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trans<sup>à</sup>mbulance

## Basic life support (BLS) Techniques



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### 3.1. Mobilisation et immobilisation



Although mobilization and immobilization are contradictory terms, exists between both an interdependent relationship in assisting patients. Immobilization is always done first, since moving patients we move into a medical vehicle carries a number of risks and possible complications in their illness or injury if it is not done right. Therefore, it is necessary to make an immobilization and mobilization as adequate as possible to the type of pathology and you can not move a victim without having made immobilization

#### 1. Patient Preparation

Mobilization is not equal to rescue, although sometimes implies that activity. It refers to the removal of the patient from the place where it is found, placing it in a more favorable place to be assisted properly. When speaking about rescue we refer to when environment in which the patient threaten their safety and is hostile, for example, a cave, mountain, inside a car, etc. To rescue the patient, we will use, if possible, the equipment needed.

In the case of severe injured patient who will need to be applied resuscitative measures, this is a priority, and immobilization should be done while maintaining cardiopulmonary resuscitation (CPR) and the care of spinal immobilization and members that were accurate.

Also, resuscitative measures are a priority with regard to the mobilization of the patient, unless staying in the scene thus endangering the life of the patient and rescuer.

To access the victim, it is necessary to control the risks. First of all, it is convenient to carry out an assurance of the intervention zone. Having secured the scene, always considering safety, actions to perform are:

Primary evaluation of the victim: A, B, C.

- Initial Stabilization: minimum attitudes to adopt the necessary to keep the controlled and stable victims, and alert the emergency services by providing accurate information on the context.

- Releasing the victim of any obstacles to its rescue scene.

- In the first phase of care, the “right” handling is very important. If not it may result in further injury or aggravate existing ones.



Fig2. Must protect the patient in certain circumstances.

### 1.1. Objectives of the immobilization

Most of the cases, the victims of any emergency situation have hampered its ability to fend for themselves, either by being stuck by the environment or by being physically disabled by their injuries, a decrease of

consciousness from any cause and sometimes, by being affected by behavioral disorders. Any of these situations prevent their full collaboration to think about their mobilization, at the mercy of of third parties who shall replace such disability, using several methods.

The objectives pursued with immobilization maneuvers are:

- Secure the patient, taking into account their reaction mechanisms and defense are diminished or abolished.
- Relieve pain, especially in trauma patients. By immobilizing a fractured limb, stimulation of nerve endings by the fracture fragments to move is prevented.
- Reduce the risk of a closed fracture from becoming open.
- Reduce bleeding in the focus of the fracture.
- Avoid injury added. The ability of patient advocacy is often hampered and rescue efforts and evacuation, sometimes require maneuvers that could easily cause injuries that did not exist.

