to manage wounds to create the optimum conditions for wound healing to occur.

Trauma wounds are defined as ‘wounds caused by injury’. They range from extensive loss of tissue to simple abrasions. Minor traumatic wounds are often encountered in Primary Care. Wound healing is an intricate process in which the skin (or other organ) heals itself after injury.

In normal skin, the epidermis and dermis exists in a state of equilibrium, forming a protective barrier against the external environment. Once the protective barrier is broken, the process of wound healing is immediately set in motion. The classic model of wound healing can be divided into four sequential, yet linking phases:
**Phases of wound healing - Haemostasis**

*Immediately following cutaneous injury,* blood elements and vasoactive amines extravasate from locally damaged blood vessels within the dermis.

Vascular permeability is temporarily increased to allow neutrophils [polymorphonuclear neutrophils (PMNs)], platelets and plasma proteins to infiltrate the wound.

Vasoconstriction follows, in response to factors released by these cells.

Coagulation then occurs as platelets aggregate with fibrin, which is deposited in the wound following its conversion from fibrinogen.
Phases of wound healing - Inflammation

**Platelets** release several factors, including platelet-derived growth factor (PDGF) and transforming growth factor β (TGF-β), which attract PMNs to the wound, signalling the beginning of inflammation.
After 48 h, macrophages replace PMNs as the principal inflammatory cell.

Together, PMNs and macrophages remove debris from the wound, release growth factors, and begin to reorganise the extracellular matrix.

The proliferation phase begins at about 72 h as fibroblasts, recruited to the wound by growth factors released by inflammatory cells, begin to synthesise collagen.
Phases of wound healing - Remodelling

Although the rate of collagen synthesis slows down after about three weeks, collagen crosslinking and reorganisation occur for months after injury in the remodelling phase of repair.
**Initial Management**

While the temptation may be to focus solely on the injury itself, it is very important to assess the whole person.

Begin with a primary survey - that is, airway, breathing, circulatory volume and level of consciousness. If this survey is overlooked, a potentially life-threatening injury may be missed.

A patient with a bleeding laceration should have gentle pressure applied with a sterile dressing to control the haemorrhage, and the affected area should be elevated. If the patient feels or looks faint they should be asked to lie down. Analgesia should be given as appropriate. Avoid anti-inflammatory medication as it may interfere with the body's natural responses to injury.

The removal of a large foreign body, such as a knife, should only be undertaken in theatre. This reduces the risk of uncontrolled bleeding and allows any serious underlying damage to be treated immediately.
Introduction to Wound Assessment & Management

Wound Assessment

**History-taking**

Once the patient has been stabilised, a more detailed history should be taken. A patient in A&E may be triaged by a Health care Professional (HCP) who will take a history. Details should include:

*How did the injury occur?* The mechanism of the injury is vital to the assessment and care of the patient, as it provides clues to the type and amount of tissue damage.

*Where was the wound sustained?* This is important as wounds sustained in an unclean environment are at a very high risk of contamination with bacteria, fungi and spores - for example, Clostridium tetani.

*When did the wound occur?* Research indicates that the greater the time between wounding and good wound care, the greater the chance of infection.

*Why did the wound occur?* The reason why the wound occurred should be established, as it may be an outward manifestation of abuse or underlying medical disorder.

*Wound assessment charts are commonly used when assessing wounds. Check local policy.*
Wound Assessment-When intervention is required

Wound assessment should note the environment where the injury occurred, and include a holistic assessment of the individual. You should consult with senior colleagues if any of the following present.

- Vascular damage — arterial bleeding from wound, loss of pulse, or poor perfusion distal to the injury.
- Nerve damage — loss of light touch or motor function distal to the injury.
- Tendon injury, including injury to the sheath.
- Facial lacerations for which a good cosmetic repair is important, particularly lacerations crossing the margins of lips, nose, or ears.
- Lacerations of palm of hand with any signs of infection.
- Lacerations associated with marked cellulitis over a joint.
- Possible foreign body remaining in the wound after cleaning, including all injuries caused by glass.
- Complex, widely gaping, or extensively devitalized lacerations.
- Burns
Introduction to Wound Assessment & Management

Types of Wound

Types of Acute Wound

The next 6 slides show in graphic detail the type of acute wounds that are presented in A&E Departments every day.

