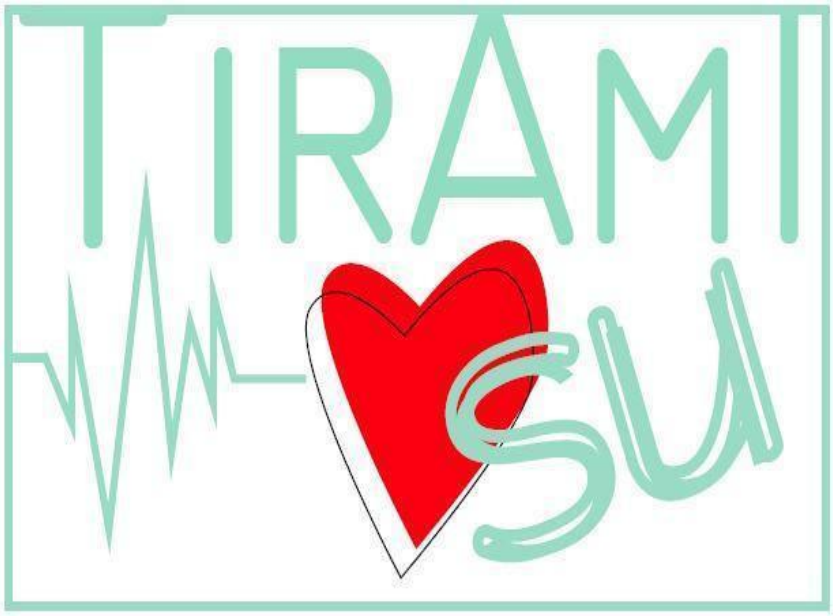
Project Number: 2019-1-IT02-KA201-062319

# Handbook on First Aid



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# Module 1

# General rules on how to interact with the emergency system

## Introduction

Emergencies represent uncommon situations in our daily life. For this reason, it is very important that everyone is trained to face such situations in the best possible way. The most common obstacle in the correct management of an emergency is to remain calm and mentally aware, a very difficult task for non-trained personnel.

The most important aspect everyone has to know is the correct way to activate the so-called Emergency System, which is represented by an operative centre dedicated to support rescuers in managing the situation. The Emergency system also helps to activate the correct supplies and to offer the best rescue for you and the patient(s). For example an Emergency System operator is able to activate police services, firefighters or paramedics depending on the situation you describe when calling the number for help.

In the European region, the emergency system can be reached by calling the international number 112.

Another important aspect to take into account is safety: personal safety is the first rule that every rescuer must follow. Even though it is evident that safety should be maintained in every situation, this aspect is often forgotten by both casual and professional first-aid providers. Always consider that if the rescue provider gets hurt while helping the injured, he/she would need additional help [1],[2].

Typically, accidents pose a danger related to the accident medium (e.g. in a car accident there can be glass, metal, fire, gases or other approaching cars). However, the most common injuries for rescuers result from the environment: slippery surfaces, stumbling on steps, hitting furniture, working in wrong or uncomfortable positions [3]. These dangers are largely neglected and easy to forget, especially for non-professional first-aid providers. In order to identify and prevent them, it is sufficient to take a pause before helping the injured person.

During an emergency, it is important to consider the biological risk resulting from either close contact with people or other biological agents [2]-[4]. A way to prevent it is to wear surgical-grade gloves (or technical gloves, for example for chemicals or hot objects). Moreover, the rescuer needs to be protected by using masks, visors and other specific equipment. Also, it is important to use sterile, single use medications (bandages, gauzes) that are not expired and keep them clean before usage. The most misused items are for example bandages or ice-packs that can (but shouldn't) easily be reused or shared with others. Remember that even a small injury like a wound can potentially lead to an infection and eventually to the amputation of a limb if medicated with a non-sterile item.

Finally, the last security matter is about respiratory infectious diseases like SARS-CoV-2 (COVID-19 disease). In this case, the only defense is to breathe through a filtering mask. Currently, several types of masks are available: the most common one is the surgical mask that filters the exhaled air of the person wearing it but not the inhaled air. For this reason, in order to be safe in an unsafe environment, it is recommended to wear a filtering mask. The most simple and economic kind is the N95/FFP2 mask. This type of face mask filters both the exhaled and inhaled air, protecting everyone during the rescue operations. In any case, remember that washing your hands carefully or using alcoholic disinfectants is the easiest way to fight the pandemic.

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## How to make an Emergency Call

All the European Countries use the same Emergency Number: 112

This number is free of charge and it can be called also if the mobile phone is locked or it does not have a sim-card inside; it is possible to dial it if there is a very weak network or in roaming connection.

Typically, 112 reaches different emergency services (usually police department or firefighters), according to the country you are dialing from. In any case, the operator will get you in contact with the right rescue service for your situation (or with more than one at the same time), he/she will be able to provide you a translation service for all the EU languages, and will automatically get your exact location.

When you call the emergency number, the operator needs to know where you are and he will ask you for information on how to reach your position.

After localizing you, the operator has to know basic information about the kind of emergency you are facing. In this handbook the focus is on medical emergencies, but an emergency can also be about public security and police, firefighting, coronavirus information, non-urgent medical services etc.

The basic principle of the emergency call is that the operator will guide you through a series of questions targeted to dispatch the closer and most appropriate response team. Sometimes the questions may seem strange, but there is a medical reason for any question. During an emergency call, it is important to be patient and remain calm, without leaving the injured person alone. Keep calm also if the line drops, as the operator will call you back.

As soon as the operator has obtained from you all the information he needs, he will authorize you to end the conversation or he will guide you to perform some maneuvers on the patient; please listen to him and provide the best collaboration possible.

Remember that calling the emergency system for no reason is a major crime in all EU countries, please don't joke about it.

## Case Scenario 1 - How to make an Emergency Call

You are playing video games when your mum calls you for help, as she has fallen down from the stairs and she is not able to stand up. When you arrive you notice she has slipped because water is coming down the stairs from the first floor bathroom. You start going downstairs paying attention not to slip too and you reach your mother. She tells you she has pain in her back and that she is not comfortable with her legs. You have your mobile in your pocket and you use it t

o dial the 112 number.