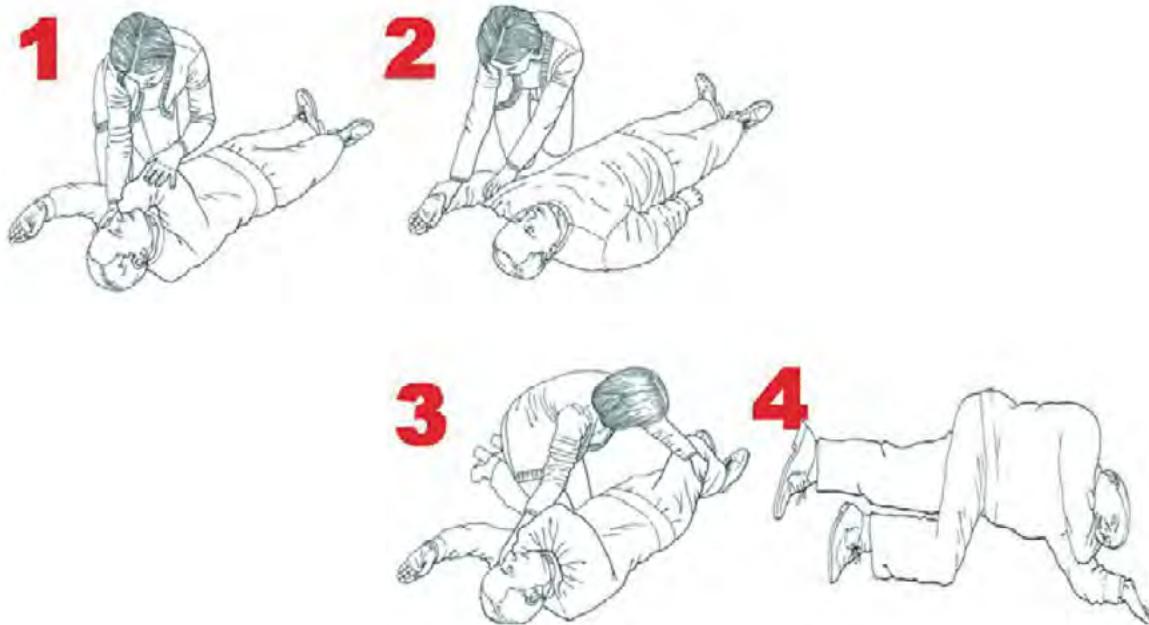
### 1.2. Phases of immobilization

- To ensure first constants threaten the patient's life. Perform CPR if necessary in an orderly manner.  
Fig 3.
- Special attention to the cervical spine.
- Members will be immobilized once the patient has been rescued if it was in a compromising position.

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Fig 3. Recovery position: Sequence to perform this technique with an unconscious but breathing and pulse.

There may be situations that require to postpone some maneuvering of immobilization by the need to remove the victim of a hostile environment.



### 2. Immobilization devices

The ideal immobilization device does not exist. They all comply any of the following functions:

- Correct deformities
- Limit the movement.
- Stabilize and warmth.

Also, they need to have the following properties:

- Be easy to apply.
- To facilitate the extraction of a victim inside a vehicle without changing position.
- Do not obstruct the airway management or performing resuscitation techniques if applicable.
- Able to accommodate to all patients.



#### 2.1. Cervical collars

The collar is a semi-rigid device elongated flat standing and fits around your neck, adapted to the anatomy of the area and whose mission is to immobilize the cervical spine, preventing the movement of lateralization and flexion-extension of the neck, achieving greater or lesser extent depending on the type of collar employed.

Fig. 4. Soft collar (red) and rigid (yellow).

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- **Soft collar:**

Made with foam lined plastic rectangular shaped wing. Its disadvantage: limitation to size (S, M, L), the inability to access a vein accessory pathway, the carotid pulse and jugular venous pressure. Besides possibly contributing to tracheal deviation.

- **Rigid Collars:**

- Thomas: made of plastic material. It has two parts that overlap and adhesive tapes that allow you to increase your height adjusting to longer or shorter necks. They have five sizes. Allows significant restriction of motion, especially flexion-extension. Have the drawback that leave no access to the accessory air or the carotid or jugular.

- Collar four supports (mental, sternal, occipital and cervicothoracic). The best known  is Philadelphia. It has two parts; one occupies the front of the neck and the other the back. In the above there is a hole that allows access to the air, although it is difficult to access the neck vessels. Prevents any movement of flexion-extension and lateralization. Lateralization movements of the neck - are limited by head remains anatomically tight shoulders and collarbones.

- Before placing a neck collar should be explored to detect discoloration, deformities, tracheal deviation, etc. and soft crackles and looking for the carotid pulse is palpated parts.

- The cervical spine must be in a neutral position, which is the most stable and therefore the situation where flow medullary arteriovenous be placed is less compromised.

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- After you will be decided the size of the collar, one very small compress vascular structures and facilitate bending; and one too big doesn't get restraint. It is convenient to remove the hair and clothing that may impede placement maneuvers.
- Disadvantages of collars:
  - Discomfort.
  - Difficult access to alternative airway opening.
  - Difficulty in central veins catheterization.
- The cerebral perfusion pressure could be altered by the collars, especially in cases where a significant hematoma can compress vascular structures; so the manufacturers have provided with holes that allow the release of pressure.
- The intracranial pressure is altered by the soft collars but not by rigid.

### General restraint techniques



### MEASUREMENT AND PLACEMENT OF CERVICAL COLLAR

Fig. 1: Once we approached the patient, one of the technicians begins to control and cervical traction. We always have to do a cervical control to all the patients with a possible trauma; however, the cervical traction (always mild) is performed when is going to use a cervical collar.



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### 2.2. Head immobilizer

It is a device used in cranio encephalic trauma, when altered level of consciousness and/or neck injury is suspected. Perfect use for standing next to scoop stretcher. Serves to limit the lateral and rotational movements of the head keeping it straight to the longitudinal axis of the body.

The head immobilizer consists of a cushioned base and two lateral rectangular blocks of about 2 cm thick. The side blocks are pierced by a circular hole, and allows the patient to hear, and it can monitor the presence of bleeding from ear. On the sides of the base there are belts to fasten device to the scoop stretcher. There are also some straps to fasten the chin and forehead of the patient.



#### Placement Technique: +

At least two people are needed. One will hold the patient's head with both hands pulling upward toward the head-neck-trunk axis, immobilizing the cervical area. The other person placed under the head the base of the device. Fastening tapes are adjusted to the stretcher. Blocks that are going to keep holding the head are then adjusted. Finally fit chin and forehead straps.

