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## Wounds, Bleeding, and Shock

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A wound is an abnormal break in body tissue. If the wound includes breaks in blood vessel walls (as it almost certainly will), blood will be lost from the circulation.

### Types of wound

Wounds may be classified according to their cause and nature.

Type	Possible cause	Typical characteristics	Possible complications
<b>Incision</b>	Sharp edge or blade	Single clean wound; profuse bleeding	Tissues such as muscles and tendons may be damaged
<b>Abrasion</b>	Rough surface	Multiple minor wounds to surface of the skin only	Contamination
<b>Laceration</b>	Multiple sharp edges or points	Multiple wounds, maybe with tearing of tissues	Contamination, extensive tissue damage
<b>Puncture</b>	Thin knife or pointed object	Small but deep wound; minimal external bleeding	Internal bleeding and organ damage; contamination
<b>Contusion</b>	Blunt object, or surface	Skin unbroken, but bleeding into tissue causing bruising	Internal bleeding; damage to internal organs
<b>Gunshot</b>	Bullet, or similar projectile	Small entry wound; extensive tissue damage along projectile path; maybe large exit wound	Extensive internal bleeding and tissue damage, severe contamination

### Bleeding

Bleeding may be classified depending on the type of blood vessel(s) involved.

#### *Arterial bleeding*

Because of the direct pressure from the heart, arterial blood will spurt out in time with the heartbeat. The strength of the spurt will depend on the size of the artery involved. The blood will be bright red as it is Oxygenated.

Serious arterial bleeding may empty the circulation in a very short time.

#### *Venous bleeding*

Venous bleeding may gush or flow out, depending on the size of vein involved. The blood will be dark red as it is not Oxygenated.

Serious venous bleeding must be considered as almost as dangerous as serious arterial bleeding.

#### *Capillary bleeding*

Capillary bleeding tends to ooze. The blood is usually mid red in colour.

Unless very extensive, capillary bleeding is rarely serious, and blood loss is generally minor.

## Internal bleeding

Internal bleeding may be impossible to detect unless signs of the blood appear either within superficial tissues, or from a body orifice.

Source of bleeding	Possible signs
Superficial tissues	Swelling and bruising
Intracranial	Blood showing in the eyes; blood (maybe mixed with cerebro-spinal fluid) appearing from eye sockets, ears, or nose; bruising around eyes or behind ears
Abdominal cavity	Bruising; swelling and 'hardness' of the abdominal surface
Lungs or respiratory tract	Coughed up red frothy sputum (haemoptysis)
Stomach or oesophagus	Vomited partially digested blood, appearing like 'coffee grounds' (haematemesis)
Intestines	Digested blood causing black tarry, offensive smelling faeces (melaena)
Rectum	Fresh red blood either appearing at the anus, or staining faeces
Kidneys, urinary system, male reproductive system	Blood in the urine (haematuria), which is stained either a smoky grey or red colour
Female reproductive system	Blood from the vagina

## Blood volume and loss

The adult human contains approximately 70ml of blood per kg of body weight. This gives a blood volume of approximately 5l in an average person of about 1.7m in height.

Blood volume increases in pregnancy - especially in the final months - although the blood itself is actually more dilute.

In an infant of 6 - 12 months age, blood volume is only approximately 0.5l, increasing to 3.2l by age 12 - 13 years.

### *Assessment of blood loss*

Blood may be lost from the circulation into body tissues, onto the ground or floor, into clothing, or into dressings. It is important to assess the likely amount of blood lost by a casualty, in order to assist the provision of adequate medical treatment, including fluid replacement and transfusion.

In terms of clinical assessment, the proportion of total blood volume lost is more important than the absolute volume.

### *Blood loss into tissues*

It is possible to estimate blood lost into tissues according to the nature of injury:

Type of injury	Likely blood loss
Fractured ankle with moderate to severe swelling	0.25 - 0.5l
Fractured lower leg with moderate swelling	0.5 - 1.0l
Fractured arm with moderate swelling	0.5 - 1.0l
Fractured femur with moderate swelling	0.5 - 1.0l
Fractured femur with severe swelling	up to 4.0l
Fractured pelvis	up to 5.0l

**External blood loss**

0.5l of blood will cover an area of approximately 0.4m<sup>2</sup> on a non-absorbent surface or into non-absorbent clothing.

0.5l of blood will cover an area of approximately 0.2m<sup>2</sup> on an absorbent surface or into absorbent clothing.