The operator asks you "112, where are you exactly?", you answer by providing your address and all the information about points of interest close to your house, presence of gates, stairs etc.

The operator has already activated the nearest ambulance and he asks you about what happened and which are your mother's conditions, you explain the situation and the operator guides you in keeping your mother's head in a fixed position until the ambulance arrives. He tells you to keep calm and informs you that he has also activated technical rescue in order to stop water flowing and provide environmental security to you and the emergency team

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approaching.

After that he allows you to hang the conversation and to wait for the ambulance to come. You must call back the number in case of sudden changes in your mother's conditions.

In five minutes you hear the ambulance approaching and you wait for the crew to come before leaving your position. The rescue operation has started.

## Step by Step Procedure

Please describe in detail the actions to follow in the situation occurred:

- Identify the situation and the presence of any potential risk for your and patient's safety before acting
- Invite the patient to keep as calm as possible and get some information about what happened and the actual health status
- Dial the 112 number and provide all the information requested
- Perform the actions the operator has suggested to you and wait for the emergency crew to come
- Inform the Emergency System if any changes occur during the wait

**The don'ts for the teachers and the students**

- Don't panic and don't forget your safety when facing the situation
- Don't waste time before activating the emergency system
- Don't oppose to the operator's requests
- Don't hang the conversation without permission

## How to identify someone who needs medical assistance

Sometimes the most challenging aspect of daily life emergency situations is to identify someone who needs help.

In many scenarios it is really difficult for non-trained personnel to distinguish those situations which are evolutive and life threatening, from others non dangerous and delayable. As we have learned so far, it is really important to be trained to recognize risky situations and to correctly activate the Emergency System if necessary.

Think about cases of multiple patients' emergency situations. In those cases you have always to be guided by the dynamic of the situation and by the patient evaluation algorithm. In this way you will be able to distinguish between who is in danger and others needing non urgent care.

The first thing you always have to do is to ensure your and patient's safety; after that, you can check the consciousness state in order to start the BLSD algorithm if needed. In the case of a conscious person, identify other signs of deteriorating patients such as rapid and superficial breathing or tachycardia (check the pulse from the patient's wrist).

Once collected all the information, call 112 and communicate to the operator what has happened and all data you collected in your primary evaluation. It is very important to ask patient to walk: if he can, this is a sign that the patient is not at immediate risk of life.

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## Case Scenario 2 - How to identify someone who needs medical assistance

You are the first person to get to a big car crash site. When you arrive you see many people coming out from their cars and running away from the crash scene. While approaching the closest car, you find some oil on the ground so you pay attention and find another way to reach the car. Inside the vehicle you find the driver, he can answer your questions and says he doesn't remember anything about the moment of the crash. You ask him if he can exit the car but he answers negatively. You see he is breathing rapidly and that his chest is not expanding symmetrically. On the other seat there is his wife, she is scared but she can move so you ask her to get out of the car, she opens the door and stands up, you call 112 and describe the situation. They have already been warned about the crash and some ambulances and firefighters are coming. You reach another car and find a man not responding to your shouts. You open the door and, with the help of other drivers, pull him out of the car. You try to call him again, but as he does not answer you start the BLSD algorithm, while another man calls 112 and warns the operative centre about what is happening. You hear ambulances approaching and, as emergency crews have come, you describe the situation and your evaluations, paramedical personnel proceed in triaging other cars and victims, while firemen deal with situation safety issues.

## Step by Step Procedure

Please describe in detail the actions to follow in the situation occurred:

- Provide safety to yourself and to the patients.
- Correctly individuate the exact number of people who may need medical help.
- Check consciousness state, if the person is unconscious, start the BLSD algorithm; otherwise, if they can answer your questions, check awareness, possibility of moving, breathing dynamic.
- Correctly activate the Emergency System and communicate the situation and the number of patients (in case of multiple patients, communicate each person's condition to the operator).
- Perform first aid maneuvers if needed.

**The don'ts for teacher and students are:**

- Don't panic
- Don't forget to correctly perform patient evaluation
- Don't forget to communicate *everything to the 112 operator*

## on-traumatized patient versus traumatized patient

When you start a first aid course, especially when focused on traumatology, you often hear about the important difference existing between a traumatized and non-traumatized patient. When you deal with a traumatized patient (especially in case of major traumas, see *Traumatology chapter*), you have to pay attention to some aspects: firstly, a person who suffered from trauma is an unstable patient. This means that he/she can rapidly deteriorate and advanced care should be ready to face such a situation. Occasional rescuers should pay attention to the general condition of the patient, with particular focus on the consciousness state. After a cardiac arrest (unconscious and not-breathing patient) has been ruled out, the primary survey should assess the presence of bleeding, breathing dynamics, breath rate, skin color and pulse rate (if possible). Those signs are assessed in order to correctly classify the potential

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negative evolution of the situation. In this critical case, the only action you should perform is to remain calm and to keep the patient's head in a neutral position. This simple action will prevent any spinal cord injury in traumatized patients.

On the contrary, non-traumatized patients have to be classified following their medical condition. Even in these cases the primary survey should assess the breath and the cardio circulatory wellness, but you don't have to care about movements and position. Your personal calmness and self-control are always required, especially during complicated situations.

Another fundamental aspect of the patient's survey is the correct collection of the medical history of the patient; this should include information about any pre-existing conditions, drugs assumed and presence of any risk factor. All the information collected has to be reported to the operative centre, in order to properly classify the priority of the patient and the best resource available for his/her care.

## Case Scenario 3 - Traumatized patient

You are doing physical activity at school. A mate of yours has fallen down from 3 meters high, she probably hit her head and now she is not able to stand up autonomously. You firstly evaluate the safety of the scenario and hold her head in the neutral position before calling her name. She answers you confusedly, she remembers her hand slipped on the handle of the pole and she has fallen down. Her breath rate is 16 breaths per minute, there is no active bleeding and she is not pale. You keep on blocking her head in that position, preventing any spontaneous movement, while your teacher calls the 112. The operator asks about any medical condition of the girl, any drugs (especially anticoagulant drugs) and tells you to continually assess the patient's conditions and to communicate any change in consciousness. After some minutes the ambulance and paramedics arrive, and by using a neck collar and a spinal board they are able to move your mate to the nearest hospital, preventing any further damage to her spinal cord and head.

