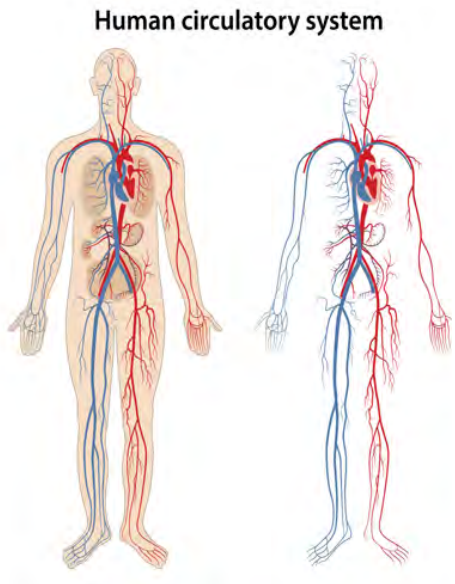
MODULE 04
BLEEDING, SHOCK & WOUND CONTROL

4.1 BLEEDING, SHOCK & WOUNDS

The Circulatory System

The blood circulates around the body in a network of flexible tubes known as blood vessels. The blood is pumped around the system by the regular, rhythmic contraction and relaxation of the heart. The blood, blood vessels and heart are known collectively as the circulatory system or cardiovascular (*cardio-heart, vascular-vessels)* system.

The Heart



The heart is located in the chest (thoracic cavity) and is in fact not one pump, but two, separated by a wall. The right hand side pumps deoxygenated blood into the lungs *(pulmonary circulation)*, where it picks up oxygen, and then goes into the left side of the heart. Here, the oxygenated blood is pumped around the body (*systemic circulation*), where it offloads the oxygen and nutrients, and picks up the carbon dioxide and other waste products transporting them to the right hand side of the heart and the cycles starts again.

The heart muscle contracts in an organised fashion by regular electrical impulses, which force the blood out of its two pumping chambers.

The Blood Vessels

There are three types of blood vessels:

- **Arteries**. These are strong, elastic walled vessels that carry blood (oxygenated in the systemic circulation) away from the heart;
- **Veins**. These are thin-walled vessels that carry blood (de-oxygenated in the systemic circulation) towards the heart and;
- **Capillaries**. These are small, thin walled (about 1 cell thick) vessels where the substances (oxygen and nutrients) are transported out of the blood into the cells and also out of the cells into the blood.

The Blood

There are about 8-10 pints (6 litres) of blood in the average adult. It consists of about 55% plasma in which there are suspended various cells (about 45%):

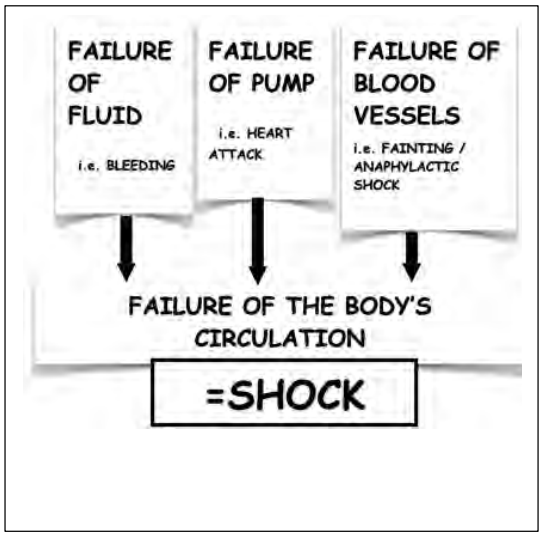
- **Red cells** - carry oxygen to the tissues;
- **White cells** - help fight infection;
- **Platelets** - help in the clotting process.

Clinical Shock

Clinical shock is the **"failure of the cardiovascular system to distribute blood (and therefore oxygen) to the tissues of the body"**. This will result in reduced flow of blood through the tissues *(reduced tissue perfusion)* and insufficient oxygen reaching the cells. .

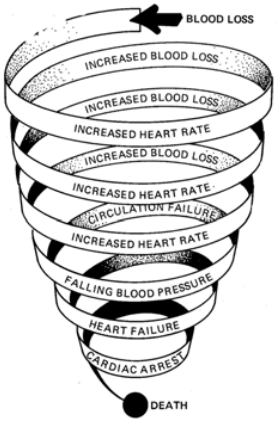
Clinical shock can be caused by either:

- **Failure of Pump** - this is termed cardiogenic shock and is often caused by heart conditions (e.g. a heart attack) reducing the ability of the heart to pump blood around the body - leading to circulation failure, or shock;
- **Failure of Fluid** – (e.g. blood / burns/extreme dehydration). Where the cause is loss of blood, this is termed hypovolaemic (low blood volume) shock. This starts when the body loses about 15% blood volume (about 1 1/2 pints or about 1L)
- **Failure of Blood Vessels** - an example of this is Anaphylactic shock, where the allergen results in increased vessel permeability (increased "leakiness") which results in the fluid leaking out of the blood vessels into the inter-cellular space causing swelling and difficulty in breathing.