‘I will briefly describe the background to the accident’
Types of Acute Wound - Avulsion

Made by strong shearing forces and friction that can result in significant tearing and destruction of tissues.

‘..patient amputated the end of the finger whilst working with a crane..’
Types of Acute Wound - Laceration

Made by an object that tears tissues, producing jagged, irregular edges, such as glass, jagged wire, or a blunt knife.

‘s..separating frozen burgers with knife. Knife slipped..'
Types of Acute Wound - Contusion

Made by blunt force causing tissue damage with bruising and swelling, typically not breaking the skin.

‘fell down the stairs causing a contusion and laceration.’
Types of Acute Wound – Puncture Wound

Made by a pointed instrument, such as an ice pick, bullet, or nail.

‘..using a power drill, accidentally drilled finger..’
Types of Acute Wound – Burn

Caused by thermal, chemical, or electrical injury to the skin.

‘..a security tag exploded on hand causing burn..’
Types of Acute Wound – Abrasion

Injury where a superficial layer of tissue is removed.

‘..fell off bike on to tarmac path..’
Introduction to Wound Assessment & Management

Types of Wound

Types of Acute Wound

- **Avulsion wounds**: Made by strong shearing forces and friction that can result in significant tearing and destruction of tissues - e.g., degloving injury.

- **Lacerated wounds**: Made by an object that tears tissues, producing jagged, irregular edges, such as glass, jagged wire, or a blunt knife.

- **Contused wounds**: Made by blunt force causing tissue damage with bruising and swelling, typically not breaking the skin.

- **Incised wounds**: Made by a clean cut of a sharp instrument, such as a surgical incision with a scalpel.

- **Burn wounds**: Caused by thermal, chemical, or electrical injury to the skin.

- **Puncture wounds**: Made by a pointed instrument, such as an ice pick, bullet, or nail.

- **Abrasions**: Injury where a superficial layer of tissue is removed.
It is important the wound is managed according to the level of risk of infection. There are 3 broad categories:

- **Low Risk**: A wound that is assessed not to be infected or at high risk of infection.
- **High Risk**: A wound that has been assessed as not being infected, but is at high risk of infection.
- **Infected**: A dirty-infected wound is one that retains devitalised tissue or involves preoperatively-existing infection or perforated viscera.
Low Risk Lacerations

As a reminder:
A Low Risk laceration may be defined as: A wound that is assessed not to be infected or at high risk of infection.

The wound will not be contaminated with soil, faeces, bodily fluids, or pus.

It may present as a sharp neat, usually shallow cut, typically made in a straight, single slash. Classically these are caused by knives but can be due to falling through glass, accidents with sheet metal, in fact anything with a sharp, cutting edge. If these edges can be approximated easily, blood loss can be minimised and the risk of infection is minimal.

Indiscriminate use of prophylactic antimicrobials in low risk wounds is not warranted (8).
1. **Low Risk Lacerations-Cleaning the wound**

- Disinfect the skin around the wound with an antiseptic if necessary, but avoid getting antiseptic into the wound.

- Keep hair out of the wound. Cut hair along the wound edge and flatten it away from the wound with ointment.

- Debride devitalized tissue and pick out as much foreign material as possible — if there may be glass in the wound, refer for radiography.

- Irrigate the wound with normal saline, drinking-quality water, or cooled boiled water. Low-pressure irrigation using a syringe is sufficient for lacerations that are not visibly contaminated.
2. Low Risk Lacerations-Closing the wound

**Sutures** are the preferred method of closing lacerations that are longer than 5 cm long, or those 5 cm or shorter when:

- Deep dermal sutures are required, to allow low-tension apposition of the wound edges.
- The wound is subject to excessive flexing, tension, or wetting.
- **Local anaesthetic** is required before suturing. See the e-module on Suturing for more guidance.
2. Low Risk Lacerations-Closing the wound