## Step by Step Procedure

Please describe in detail the actions to follow in the situation occurred:

- Assess the exact dynamic of the situation and any safety issues
- In case of a traumatized patient hold his head in a neutral position before starting speaking to him (to prevent any movement), then assess consciousness state (if unconscious follow the BLSD algorithm, see BLSD chapter)
- Assess breathing dynamics and cardio circulatory integrity
- Call 112 and communicate dynamics and patient's conditions
- Continually assess the patient's conditions and communicate any change to the 112 operative centre

**The don'ts for the teachers and the students:**

- Don't panic
- Don't forget to ensure your and patient's safety
- Don't forget to hold patient's head

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- Don’t waste time before activating the Emergency System

## Evaluate the area for safety issue

As already said, the most important aspect of a good rescue is safety. Safety must be ensured for both the rescuer and the patient before acting in any way. Safety should be assessed every time you face an emergency situation and some general rules are required.

Firstly, don’t approach the scene in case of fire, not stable buildings or in presence of toxic materials; when you call the 112 system please communicate all the safety issues of the scenario, communicate also if there are best ways to reach the target, tell the operator in case of toxic materials, if it is possible to identify them. Always wait for the firefighters to arrive before approaching the scene and try to collect any possible information about the patient’s conditions, don’t try to act before the safety has been guaranteed.

Another important aspect is the need to wear personal safety devices such as gloves, visors and masks. It is crucial to protect ourselves before helping the patient. It is recommended to bring a pair of gloves in your backpack or inside your car in case of any eventuality.

## Case Scenario 4 - Evaluate the area for safety issue

The building close to your school has collapsed. Fortunately, it was abandoned and, when you arrive in the proximity of the rubbles, you notice a car among them with a person inside. He seems awake, he is asking for help; unfortunately, there is an uncovered wire lying on the car and it is too risky to approach the patient.

You call 112 and describe the situation, the operator activates the firefighters and calls the electric company in order to make the power switch off. During the phone call you tell the operator the patient is conscious and is asking for help, the car seems not to be affected by the collapse and you don’t see any blood from your position.

As the firefighters have come, the situation is safe, and the paramedics can approach the car and rescue the patient. He is just shocked from the situation but it seems his medical conditions are ok. He is transported to the nearest hospital to be evaluated by a doctor.

## Step by Step Procedure

Please describe in detail the actions to follow in the situation occurred:

- Identify the situation and its related risks
- Activate the 112 reporting to the operator what happened and everything you can assume about the patient’s conditions
- Wait for the technical rescue to arrive and to the situation to be safe

***The don’ts for the teachers and the students***

- Don’t forget to assess the safety of the situation
- Don’t waste time before activating the Emergency System

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- Don’t act without technical rescuers *permission*

## References

[1] “Foundation for Assisting in Home Care.” https://med.libretexts.org/Courses/Lumen_Learning/Book%3A_Foundations_for_Assisting_in_Home_Care_(Lumen) chapter 3.11
[2] C. Serini, R. Zacchetti, M. Ghislanzoni, and G. F. Villa, “MANUALE DI PRIMO SOCCORSO.” Chapter 1, Appendix A
[3] M. G. Balzanelli, *Manuale di Medicina di Emergenza e Pronto Soccorso*. Chapters 10, 90, 91
[4] *M. Chiaranda, Urgenze ed emergenze. Piccin., 2007. Chapters 1,2 27*

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# Module 2

# Cardiopulmonary resuscitation

## Introduction

Cardiopulmonary resuscitation (CPR) represents an ensemble of manoeuvres that should be applied to someone without spontaneous breathing and circulation, maintaining the vital functions, represented by respiratory and cardiac function. By doing so, the body of the patient will receive enough oxygen, until a medical team arrives and can begin Advanced Life Support (ALS).

To achieve this goal, everybody should be able to recognize when someone is in Cardiorespiratory arrest and what should be done in this situation to maintain blood flow and adequate oxygen delivery.

This chapter covers cardiac arrest recognition, alerting the emergency services, chest compressions, rescue breaths, automated external defibrillation (AED), CPR quality measurement, safety, and foreign body airway de-obstruction.

To maintain the body c basal condition and ensure oxygenation of the brain, there are three essential things:

A: AIRWAY - freedom of the airways.

B: BREATHING - providing ventilation to supplement the respiratory mechanism and allowing for alveolocapillary oxygen exchange.

C: CIRCULATION - maintaining the pump function of the heart so that circulation can be achieved, and oxygenation of tissues can take place, especially at the brain and heart level.

When should cardiopulmonary resuscitation (CPR) start?

CPR is initiated in all patients who are unconscious and do not breathe, except when there are obvious lesions incompatible with life.

Do not confuse agonal breathing with normal breathing. Agonal breathing is a sign of cardiac arrest, and CPR should be started in this case.

A short period of seizure movement can occur at the start of cardiac arrest, because of brain hypoxia. Assess the person after the seizure episode has stopped: if unresponsive and not breathing normally, start CPR.

Start CPR in an unresponsive person who is not breathing normally. There are few reliable criteria for the rapid determination of death; in these situations, resuscitation manoeuvres will not be initiated, like in decapitated victims, rigour Mortis is installed etc.

When is CPR discontinued?

CPR is interrupted only in the following situations:

− the victim shows signs of life (reappearance of efficient spontaneous circulation and ventilation);

− resuscitation is taken over by a person trained at a higher level of competence

responsibility for the patient is assumed by a doctor, nurse, paramedic or emergency service personnel);

− in case of exhaustion of the person performing CPR or if continued resuscitation would endanger the lives of other team members.

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# Basic Life Support

Basic Life Support – (BLS) or basic resuscitation includes the main theoretical knowledge and practical skills that any person needs to be able to apply and intervene in a life-threatening situation, especially in cardio-respiratory arrest, in the absence of medical equipment.

This chapter tries to present the most important elements of cardiorespiratory resuscitation in the form agreed by the European Resuscitation Council.