**Development of hypovolaemic shock**

As the body loses blood, it initially compensates for the loss by constricting medium sized blood vessels under the control of the autonomic nervous system. As blood loss continues, the heartrate is increased to compensate for the reduced volume. Eventually the level of blood loss outstrips the possible compensation, and the basic processes of life begin to falter.

Blood lost	Likely effects (in an adult)
10%	Maybe a slight increase in pulse rate, but no other signs or symptoms
15%	Pale skin; pulse rate 100 (BP is maintained by constriction of blood vessels)
15% - 30%	Pale, cold, clammy skin; slow capillary refill; pulse rate above 100; increased respiratory rate. (This is the limit of the compensation)
30% - 40%	Anxiety, restlessness, agitation; pulse above 120; systolic BP 100 or less
over 40%	Extreme pallor, cyanosis; very fast weak pulse; systolic BP 70 or less; respiratory distress; reduced level of consciousness

As the condition of shock develops, the casualty may feel faint and dizzy, cold, thirsty, and nauseous.

**Treatment****General treatment for wounds**

Apply direct pressure with the fingers or hand (preferably the casualty's) at the wound.

Elevate the site of the injury above the level of the heart (if possible).

Apply a suitable dressing.

Whilst applying treatment, attempt to assess the extent of the blood loss (if not obviously minor).

**Indirect Pressure**

If direct pressure and other treatment prove ineffective in controlling blood loss, indirect pressure may be applied. (This is no longer included in current teaching, but is noted here as it may still be relevant).

Indirect pressure is applied by compressing the artery feeding a limb:

Brachial pressure point, on the brachial artery feeding the mid and lower arm,

Femoral pressure point, on the femoral artery feeding the leg.

Indirect pressure must not be applied for more than 10 minutes.

Tourniquets are not part of first aid, and must not be used.

**Dressings**

To achieve their purpose fully, dressings must be:

- Large enough to cover the wound completely.
- Sterile.
- Applied firmly.

If a single dressing does not control the bleeding from a wound, check that appropriate elevation has been used, apply a second dressing over the first.

If a second dressing fails to control the bleeding, both dressings should be removed and a new dressing applied - paying attention to dressing placement and the manner in which it applies pressure to the wound.

## Foreign bodies in wounds

Do not remove any foreign bodies from wounds unless they are simply adhering to the skin surface.

Build up padding around the item in the wound.

Cover and seal the area with a large dressing.

Secure long or large objects to prevent movement during transit to hospital.

If the casualty is impaled on an immovable object, summon fire service and paramedic assistance, support the casualty to prevent further injury and minimise discomfort, and apply treatment in situ.

## Infection

All open wounds are at risk from infection by bacteria - from the casualty's own skin, from the surface of the ground, and from foreign bodies, clothing, and other objects.

To minimise infection during treatment, wear gloves, use only sterile dressings, and position the casualty carefully to avoid contamination.

## Crush injuries

If the casualty has been crushed for less than 15 minutes, and it is possible to release the crush, do so.

If the casualty has been crushed for more than 15 minutes (or the time is unknown), or it is not possible to release the crush, summon paramedic (and fire service) assistance, and apply treatment - such as is possible - in situ.

## Amputation

Clean amputations bleed relatively little as the severed blood vessels 'retract' into the tissues.

Treat the wound as appropriate.

Place the severed part in a clean plastic bag, wrap the bag in a cloth and keep it cool with crushed ice in water.

Do not wash the part, or allow it into direct contact with ice.

## Casualty management

Complete management of a casualty who has lost, or is losing, blood includes treatment above and beyond just that required for the wound itself - if the progress of shock is to be minimised.

- Place the casualty in a sitting position if blood loss is slight and the level of consciousness is high. Place the casualty in a lying down position if blood loss is extensive or the level of consciousness is falling.
- Ensure an open airway.
- Administer high flow-rate 100% Oxygen.
- Dress any obvious wounds having inspected for foreign bodies.
- Elevate the injured area (if possible).
- Immobilise the injured area (if relevant).
- Raise the legs (if possible).
- If internal bleeding is suspected, position the casualty appropriately:
  - Abdominal injuries - Fowler's position.
  - Chest injuries - on the side, with the injured side lower.
  - Head injuries - such as to allow drainage of blood or other fluid, but not in a head-down position.
- Loosen tight clothing.
- Monitor the casualty carefully.
- Be prepared for the casualty to vomit.
- Keep the casualty calm, and give reassurance.
- Provide transport to hospital and/or organise paramedic assistance at the scene.
- Do not give anything by mouth.
- Do not use constrictive bandages of any kind.