### 2.3. Spine boards



Fig.5 Spine boards

They are flat and rigid surfaces of different materials used for immobilization and mobilization of accidents resulting. They are complemented with head immobilizers for lateral restraint.

They have some side holes to pass the straps with which the patient is secured.

Short tables have two straps that cross from the chest to the legs. At the top are closer to the cervical area and secured with velcros. The long stretchers make a useful

function (but not open like the spoon) due to the low mobilization that is done to the polytraumatized patient.

### 2.4. Scoop stretcher

Metal support formed by two longitudinal symmetric branches, articulated on its upper and lower ends, by a anchoring system that can be adapted to different lengths.

To facilitate entry of the branches during placement must remove or adjust the patient's clothes to allow approximation of the branches. Introduce them until the closing match midline of the injured. Nose can use as a guide.



Once fastened can rise to mobilize the patient. The scoop stretcher is accompanied by three adjustable length straps used to attach the patient to the stretcher.

### Placement Technique:

Adapt the table to the length of the patient. Separate the two parts and put them on either side of it (the narrowest part at feet and wider at the top).

As a technician is at the top maintaining cervical control, other two will grip the patient's shoulder and hip. They rotated slightly to enter another part of the bucket under it. Then the same operation is done on the other

side. Once they are both sides of the stretcher under the patient closes (possibly first closing the top and then the bottom one) ensuring that engages well.

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The straps used to secure the patient is then placed. They are three, about two meters long, with snaps in the ends (can be lengthened or shortened as required).

- The first strap secures the top of the patient. Is placed on the chest at the armpits.
- The 2<sup>nd</sup> secures the middle part of the patient and will be placed at the the abdomen or waist (above the iliac crests if there is no pelvic fracture).
- The 3<sup>rd</sup> strap secures the bottom of the patient. Be placed on the legs below the knees.
- The remaining part of the straps can be used to bind the arms.

### How to turn a patient lying face down (lying prone):

They do at least three persons. After making an initial assessment and if the patient is conscious, he is explained what is to be done.

- putting on straight legs and arms along the body.
- One will be responsible for cervical control and coordinating the maneuver. It will hold the patient's head to the side with the arms crossed.
- The second technician is at the side to where you will turn at the level of chest. It encircle with his arms the body of the patient introducing them under the patient as much as he can.
- The third health technician is placed at the level of the thigh - hip.
- When the first health technician gives the order, the three slowly rotate the patient controlling with their thighs and knees the moving of the patient to let him face up.
- You can also use the scoop stretcher to turn a patient lying prone.

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### 2.5. Vest for extrication

The most widely used is the spinal splint of Kendrick. It is a vest for extrication people who are for hard accessible places and possible spinal cord injury. So it is possible to immobilize the patient with the entire column in a single block.



Fig.7 Extrication Jacket

It consists of a vest with parallel bands that fits the back, with three side straps (pelvis, abdomen, thorax) and two leg straps corset. It also has two belts that fit the face and chin, avoiding the movement of the head and cervical spine. The cushion allows to fill the gap of the occiput avoiding hyperextension of the neck.

It has two handles to grasp and remove the patient optimally.

#### Placement Technique:

- It is introduced between the patient and the back of the car seat, avoiding the false placement on the waistband of trousers and skirts.
- First thighs ribbons are placed.
- Then it goes under the arms by adjusting the straps from the bottom up.
- Finally the upper on both sides of the face wings are placed.
- Once the patient is in a safe place, should be removed, since it hinders the assessment and promotes respiratory alterations.

### 2.6. Limb immobilization splints

#### 2.6.1. Rigid splints:



a) non-deformable rigid splints:

- Splints wooden slats of different shapes and sizes, padded and lined with cotton fabric. Also there are metal or plastic. They require a bandage to secure the limbs.
- Splint MEI: built by wooden slats placed on a rectangle of fabric. Suitable for immobilizing distal femoral fractures.

b) deformable rigid splints:

Allow more functional assets. They are made of aluminum wire, cardboard or plastics. Also included in this group ones that allow vacuum splints stabilize fractures in any position. Have as disadvantage their relatively large size.



#### 2.6.2. Flexible Splints:

This group includes pneumatic splints. Also pillows, bandages, bandanas, or other tools to make the function splint. Pneumatic splints may not be compartmentalized, tricameral (3 chambers) or tetracamerales (4 chambers). The latter being most recommended as they seem to prevent compartment syndrome.