The cardio-respiratory arrest may occur due to a problem at airways level, breathing or circulation.

The human body needs a permanent supply of oxygen to all organs and systems. In particular, the brain is severely affected by the absence of oxygen for more than a couple of minutes.

Resuscitation in basic life support means maintaining proper breathing and circulation, by a trained person who is not receiving medical assistance until the specialized crew arrives.

As all the statistical assessments have shown, the most common cause of death worldwide remains ischemic heart disease. Thus, ischemic pain recognition and announcement of emergency services before the installation of cardiac arrest will greatly increase survival in patients with acute myocardial infarction.

The chain of survival consists of a succession of actions, which if are performed correctly and in the recommended sequence will increase the chances of survival of victims in cardiorespiratory arrest (CA).

Early and correct initiation of CPR can double and, in some cases, even quadruple the chances of survival of a victim in CA.

The components of the survival chain are the following:

− early identification of the emergency and calling the emergency medical services (EMS).

− early CPR.

− early defibrillation.

− advanced life support and post-resuscitation care.

Basic resuscitation involves the following steps:

− area evaluation, evaluating the safety for the saviour and the victim – what it means is avoiding dangers for the saviour (e.g. electrocution, intoxication, trauma);

− checking the state of consciousness by verbal and tactile stimulation - slight shaking -

"Are you OK?"

− if the person responds, they are left in the same position and the situation is further investigated. The emergency service is called, useful information from the victim is obtained (what happened? any medical history, allergies etc.) and they are re-evaluated periodically until EMS arrive.

− the absence of any answer means that the patient is unconscious and imposes you call for help and begin basic resuscitation manoeuvres – applying the A.B.C. approach.

A. The first gesture is the manoeuvre to open the airway by hyperextension of the head (with the hand on the forehead) and lifting the chin with two fingers in the non-traumatized patient). This opens the mouth and you

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need to check if there are any foreign bodies (if so, they need to be extracted manually).

If a traumatic injury to the cervical spine is suspected, the above manoeuvre is not performed, perform subluxation of the mandible, keeping the head in a neutral position, in the axis with the torso.

B. Breath assessment: look, listen and feel while keeping the airways open, check for the presence of breathing, for chest movements, listening to breathing sounds and feeling the flow of air.

The presence of breaths is checked for a maximum of 10 seconds. It is possible that immediately after cardiac arrest, the victim might present some gasping-type breathing movements that cannot be considered normal breathing. Whenever the saviour has doubts about the existence or not of breathing they will act as if it does not exist.

If the victim is breathing normally but is unconscious, he or she will be placed in a recovery position, the emergency service is called and the victim will be reassessed periodically.

If the person is not breathing, the emergency service is called (by another person or even by the rescuer) and then resuscitation manoeuvres are initiated with chest compressions and ventilations.

C. The person performing the resuscitation must position themselves sideways to the victim, and the victim needs to be placed on a hard surface. Locate the site for external chest compressions, this is in the centre of the chest over the sternum. Do not apply any pressure to the upper abdomen or the xiphoid appendix. Place the bridge of the palm of one hand and the second hand above the first on the site. With the fingers intertwined, the elbows straight and the arms perpendicular to the patient's vertical plane, perform 100-120 chest compressions per minute so that the sternum is compressed by at least 5 cm (but not exceeding 6 cm).

After each compression, a moment of the return of the thorax is recommended, without losing contact between the hands and the victim's chest the compression and decompression time must be equal.

After 30 chest compressions, two mouth-to-mouth ventilations are performed. The airways are maintained in the open position, clean any foreign bodies and pinch the victim nose with the index finger and thumb. The saviour inhales and then places his mouth tightly on the patient's mouth, exhaling.

If the chest does not expand after proper ventilation, the following alternatives will be taken into consideration:

− checking the oral cavity and extracting any visible foreign bodies with two fingers ;

− repositioning the head while maintaining hyperextension and lifting the chin;

− continuation of chest compressions at a rate of 100 / min if the correct ventilations prove to be incapable of producing chest expansion and we suspect that there is an obstruction of the airway below.

There is also the option of performing compression-only resuscitation at a rhythm of 100 / min (but not more than 120 / min) without interruptions for ventilation because of certain reasons such as aesthetic, mouth injury, infection risk, resuscitator is a child the resuscitator cannot perform ventilation.

## Case scenario 1 -

## Basic Life Support Manoeuvres

You, together with your class colleague are returning from school, at noon, passing through a public park.

Near a bench, collapsed on the ground, you find a person, a man, of approx. 60 years old, who is not moving or reacting spontaneously. There are no signs of violence or aggression, nor blood near him.

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Because you just finished a Basic Life Suppor t course, organized by your school, you decide to approach the victim and to help him, together with your friends. The surroundings look safe, and you know that near the park there is an Automatic External Defibrillator.

You asses the state of consciousness of the victim, he did not respond to verbal stimuli and also is not responding to a gentle shake applied to the shoulders.

Because the victim does not respond, you consider him as being unconscious and put him on his back. You open the airway, do not find anything inside his mouth, and breathing is absent. You immediately start CPR manoeuvers, ask one of your friends to call 112 and ask another one to bring the AED.

- After you have the AED near you, you start it and follow the prompt commands, deliver a shock and perform CPR for two minutes. The AED prompts for a new shock, you deliver a second shock. Immediately after this, the ambulance arrives at the scene and the crew takes off the CPR manoeuvers.