Tissue adhesives and adhesive strips are equally preferred to sutures to close wounds 5 cm or shorter when:

- There are no risk factors for infection and
- The wound edges are easily apposed without leaving any dead space and
- The wound is not subject to excessive flexing, tension, or wetting.
2. Low Risk Lacerations - Closing the wound

Adhesive strips are preferred to tissue adhesives to close wounds 5 cm or shorter when:

- The laceration is a pretibial flap or
- There are any risk factors for infection and
- The wound edges are easily apposed without leaving any dead space and
- The wound is not subject to excessive flexing, tension, or wetting.
3. Low Risk Lacerations - Dressing the wound

Apply a dressing after closing the laceration:

- For lacerations with minimal exudate, dress with a clear vapour-permeable dressing (a).
- For lacerations with modest exudate, dress with a low-adherence, absorbent, perforated dressing with an adhesive border (b).

For more information about aseptic technique and dressing a wound, watch this tutorial provided by Queen Mary's University: [http://www.cetl.org.uk/learning/aseptic-dressing-technique/player.html](http://www.cetl.org.uk/learning/aseptic-dressing-technique/player.html)
4. Low Risk Lacerations - Follow-up points

If symptoms and signs of infection develop after closure of the laceration:
- Remove sutures or adhesive strips and incise if it is not draining.
- Incise through tissue adhesive (e.g., ...) to allow drainage.
- Take swabs from any discharge for microbiological investigation, and start empirical antibiotics while awaiting results.

Remove sutures after:
- 3–5 days on the head.
- 10–14 days over joints.
- 7–10 days at other sites.

Remove adhesive strips after:
- 3–5 days on the head.
- 7–10 days at other sites.

Tissue adhesive does not need to be removed; it will slough off naturally after 7–10 days.

Removal of dressings:
- Keep the laceration dressed until sutures or adhesive strips are due to be removed.
- Low-adherence absorbent dressings should be replaced if exudate has caused significant wetting of the dressing.
High Risk Lacerations

As a reminder: A High Risk laceration may be defined as: a wound that has been assessed as not being infected, but is at high risk of infection.

The wound may be contaminated with soil, faeces, bodily fluids, or pus.

People may have additional risk factors. These include:

- Diabetes.
- Oral steroid therapy and other causes of immunosuppression.
- Age older than 65 years.
- Foreign body present before cleaning of wound.
- Stellate shape or jagged wound margins.
- Visible contamination with substances other than soil, faeces,
- saliva, or pus.
- Presentation longer than 6 hours after injury.
- Wounds longer than 5 cm.
1. High Risk Lacerations - Cleaning the wound

- Disinfect the skin around the wound with an antiseptic, but avoid getting antiseptic into the wound.
- Keep hair out of the wound. Cut hair along the wound edge and flatten it away from the wound with ointment.
- Debride devitalized tissue and pick out as much foreign material as possible — if there may be glass in the wound, refer for radiography.
- Irrigate the wound with normal saline, drinking-quality water, or cooled boiled water. High-pressure irrigation should be used to remove visible debris from the wound, using a syringe and a green needle.
2. High Risk Lacerations - Dressing the wound

**Important:** Wounds that are of High Risk of Infection are dressed but not closed.

- Prevent apposition of the wound edges by packing with a non-adherent dressing.
- Cover all lacerations at high risk of infection with a non-adherent, absorbent dressing:
  - For lacerations with small quantities of exudate, dress with a non-adherent or topical iodine dressing (a).
  - For lacerations with more exudate, cover with a non-adherent or hydrofibre dressing (b) (good for cavities), or a foam dressing.
- Arrange review 3–5 days after initial presentation.
3. High Risk Lacerations - Antibiotic Therapy and Tetanus