They are suitable in distal fractures of upper and lower limbs. Besides restraints, serve to compress bleeding points, and is recommended to be transparent.

The splint should cover a joint above and below the fracture. In the upper limb must cover the fingers to prevent constriction band proximal that would alter the distal arterial flow.

### Placement Technique:

- Choose the right size and shape.
- Explain to the patient what we will do.
- Remove clothes, jewelry and ornaments.
- In open fractures, perform cleaning and disinfection, covering the wound with sterile dressings.
- The splint is inserted and inflated with open zipper.
- We hold the hand or foot stretching slightly proximally and distal to the fracture.
- Inflation is maintaining traction and continuously monitoring the pulse and sensitivity. If the distal pulse is lost, a little deflated.
- Note that in air transport there is expansion of gases by altitude, so the will increase of pressure pneumatic splints.
- It is advisable to remove the splint after radiological control.



Fig.10 Traction Splints

### 2.6.3. Traction Splints:

Device used for immobilizing fractures of the distal femur (it can not be immobilized with pneumatic splints) and proximal tibia. Sta-



Fig. 11. . Patient over a vacuum cushion

bilizes and prevents fragments and other injuries. Normally femur fractures are associated with other injuries such as broken large vessels, muscle tears, etc, which can compromise patient constants.

It is a ferule holder with a set screw to adjust the length. It has support legs and a pulley system for traction. Drive belt with a metal ring and a set of five bands to secure the splint in different parts of the leg.

- You have to apply it carefully in pelvis and groin to avoid too much pressure on genitals.
- Monitor pulse and sensitivity at all times.
- Not useful in hip fracture, ankle, knee and foot. Do not use when fractured pelvis.
- Traction should be done with analgesia as to align the fracture must pull hard.

### 2.7. Vacuum mattress

The mattress is bent, and after performing a vacuum, it has the shape to the previously given, so we have a rigid support that is adapted to the physiological and pathological body bends preventing, in theory, its displacement if we appropriately provided with complementary belts that fix the patient to the mattress.

- In addition to immobilize, diminishes the effects of vibration.
- It is possible to place the patient in lateral decubitus if not be able to control the airway. This will be placed in a supine position on the mattress and then with wedges or pillows will be placed in the lateral decubitus chosen.
- When placing the patient must be careful with its movements on a structure that is deformable, so it is advisable to preform something the mattress, placing more material in the upper third and giving shape to hold the head .
- In case of thoracolumbar spinal injuries chamela be convenient to put more material in this area to provide adequate support this column height and if this item is available, may solve the problem by placing a pillow.
- Sometimes, when you vacuum the mattress may tend to bow in one of its axes. If this happens, you have to lift the patient and reposition the mattress observing if there is any foreign matter that produce such deformity.
- Once evacuated, is not suitable ground lift without using a rigid support underneath (spinal board or scoop stretcher) and bows that can occur.
- To be effective as immobilizer should be large, twice the width of the stretcher.

### 3. Mobilization and Immobilization Techniques

To treat a patient, you will be keep in mind:

- Features of the location where the patient is located. Location and position.
- Actual and potential risks for both the patient and healthcare or rescue team.
- Clinical status of the patient.
- Possibility to have rescue services provided with specific material

#### 3.1. Removing the patient sitting

For the extraction of a patient sitting inside a vehicle there are so many possibilities as types of accidents as deformity and other elements will condition these maneuvers. +







Fig. 12. Collecting a patient with scoop

Restraint techniques should be performed prior to any attempt at mobilization (except in cases of rapid mobilization of emergency), since extraction is one of the times when more forces and movements are applied on the spine and extremities patient .

In the members will try to give a rigid support to fracture, to avoid the displacement of the fragments, which is what causes pain and neurovascular risk. The way to give this support will depend on the materials that are available and the capacity of rescue personnel imagination. Immobilization of members inside a vehicle is very difficult and the use of pneumatic splints plastics is limited by the danger of breaking.

### 3.2. Lifting the patient lying horizontally (in a supine position)

All movements should be made collectively. The mobilization of a patient from the supine position will be by using a long spine board or scoop stretcher.



Fig. 13. Long spinal board, being used for a patient who has suffered a car crash.

the starting position, the space available, the existence of injury and limb situation will be decided.

Rescuers will be located in the place to which it rotates, one subject's head, bearing in mind the placement of the hands towards the face, another subject the patient's shoulder and pelvis, and a third from the pelvis and knee the opposite side to which will make the turn. After making the turn to the lateral position, one of the rescuers (usually the center) will introduce the spine board with one hand (previously placed by the patient).