## Step by Step Procedure

- Action 1: Check the surrounding area for any potential dangers.
- Action 2: Approach the victim and ask him what has happened, does he need help? Use verbal and tactile stimulation – easy shakes from the shoulder and ask - "Are you okay?"
- Action 3: Put him on his back, and start with the opening of the airway, by hyperextension of the head, (with one hand on the forehead) and lifting the chin with two fingers. If a traumatic injury to the cervical spine is suspected, it is not indicated to perform the above manoeuvre, but the subluxation of the mandible – jaw thrust, keeping the head in a neutral position, aligned with the trunk.
- Action 4: Asses the breathing, which is absent. Keeping the airways open, check for the presence of breathing by looking for chest movements, listening to breathing noises and feeling the flow of air. The breathing is checked for a maximum of 10 seconds.
- Action 5: Start chest compression. The palms with interlocked fingers are placed on the centre of the chest, the palm of one hand and the second hand positioned above the first, with straight elbows and arms perpendicular to the thorax. Performs chest compressions so that the sternum is depressed by at least 5 cm (but not exceeding 6 cm). After each compression allow a moment of return of the thorax (complete decompression) without interrupting contact of the hands with the victim's chest. The frequency of chest compressions is 100 / min (not to exceed 120 / min), and the time for compression and decompression must be equal.
- Action 6: Ask for AED
- Action 7: If comfortable, perform mouth to mouth ventilation. After 30 chest compressions, two mouth ventilations are performed. Keep the airways in an open position, remove any foreign bodies from inside the mouth if any is present and pinch their nose with index and thumb. The saviour takes a normal breath after which he places his mouth tightly on the patient's mouth, exhaling, through which introduces air into the victim's airway for 1 sec. Observe chest expansion during insufflation and then passive exhalation.
- Action 8 Attach AED and follow the prompts, delivering the first shock. As soon as the external automatic defibrillator is available, attach to the patient with self-adhesive electrodes, attach the electrodes to the patient's bare chest according to the pictures shown on the AED or the on the pads, follow the indications of the machine, it will defibrillate or not according to the rhythm recognized by the defibrillator.
- Action 9: Continue CPR for 2 minutes. Immediately after applying the shock, continue with two minutes 30: 2 CPR, without any delay after defibrillation.

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- Action 10: Deliver the second shock. At every 2 minutes, the chest compressions will be stopped and followed again by defibrillator prompts, that identifies the need for another shock.
- Action 11: Continue CPR
- Action 12: Stop the CPR when the ambulance crew take the resuscitation manoeuvres.

**The don'ts for the teachers and the students**

- Do not consider gasping as normal breathing, if gasping is present this means that the patient is in cardiac arrest.
- Do not perform chest compression on soft surfaces, like a bed, put the patient on solid ground, on his back.
- Do not exhaust yourself, ask someone to change you from chest compression at an interval of 2 minutes.

## Upper airway obstruction

For survival in the event of an upper airway obstruction accident with a foreign body it is extremely important to hastily recognize these situations.

Causes of obstruction

The most common cause of airway obstruction is the tongue. Hyperextension manoeuvre of the head and lifting the chin can lead to airway dezobstruction. If a foreign body blocks the airway, we must use another technique to release it.

Food scraps can be another cause of obstruction, adults can even choke on large pieces of meat, children can choke on candy, peanuts etc. and can put different smaller objects in the mouth, like small toys.

Airway obstruction can be partial or complete. It usually occurs during meals, the victim will put his hands around his neck, trying to signal the problem.

In incomplete, partial obstruction the victim is conscious, able to cough efficiently and has wheezing between coughs. The victim will be encouraged to cough without intervening in any way. If the deobstruction fails on its own, the emergency system must be activated and the victim's transport to the nearest medical unit must be prepared. The victim will be constantly monitored because a partial obstruction can become a total obstruction at any moment.

In complete obstruction the victim cannot speak, cough or breathe, is cyanotic, sweaty and scared, and in a short time (1-2 minutes) they will become unconscious and if the attempt to clear the obstruction fails, they will enter in cardio-respiratory arrest.

If the victim becomes unconscious, lay them on the ground and begin resuscitation manoeuvres.

In case of partial airway obstruction in a person with preserved consciousness, the most successful way to dezobstruate the airway is encouraged the victim to cough in order to eliminate the foreign body.

If the obstruction becomes complete - the patient can no longer speak, responds only with head movements and coughing efforts become ineffective, as long as the patient remains conscious, 5 strong interscapular blows can be performed followed by 5 abdominal compressions - manoeuvre bearing the name of the Heimlich manoeuvre.

This results in sub-diaphragmatic abdominal compressions determines by lifting the diaphragm the output of strong air from the lung, creating an artificial cough that can eliminate a foreign body.

To determine the degree of obstruction, it is important to ask the victim, if he/she is conscious something like: "Are you suffocating?"

Accidents of the manoeuvre:

- Regurgitation (by compressing the full stomach);
- Damage to the abdominal organs.
- Damage to the xiphoid appendix.

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They can be avoided by choosing the correct place of compression (NOT on xiphoid appendix).
After dezobstructing the upper airways, fragments of the foreign body can remain in the upper or lower respiratory tract, which can cause subsequent complications. Therefore, victims with a persistent cough, difficulty of swallowing or sensation of a foreign body blocked in the throat should be evaluated and monitored in a specialized clinic.

## Case scenario 2 - Upper airway obstruction – de obstruction procedures

You are at a restaurant, with some friends. Suddenly, someone near you begins to cough and put their hands over their neck, trying to get your attention. They are suffocating because of a piece of food. Immediately you encourage them to cough, but they are not able to do so with enough efficacity. You ask someone to call 112 because you recognize that the person has a severe upper airway obstruction. Immediately after this you go behind them and apply 5 interscapular blows, followed by 5 abdominal thrusts. In the end, after this manoeuvre, you were able to help them remove the piece of food lodged in his throat.

## Step by Step Procedure

- Action 1: Encourage the person to cough to try to clear the blockage, ask them to try to spit out the object if it's in the mouth.
- Action 2: Stand behind the person and to one side. Support their chest with 1 hand. Lean the person forward so the object blocking their airway will come out of their mouth. Also, ask someone to call 112 in the meantime.
- Action 3: Give 5 back blows between the person's shoulders with the heel of your hand. Check if the blockage has cleared. If not, perform up to 5 abdominal thrusts (Heimlich manoeuvre).
- Action 4: Stand behind the person that is choking, place your arms around their waist and bend them forward. Cover one of your fists with the palm of the other hand, and place it between the person's umbilicus and xiphoid appendix. Pull sharply inwards and upwards, you can repeat this up to 5 times. Check if the blockage has cleared.