- Treat lacerations that may be contaminated with soil, faeces, saliva, or purulent exudates with co-amoxiclav. If the person is allergic to penicillin, treat with **erythromycin** combined with **metronidazole**.
- Treat lacerations that are not obviously contaminated with **flucloxacillin**. Use **erythromycin** if the person is allergic to penicillin.
- Refer people with a tetanus-prone wound which is at high risk of contamination with **human tetanus immunoglobulin**, regardless of tetanus immunization status.
- Check the person's tetanus immunization status and administer an opportunistic booster dose of tetanus vaccine if they are not up to date. A fully immunized person will have had a primary course of three vaccines followed by two boosters spaced 10 years apart.
- For further information on contraindications, cautions, drug interactions, and adverse effects, see the electronic Medicines Compendium (eMC) ([http://emc.medicines.org.uk](http://emc.medicines.org.uk)), or the British National Formulary (BNF) ([www.bnf.org](http://www.bnf.org)).
- Also refer to local policy when prescribing anti-biotic therapy.
4. High Risk Lacerations-Closing the wound following the 3 day review.

**Review and close the laceration 3–5 days after presentation** if there are **no signs** of infection. If infection is present, see Managing an infected laceration.

– Tissue adhesives are not recommended for delayed closure of lacerations at high risk of infection because they are not easily removed to allow drainage.

– Skin closure strips are recommended because they are easily removed if infection develops and have been shown to be an effective method of closing simple lacerations in children compared with tissue adhesives.

**Review and close the laceration 3–5 days after presentation** if there are **no signs** of infection. (see **Low Risk Lacerations - Closing the wound**)

**Apply a dressing after closing the laceration.** (see **Low Risk Lacerations - Dressing the wound**)

5. High Risk Lacerations - Follow-up points

- **If symptoms and signs of infection develop** after closure of the laceration:
  - Remove sutures or adhesive strips and incise if it is not draining.
  - Take swabs from any discharge for microbiological investigation, and start empirical antibiotics while awaiting results.

- **Remove sutures after:**
  - 3–5 days on the head.
  - 10–14 days over joints.
  - 7–10 days at other sites.

- **Remove adhesive strips after:**
  - 3–5 days on the head.
  - 7–10 days at other sites.

- **Removal of dressings:**
  - Keep the laceration dressed until sutures or adhesive strips are due to be removed.
  - Low-adherence absorbent dressings should be replaced if exudate has caused significant wetting of the dressing.
Infected Lacerations

As a reminder: A infected laceration may be defined as:

one that retains devitalised tissue or involves preoperatively-existing infection or perforated viscera.

An infected laceration may present with:

• Erythema spreading from the laceration
• Heat at site
• Cellulitis
• General malaise
• Fever
• Discharge (serous exudate with pus, seropurulent or haemopurulent
• Abnormal smell
• Friable granulation tissue
• Pain and tenderness at the site
• Delayed healing (compared with expected rate for site and condition)
1. Infected Lacerations - Cleaning the wound

- Before cleaning the laceration, take swabs for microbiological investigation from deep within the infected wound.
- Disinfect around the wound area with antiseptic, but avoid getting antiseptic into the wound.
- Keep hair out of the wound.
- Anaesthetize the laceration before cleaning if debridement or exploration of the wound for foreign bodies is necessary and is likely to be painful.
- Debride devitalized tissue and pick out as much foreign material as possible — if there may be glass in the wound, refer for radiography.
- Irrigate the wound with normal saline, drinking-quality water, or cooled boiled water.
2. Infected Lacerations - Dressing the wound

**Important:** Wounds that are infected are dressed but not closed.

- Prevent apposition of the wound edges by packing with a non-adherent dressing.
- Cover all lacerations at high risk of infection with a non-adherent, absorbent dressing:
  - For lacerations with small quantities of exudate, dress with a non-adherent or topical iodine dressing.
  - For lacerations with more exudate, cover with a hydrofibre (good for a cavity) dressing or a foam dressing.
  - Consider topical anti-microbials.
- Arrange review 3–5 days after initial presentation.
3. Infected Lacerations- Antibiotic Therapy and Tetanus

- Take a detailed history and ascertain whether the wound was originally contaminated with high-risk material (soil, faeces, bodily fluids, or purulent exudates):
  - Treat contaminated lacerations with eg co-amoxiclav. If the person is allergic to penicillin, treat with erythromycin combined with metronidazole. **Metronidazole** provides additional coverage for anaerobes that are not susceptible to erythromycin. It is licensed for various deep soft-tissue infections in which anaerobes are likely to proliferate.