Immobilization of the neck in the patient lying unchanged with respect to the patient seated, the first rescuer responsible for fixing the head in a neutral position and a second placing a rigid cervical collar. However, unlike the previous case in the prone, the limbs may be observed carefully, proceeding to their immobilization with any of the different types of splints. A basic principle is that when in doubt, always with a splint, it will be time to take it off.

After immobilizing the neck with a cervical collar and members affected by fractures or dislocations with splints, it will place the patient in the lateral position as before the introduction of the long spine board under her back step. The side on which the patient rotate depending on

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### 3.3. Rapid mobilization of emergency

It is only indicated in situations where the conditions of the scene (danger to the patient or the healthcare team by explosion, drowning, fire, landslide, etc.) and / or the patient's clinical situation (imminent life-threatening) prevent any resuscitation techniques and advise not to spend time in placing restraints.

Rapid emergency mobilization of a patient sitting inside of a vehicle depends on the number of rescuers involved. In any case will always block mobilization (keeping the head-trunk-limb axis) and is recommended at least cervical collar placement.

The maneuver Reutteck apply where there is a single rescuer, based on two separate facial props, biaxilar and forearm. If there is availability of an increased number of rescuers, they made a turn block the patient to face his back to the door of the vehicle so they can place the patient on a rigid support. These "non-instrumental" techniques must be careful at all times in manual immobilisation of the cervical spine.

If the patient is supine, the rapid mobilization of emergency will be done by lifting the block technique tray with at least three rescuers, one in the head and the others in the pelvis and legs. The survey is carried out in three stages. First the patient resting on the raised knee, and the second is left standing on the upper limbs of the rescuers and the third of these approaches to transfer trunk effortlessly up of the stretcher left. One drawback of this technique derives from the weight and size of the patient; also in cases of fractures of the thoracolumbar spine, causing further displacement posteriorly and increasing movement of fragments.

Another maneuver is the technique of the bridge, in which the patient is between the legs of two rescuers who put his hands on both sides of the patient doing a minimum lift, while another slips a board or stretcher under the patient.

### 3 4. Lateral safety position (LSP)

It is the position of choice for people unconscious not politraumatized.

The unconscious person may vomit and if he/she is on his/her back, the lungs can suck gastric contents. This position will keep the airway unobstructed by the tongue falling back and vomiting protected, allowing only leave the patient to go for help.

To place a patient in LSP it is enough to roll him slowly toward the rescuer from its initial position, being careful not to damage the arms and legs, keeping the head, neck, trunk alignment. Remove objects before they can do damage (glasses, etc.).

The rescuer kneel beside the patient, place the arm nearest it at right angles to the head, with the palms up and take the opposite arm over the patient's chest until the palm of your other hand touch the opposite shoulder; then bend the opposite leg, resting your foot on the floor and holding the patient's shoulder and the opposite popliteal (behind the knee), rotate it 90 ° into position.

### 3 5. Transport and waiting positions

The positions described below are used on normal stretchers when a spinal injury is not suspected.



Fig. 14. Patient in anti-shock position or Trendelenburg



Fig. 15. Semi-sit Patient. This position should be used in patients who report breathing difficulties.

### 3.5.1. Position antishock or Trendelenburg:

required in patients in a state of “shock” or suffering a large loss of blood. It is to place so that the head is lower than the ends. It can be done by lifting the legs or on special stretchers, leaning across the bearing surface in the direction of the head. This position ensures the irrigation of the vital parts of the body, to the detriment of the extremities.

### 3.5.2. Position of acute abdomen:

Used for the transfer of patients with abdominal injury, whether traumatic or not. The victim moves on her back and legs bent. This position reduces the pressure in the anterior abdominal wall of the victim.

### 3.5.3. Position of respiratory failure due to pulmonary origin:

To move patients with respiratory distress from any cause. They are moved half sitting, since thereby improving the breathing capacity. A variation of this approach, which is used in patients with penetrating wounds to the chest, rib fractures, etc., that is to place half built, but flat on the injured side. It is to support healthy respiratory function of the lung, while immobilizing the injured hemithorax.

Other less common but no less important conditions have to move as follows, depending on the cause:

- Patients traumatized and / or spinal cord pathology: Supine to 180 degrees with head and trunk aligned.
- Suspicion of intracranial hypertension: In Anti-Trendelenburg.
- Burned or patients without ventilatory, circulatory or neurological disorders: Supine with semi-built trunk.
- Patients with low level of consciousness without possibility of isolating air: In the recovery position.
- Acute pulmonary edema: Seated with legs dangling.
- Pregnant women: In the left lateral position.
- In the presence of umbilical cord prolapse: In knee-chest position.