**The don’ts for the teachers and the students**

- Do not put your fingers in their mouth if you can't see the object, as you risk pushing it further down their throat.
- Do not perform abdominal thrusts on small children under 1-year-old or pregnant women.

## Recovery position

If a person is breathing normally and unable to be woken up (unconscious), they should be gently placed in the recovery position. The recovery position is designed to keep unconscious people safe by making sure their airway is kept clear and open. It also reduces the risk that any fluid could cause them to choke.
Some examples of situations that require a recovery position are for example the person who passes out from drinking alcohol or using drugs, or someone unconscious because of a stroke strake.
A patient who is unconscious but breathing and with a pulse is at risk of airway obstruction due to the fall of the base of the tongue on the posterior wall of the pharynx. Also, to reduce this risk and to avoid obstruction of the airways by fluid secretions (like blood or excessive saliva) or vomiting, it is required that the victim be placed in the recovery position, which is a lateral sitting position (lateral decubitus), adapted to maintain the airway open and to permit the

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patient to stand still in the lateral position, without any risk to the patient. When someone is unconscious, their muscles relax and go floppy. The tongue is a muscle in fact, and if someone is unconscious and lying on their back, the back of their tongue will flop back and block their airway, making them unable to breathe. In addition, the oesophagus (the connection between the mouth and the stomach) and the oesophagal sphincter are relaxed and remain open. This means the contents of the stomach may go up and reach into their lungs.

The victim is evaluated, and the emergency service is called by the unique emergency number 112. The patient must be placed in a stable position, close to a real lateral position, with the head tilted and without pressure on the chest to prevent problems regarding ventilation of the victim. The airways should be maintained permeable by 2 simple manoeuvres, head hyperextension and lift of the chin, then approach the patient's legs, place one of the arms at a straight angle, bend the knee opposite the rescuer and twist the patient by holding him by the shoulder and knee.

Support the patient's cheek on the palm of the bent arm so that the head remains hyperextended, and secretions from the mouth can leak out, then announce the emergency service and periodically reassess the victim.

If there is any chance that the person you're helping may have suffered a spinal injury because of a traumatic event, do not move them. Instead, call emergency services (112) and wait for them to arrive. This is the best possible thing you could do because moving them risks further injury at the spine level. Only move them if they present a life-threatening situation (risk of fire, explosion or if they are entering in cardio-respiratory arrest).

If patient status will change, we should immediately announce the emergency services at 112, and if the patient stops breathing spontaneously, we will change the position, putting the patient on his back, on a solid surface, and CPR should be started immediately.

## Case scenario 3 - Recovery position

You are playing football with your friends, after class hours. You observe one of the caretakers from school collapsing near your playground. Immediately you approach the patient, to help him.

After you assess the area for safety, you approach him and ask if everything is all right. He does not answer, does not respond even when you shake him by the shoulder.

Because of this, you perform the head tilt-chin lift manoeuvre to open his airways, and asses the presence of breathing. The patient is breathing, with approximately 18 breaths per minute.

When you found this, you put the patient in the recovery position, ask one of your friends to call 112 and to announce the emergency (unconscious but breathing person) and wait near the patient for help to arrive. All of the time you observe the patient, to be sure that he is continuously breathing.

When the Emergency Medical Team arrives at the scene, they take the patient in the ambulance and thank you for your help.

## Step by Step Procedure

- Action 1: Check the surrounding area for any potential dangers.
- Action 2: Approach the victim and ask him what has happened, does he need help? Use verbal and tactile stimulation – easy shakes from the shoulder and ask - "Are you okay?"
- Action 3: Put him on his back, and start with the opening of the airway, by hyperextension of the head, (with hand on forehead) and lifting the chin with two fingers. If a traumatic injury to the cervical spine is suspected, it is not indicated to perform the above manoeuvre, but the subluxation of the mandible – jaw thrust, keeping the head in a neutral position, aligned with the trunk.

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- Action 4: Asses the breathing. Keeping the airways open, check for the presence of breathing by looking for chest movements, listening to breathing noises and feeling the flow of air. The breathing is checked for a maximum of 10 seconds. Your patient is breathing.
- Action 5: Put the patient in a recovery position. Support the patient's cheek on the palm of the bent arm so that the head remains in hyperextension, and the secretions from the mouth can drain externally, call the pre-hospital team or 112 services is announced and periodically reassess the victim. If the victim must be kept in this position more than 30 minutes before the arrival of the advanced medical crew, turn them over on the opposite side, to release pressure on the lower arm.
- Action 6: Reassess frequently the patient until the help arrives.

**The don'ts for the teachers and the students**

- Do not let unsupervised the patient, some may stop breathing and they will require cardio-pulmonary resuscitation manoeuvres.
- Do not let someone unconscious and breathing laying on his back, the person could suffocate with secretion from the mouth or because the base of the tongue can obturate the airway.

## Sudden Cardiac Arrest

Sudden cardiac death (SCD) syndrome is characterized by the sudden and unexpected death of a healthy person who has a sudden cardiac arrest.

The causes of sudden death also differ in young people, where the most common pathologies are rhythm disorders, cardiomyopathies, myocarditis, and congenital malformations, compared to the elderly, where ischemic heart disease, degenerative valve disease and heart failure predominate.

The installation of Sudden Cardiac Arrest may be preceded by acute symptoms (malignant arrhythmias describe usually by the patients as palpitation, which persist for a longer period, cardiovascular collapse, chest pain, dyspnoea-difficulty in breathing, hypotension, visual disturbances, nervous disorders, altered mental status, cold and clammy skin), a stage lasting from a few minutes to an hour.

Sudden Cardiac Arrest and sudden cardiac death is a tragedy and, in the case of an underlying genetic predisposition, may be preventable. SCD in the young often occurs in people who were thought to be well, may occur without warning symptoms, and is often the first presentation of underlying genetic heart disease.

Most cases of SCA are installed in Out of hospital settings.

The persons most likely to survive an out of the hospital cardiac arrest are those who are witnessed to collapse by a bystander and found in a shockable rhythm ( arrhythmias leading to ventricular fibrillation or pulseless ventricular tachycardia). The patients who received bystander CPR from the first moments after the collapse had a significantly higher rate of survival compared with the ones that did not receive BLS CPR. The use of an Automatic External Defibrillator (AED) is very important, as the majority of cardiac arrests are witnessed, so the presence of AEDs at schools, stadiums, stations etc, may increase the survival rate.