The way the body responds when the circulation fails is to ensure adrenaline is secreted into the body. Between 15% to 35% blood loss, this causes:

- Constriction of the peripheral blood vessels in order to maintain blood levels to the core - this results in a **Pale, Cold and Clammy skin**;
- **Increased Heart and Breathing rates** - in order to try to maintain circulation to the vital organs
- Quite often the patient may also feels nausea and a sense of fear.



If not rectified, as more blood is lost (over 35%) the breathing becomes laboured, the persons skin become mottled, they will go unconscious and death will ensue.

Bleeding Control

In the presence of major external bleeding - the immediate treatment procedure is to

- **P – Position** the patient and make them rest – increased movement could increase the rate of blood loss. Sitting on the floor is better than sitting on a chair (the patient can't fall off the floor). Even better than sitting on the floor, is lying on the floor (with legs raised) – this will maintain blood flow to the vital organs. However, there may be times when elevating the legs may not be possible (e.g. suspected pelvic or spinal injuries) – in these cases just leave the patient in position you found them in (minimal movement) is often best – since unnecessary movement may increase bleeding, pain and shock. Then:
- **E – Examine** the wound, since how pressure is subsequently applied depends on what you find. If the injury is very minor you may decide to clean it with water. However, if there is considerable bleeding, the main priority is to stop the bleeding (thereby increasing shock). After you examine the injury site, apply:
- **P – Pressure** to the wound. If there is no foreign object present (e.g. knife / glass) then pressure can be applied directly onto the wound site. However if there is something sticking out of the wound direct pressure can be applied either side of the object. Also, remember not to pull any foreign objects out of the wound – they are acting like a "plug". If it is removed it may cause the wound to bleed more. Then, if possible:
- **E – Elevate** the limb above the level of the heart. Limb elevation may help - however injuries may dictate that this is not possible - e.g. fractures.

Once the bleeding has been initially controlled (and this is done often by the patient themselves – pressure elevate) then appropriate dressings and / or bandages may be applied to help maintain pressure.

Treatment for Shock

Once the cause of the shock has been identified (e.g. external / internal bleeding) and, if possible, treated (e.g. direct pressure and elevate for external blood loss) then we want to treat for shock. Our main treatment principles are to:

- Maintain blood circulation to the vital organs and;
- Keep the patient calm and reassured.

This is done by waging **W.A.R.R.** on shock. We:

- Keep the patient **Warm** – but don't overheat. This may cause peripheral blood vessels to dilate and draw blood away from the vital organs;
- Maintain a good **Air** supply to the patient – undo tight clothing and possibly open up some windows to get some fresh air in, and;
- Lots of **Rest** and **Reassurance** by keeping the patient calm we will reduce the workload and strain on the cardiovascular system.

Earlier in module 1 we discussed a patient who faints – unfortunately differentiating between this and shock can be difficult, especially for those who are not experienced in emergency care. A bad fright or a bad sight may cause the brain to "switch off" thereby losing control of the blood vessels. This will cause the blood to temporarily pool to the patients lower – with the lack of blood to the brain causing a decreased level of response. This is a temporary state and, once on the floor (often with the legs raised) blood flow to the brain is restored and the patient will quickly start to recover.

Someone who feels faint (e.g. from the sight of their, relatively minor, blood loss or from seeing someone else's wound) may:

- Often look pale, but their skin will often be dry (not clammy);
- The breathing and pulse will often slow down (as opposed to speed up as in shock)

The good news is that the initial treatment for shock and faint is the same – lay the patient flat with legs raised, keep warm and re-assure. A simple faint should start to improve within a few minutes.

HOWEVER, BE AWARE THAT A PERSON WHO COLLAPSES DUE TO A SIMPLE FAINT SHOULD START TO COME ROUND WITH 2-3 MINUTES - IF THEY DON'T START TO RECOVER YOU MAY NEED FURTHER MEDICAL ASSISTANCE AS IT MAY NOT BE A SIMPLE FAINT.

Nosebleeds

These commonly occur when the vessels in the nostril become ruptured, either through a blow to the face, sneezing or high blood pressure. Nosebleeds are usually unpleasant, but can be dangerous especially where either a great deal of blood has been lost or it has been caused by a head injury and there are reduced levels of consciousness and / or blood mixed with straw coloured watery fluid. Our main aims are to;

- **Maintain an open airway** by sitting the casualty down, head well forward and not tipping back (since blood may run down the back of the throat blocking the airway or making them vomit). Tell them to breath through their mouth;
- **Control the blood loss** by pinching the fleshy part of the nose just below the bridge. Tell them not to try to talk, cough, spit or sniff as this may disturb any blood clots;
- After 10 minutes tell them to release the pressure. If the nose is still bleeding, tell them to re-apply the pressure for a further 10 minutes.
- If the nosebleed persists beyond 30 minutes, ensure that medical aid is sought for them (of course if the bleeding is of a massive amount, then do not wait 30 minutes).