- If the wound has not improved and bacteria culture indicates resistance to the first-choice antibiotic, change to a suitable antibiotic guided by the results of sensitivity testing.
- Check your local policy regarding anti-biotic therapy.
3. Infected Lacerations-Antibiotic Therapy and Tetanus

- Refer urgently if the person has signs or symptoms of tetanus (generalized rigidity and spasm of skeletal muscles, including lockjaw) and has had a laceration in the previous days or weeks.

- Refer people with a tetanus-prone wound which is at high risk of contamination to hospital for treatment with human tetanus immunoglobulin, regardless of tetanus immunization status.

- Check the person's tetanus immunization status and administer a booster dose of tetanus vaccine if needed (a fully immunized person will have had a primary course of three vaccines followed by two boosters spaced 10 years apart)

- For further information on contraindications, cautions, drug interactions, and adverse effects, see the electronic Medicines Compendium (eMC) (http://emc.medicines.org.uk), or the British National Formulary (BNF) (www.bnf.org).
4. Previously Infected Lacerations - Closing the wound

Review 3–5 days after presentation:

– Close the laceration if there are no signs of infection.
– If signs of infection persist, review the swab results, change the antibiotics if indicated, and arrange further review.

Review and close the laceration 3–5 days after presentation if there are no signs of infection. (see Low Risk Lacerations - Closing the wound)

Apply a dressing after closing the laceration. (see Low Risk Lacerations - Dressing the wound)
4. Infected Lacerations - Follow-up points

- **If symptoms and signs of infection develop** after closure of the laceration:
  - Remove sutures or adhesive strips and incise if it is not draining.
  - Take swabs from any discharge for microbiological investigation, and start empirical antibiotics while awaiting results.

- **Remove sutures after:**
  - 3–5 days on the head.
  - 10–14 days over joints.
  - 7–10 days at other sites.

- **Remove adhesive strips after:**
  - 3–5 days on the head.
  - 7–10 days at other sites.

- **Removal of dressings:**
  - Keep the laceration dressed until sutures or adhesive strips are due to be removed.
  - Low-adherence absorbent dressings should be replaced if exudate has caused significant wetting of the dressing.
Advice to Patients

Low Risk
- Seek medical attention if infection develops.
- Look out for increasing pain, redness, or swelling spreading from the laceration.
- Report fever or general malaise.
- Take simple analgesia, such as paracetamol or ibuprofen, if the wound is painful.
- Keep the wound dry. Waterproof dressings, such as vapour-permeable dressings, allow light wetting (as from showering) without the dressing separating or the wound becoming wet.

High Risk
- Seek medical attention if infection develops.
- Look out for increasing pain, redness, or swelling spreading from the laceration.
- Report fever or general malaise.
- Take simple analgesia, such as paracetamol or ibuprofen, if the wound is painful.
- Keep the wound dry. Waterproof dressings, such as vapour-permeable dressings, allow light wetting (as from showering) without the dressing separating or the wound becoming wet.

Infected
- Seek medical attention if the infection develops further.
- Look out for increasing pain, redness, or swelling spreading from the laceration.
- Report unresolved fever or general malaise.
- Take simple analgesia, such as paracetamol or ibuprofen, if the wound is painful.
- Keep the wound dry. Waterproof dressings, such as vapour-permeable dressings, allow light wetting (as from showering) without the dressing separating or the wound becoming wet.
Child Maltreatment

Although rare, suspect child maltreatment if:

A child has lacerations, abrasions, burns or scars and the explanation is unsuitable.

Examples include wounds

– On a child who is not independently mobile.
– That are multiple.
– With a symmetrical distribution.
– On areas usually protected by clothing (such as the back, chest, abdomen, axilla, genital area).
– On the eyes, ears, or sides of face.
– On the neck, ankles, or wrists that look like ligature marks (4).

See your local policy on reporting concerns regarding child protection immediately.
References


References