## Case Scenario 4 - Sudden cardiac arrest

You are visiting some friends, and suddenly their grandfather describes the debut of palpitation, and he becomes unresponsive immediately.

You asses the state of consciousness of the victim, he did not respond to verbal stimuli and also is not responding to a

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gentle stimulus applied at the shoulder level.

Because the victim did not respond, you consider him as being unconscious and put him on his back. You open the airway, did not find anything inside his mouth, and the breathing is absent. You immediately start CPR manoeuvres, ask one of your friends to call 112 and ask another one to bring the AED, which is placed at the street corner.

After you have the AED near you, you start it and follow the prompt commands, deliver a shock and perform CPR for two minutes. The AED prompts for a new shock, you delivered a second shock. Immediately after this, the ambulance arrives at the scene and the crew took of the CPR manoeuvers.

## Step by Step Procedure

- Action 1: Check the surrounding area for any potential dangers.
- Action 2: Approach the victim and ask him what is happened, does he need help? Use verbal and tactile stimulation – easy shakes from the shoulder and ask - "Are you okay?" There is no response.
- Action 3: Put him on his back, and start with opening of the airway, by hyperextension of the head, (with hand on forehead) and lifting the chin with two fingers.
- Action 4: Asses the breathing, which is absent. Keeping the airways open, check for the presence of breathing by looking for chest movements, listening to breathing noises and feeling the flow of air. The breathing is checked for a maximum of 10 seconds.
- Action 5: Start chest compression. The palms with interlocked fingers are placed in the centre of the chest, the palm of one hand and the second hand positioned above the first, with straight elbows and arms perpendicular to the thorax. Perform 30 chest compressions so that the sternum is depressed by at least 5 cm (but not exceeding 6 cm). After each compression allow a moment of the return of the thorax (complete decompression) without interrupting contact of the hands with the victim's chest. The frequency of chest compressions is 100 / min (not to exceed 120 / min), and the time for compression and decompression must be equal.
- Action 6: Ask for AED
- Action 7: Perform mouth to mouth ventilation. After 30 chest compressions, two mouth ventilations are performed. Keep the airways in an open position, remove any foreign bodies from inside the mouth if any is present and pinch their nose with index and thumb. The saviour takes a normal breath after which he places his mouth tightly on the patient's mouth, exhaling, through which introduces air into the victim's airway for 1 sec. Observe chest expansion during insufflation and then passive exhalation.
- Action 8: Attach AED as soon as possible and follow the prompts, delivering the first shock. As soon as the external automatic defibrillator is available, attach it to the patient with self-adhesive electrodes, place them as shown on the defibrillator or the electrodes and follow the indications of the machine, it will defibrillate or not according to the rhythm recognized by the defibrillator.
- Action 9: Continue CPR for 2 minutes. Immediately after applying the shock, continue with two minutes 30: 2 CPR, without any delay after defibrillation.
- Action 10: Deliver the second shock. At every 2 minutes, the chest compressions will be stopped and followed again by defibrillator prompts, that identifies the need for another shock.
- Action 11: Continue CPR
- Action 12: Stop the CPR when the ambulance crew take the resuscitation manoeuvres.

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**The don'ts for the teachers and the students**

- Do not wait to call 112 if someone is accusing prolonged palpitation or chest pain
- Ask for an AED and use it as soon as possible
- Do not consider gasping as normal breathing, if gasping is present this means that the patient is in cardiac arrest.
- Do not perform chest compression on soft surfaces, like a bed, put the patient on solid ground, on his back.
- Do not exhaust yourself, ask someone to change you from chest compression at an interval of 2 minutes.

## Arrhythmias

An arrhythmia (also called dysrhythmia) is an irregular or abnormal heartbeat. Your pulse indicates your heart rate or the number of times your heart beats per minute. Pulse rates vary from person to person. Your pulse is slower when you are at rest and increases when you exercise since more oxygen-rich blood is needed by the body during exercise. You can tell how fast your heart is beating by feeling your pulse. You can feel your pulse on your wrist or neck. Place the tips of your index and middle fingers on the inner wrist of your other arm, just below the base of your thumb. Or place the tips of your index and middle fingers on your lower neck, on either side of your trachea. Press lightly with your fingers until you feel the blood pulsing beneath your fingers. You may need to move your fingers around slightly up or down until you feel the pulse. You can count the number of beats in 10 seconds and multiply by 6 to determine your heart rate in beats per minute. A normal heart rate, at rest, is 50 to 100 beats per minute. A fast heart rhythm with a rate of more than 100 beats per minute is a tachycardia while a slow heart rhythm with a rate below 60 beats per minute is bradycardia.

The atria (the heart's upper chambers) and ventricles (the heart's lower chambers) work together, alternately contracting and relaxing to pump blood through the heart. The electrical system of the heart is the power source that makes this possible. Irregular heart rhythms can also occur in normal, healthy people. Arrhythmias can also be caused by certain substances or medications, such as caffeine, nicotine, alcohol, cocaine, inhaled aerosols, diet pills, and cough and cold remedies. Emotional states such as shock, fright or stress can also cause irregular heart rhythms. Arrhythmias that are recurrent or related to an underlying heart condition are more concerning and should always be evaluated by a doctor. In most cases, treating the underlying condition will take care of the arrhythmia. If not, many medications and procedures are available to eliminate or control the abnormal heart rhythm. An arrhythmia may be "silent" and not cause any symptoms. If symptoms occur, they may include: palpitations (a feeling of skipped heartbeats, fluttering, "flip-flops" or feeling that the heart is "running away"), pounding in the chest, dizziness or feeling lightheaded, shortness of breath, chest discomfort, weakness or fatigue (feeling very tired).