Review Questions – Circulation & Shock

6. What is the amount of blood contained by an average adult and what are the 3 component parts of blood?
7. What is a clinical definition of shock and what are the 3 ways in which a patient can go into shock (giving an example of each of the pathways)?
8. What are the 3 major clinical signs of shock?
9. What is the general principle for control of external (non-catastrophic) bleeding?
10. How is pressure applied to a knife protruding from the wound site?

4.2 BURNS

The approach to an incident resulting in burns is often complicated by the presence of fire, explosions, electricity etc.(see chapter on scene assessment).

Causes of Burns

There are many causes of burns, but most can be put into the following categories:

- **Dry heat** *fire, flames, friction, hot objects etc.*
- **Scalds (wet heat)** *steam, hot liquids etc.*
- **Chemicals** *industrial chemicals, acids/alkali's, bleach etc.*
- **Cryogenic (cold)** *frostbite, dry ice, liquid chemicals e.g. Nitrogen*
- **Electrical** *low voltage, high voltage, a.c./ d.c. etc.*
- **Radiation** *sunburn, nuclear industry etc.*

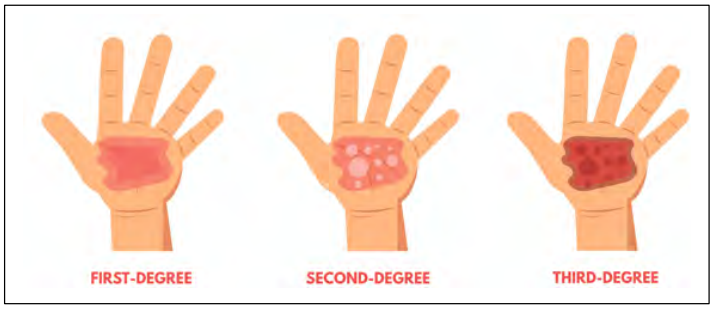
Classification of Burns

There are many classifications of burns, but in the first aid situation they are classified according to the **area** burnt and the **depth** of the burn.

Depth of Burn

The mnemonic **S-I-D** can be used for depth classification:

S	**S**uperficial *(1st degree)*	These only affect the top layer of the skin. Formally known as 1st degree and are identified by reddening pain and tenderness.
I	**I**ntermediate *(2nd degree)*	These are **partial thickness burns,** also known as 2nd degree burns. They will look raw and blisters will form. Can be serious if over a large area.
D	**D**eep *(3rd degree)*	These are **full thickness**, or 3rd degree, burns. The skin may appear pale, waxy or charred. There may be no pain from the burn since nerve endings may have been destroyed. There will however be pain from surrounding tissue.



The severity of the burn is also related to the surface area of the burn. The extent is expressed as a percentage of the body's total surface area. The old "Wallace Rule of 9's" algorithm is now used less often by itself in first aid. An easier method of approximation – The Rule of 1's – is more commonly used. The casualty's own hand is used as a rough guide – this will approximate a 1% of Body Surface Area (BSA).

Management

Our main aims are to stop the burning process, to minimise infection and to arrange urgent removal to hospital. As always the Primary survey (DRs ABC) take priority:

Position and Protect	Lay the patient down and douse the fire;
Cool down	Cool, tepid water for approx. 10 minutes, or until the pain has reduced;
Remove	Watches, bracelets before swelling starts, together with ar clothing that is not attached.
Cover	Sterile dressing / burns sheet / cling film (used in sheets not wrapped around a limb) to minimise infection
999	See guidelines below;
Minimise shock	Good air supply and lots of reassurance and elevate burned limbs.

- Burns to the face and airway are dangerous due to the risk of swelling. Allow the casualty small sips of water to slow down the swelling.
- In the case of chemical burns, if possible, note the type and amount of chemical spilled. Copious dousing with running water is required.

WITH BURNS, DO NOT:

- Touch burnt area;
- Burst blisters or;
- Apply lotions, ointments, margarine's or fats.

Seeking further help

Guidelines have now been introduced for when to send a burned casualty to hospital from the civilian workplace, and they often include:

- If the casualty is a child;
- Burn thickness
    - All full thickness burns;
    - All partial thickness burns larger than 1% Body Surface Area (BSA);
    - All superficial burns larger that 5% Body Surface Area (BSA);
- All burns involving the feet, hands, face or genital area – *may compromise ability to lead a normal life*
- All burns that extend around a limb – *limb swelling may cause compartment syndrome and may need a fascectomy;*
- Burns with a mixed pattern of depth;
- If you are unsure about the extent or severity of the burn

HOWEVER, THEY ARE ONLY GUIDELINES – IF IN DOUBT CALL 999.

The main dangers to the patient from burns are:

- Shock (caused by loss of body fluid);
- Infection (resulting from the damaged skin) and;
- Hypothermia (resulting from overcooling of large area burns) and;
- Damage to the respiratory tract following inhalation of hot air or flames

Review Questions

1. Superficial and Intermediate (partial thickness) burns are less painful that deep burns – true or false?
2. Cling film is an acceptable covering for a burn, true or false?
3. What is the initial action of the first responder with a burn's patient – and what would you not do?
4. What are the main dangers associated with burns patients?