Treatment depends on the type and severity of your arrhythmia. In some cases, no treatment is necessary. Treatment options include medications, lifestyle changes, invasive therapies, electrical devices or surgery. The following tips can help limit the occurrence of arrhythmias: if you smoke, stop; limit your intake of alcohol, limit or stop using caffeine, avoid using stimulants; if you notice that your irregular heart rhythm occurs more often with certain activities, you should avoid them;

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# Case scenario 5 - Arrhythmia

You are visiting some friends, and suddenly their grandmother describes the debut of intense palpitation. This was the first time that she felt something like this.

She is used to drinking a lot of coffee and smokes plenty of cigarettes each day, so she asks her nephew to bring a big mug of coffee.

You advise her to stop drinking coffee right now, also discourage her to smoke a cigarette and try to convince her to ask for specialized help.

In the end, she has agreed with you and you call 112, describing the situation.

## Step by Step Procedure

- Action 1: Put her on her back on the sofa, explaining that she should avoid doing any substantial physical efforts.
- Action 2: You measure the pulse at the radial artery, and you find it to be very high, at 145 beats per minutes.
- Action 3: Try to convince her not to consume any high caffeine or sugar products like coffee.
- Action 4: Call 112, after you discus with the patient and convince her to agree to medical help.

**The don'ts for the teachers and the students**

- Do not wait to call 112 if someone is accusing palpitation
- Do not let this person do any sustained physical activity or consume substances that can increase the heart rate.

## References

[1] Diana Cimpoesu et all Guides And Algorithms Into The Emergency Medicine, Edit. Gr.T. Popa - Iasi, 2019, p 42-68

[2] European Resuscitation Council Guidelines for Resuscitation: 2017 update, Resuscitation, Vol 123, 2018

[3] Tintinalli JE, Kelen GD, Stapczynski JS. Emergency Medicine, A Comprehensive Study Guide 8th Edition American College of Emergency Physicians, 2016.

[4] Adult Basic Life Support: Provider Manual. European Resuscitation Council, 2015.

[5] American Heart Association. Guidelines for Cardiopulmonary Resuscitation Emergency Cardiac Care. 2015 & 2018.

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# Module 3

# Respiratory system

## Asthma

Asthma is a syndrome characterized by obstruction of air flow and can vary markedly, both spontaneously and under treatment.

Asthmatics have a chronic, specific inflammation of the airways that makes them more responsive to a wide variety of triggers, exposure that leads to recurrent episodes of bronchoconstriction that manifests itself with the typical symptoms of dyspnoea, expiratory wheezing, chest tightness and dry cough, with a chronological spread often at night or in the early hours of the morning. Airway partial obstruction is generalized with varying degrees of damage, usually reversible from a few minutes to a few hours with asymptomatic periods between episodes. However, some patients with chronic asthma have an irreversible degree of airway obstruction.

The global prevalence is increasing in recent years, affecting approximately 300 million people worldwide. This positions asthma as one of the most common chronic diseases, more common in developed countries with a distribution of about 10-12% in adults and 15% in children with about half of cases diagnosed before the age of 10 years and a third before the age of 40.

The increased prevalence in developed countries is associated with urbanization, the increase being noted in the degree of atopic terrain but also in other allergic pathologies which suggests that an increase in the prevalence of asthma has a systemic cause and is not limited to the lungs. The majority of asthma prevalence in patients in developed countries is based on atopia, i.e. those with a genetic predisposition, associated with other allergic diseases such as urticaria, allergic rhinitis in over 80% of asthmatic patients, with allergic sensitization to dust mites and other environmental pollutants as well as animal hair and pollen.

Asthma treatment is directly aimed at correcting airway obstruction by repeated or continuous administration of bronchodilator medication. Asthma medication can be more easily divided into bronchodilator medication that provides a rapid reduction of symptoms mainly by relaxing the smooth muscles in the airways and control medications used to inhibit the underlying inflammatory process.

## Case scenario 1 - Asthma attack

It is spring, flowers are blooming, and you go on a field trip with the school to the local mountainside. The plan is to stay in the mountains for the next week learning survival tactics in the wild. For the first two nights you decide to stay at basecamp in the local cabins.

You notice that your friend has been having slight coughing bouts and a runny nose since the day before, but he states that it is just his usual allergies and that he often gets a runny nose during springtime.

When you enter your cabin, you can feel the room is stuffy, so you and your friend decide to air the cabin out. In doing so you can see that his cough has been getting more persistent, but he quickly diverts attention and asks you to come help the others in starting the fire outside for the evening.

During the night you hear your friend coughing, breathing faster and you see him use his inhaler. He sees you wake up and he tries to comfort you saying that he is fine and not to worry since he has his inhaler with him. He continues that

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he has not really needed his inhaler for years now, and that his mother always used to administer it to him when he had one of his rare asthma attacks. After taking another dose he says he is feeling better and you both go back to sleep.

Less than two hours later you see him at the side of the bed, breathing fast and wheezing, agitated. He says his inhaler is not working and that he does not want to use it anymore but that he's symptoms are getting worse.

He does not want you to wake the others up or want an ambulance because he fears it will ruin the trip for everyone.

What do you decide to do? Would you have changed anything that happened until this point?

## Step by Step Procedure

Action 1. Recognise the emergency! It is very important to assess the situation and act when you see somebody in need of medical help. Studies in Cardiac Arrest survival rates have shown that early recognition is key to proper treatment and in reducing mortality in patients. Early recognition is a critical link in the chain of survival for all medical emergencies.

Action 2 Activate the Emergency Medical Services (EMS) as soon as possible when you think somebody is in need of professional help! If available, seek help from other people in your proximity!

Not all medical conditions require EMS but the dispatcher on the Emergency 112 (European Universal Emergency Number) can help you evaluate, make a decision and even guide you in initiating the first steps of treatment – for example in the case of an Asthma Attack on the proper use of inhalers, in traumatic injuries how to limit blood loss or in even severe scenarios like Cardiac Arrest with the initiation of Chest Compressions.

Action 3 In case you are dealing with an allergic reaction of any form, as can also be the case of Asthma, it is important to identify and remove the patient from the allergen. In the scenario we have just discussed, we can identify a few possible exacerbating factors for the Asthma attack. These are pollen from the blooming flowers, dust and possibly mold from the old cabin at the basecamp. Our patient got worse while being inside so a very good idea would be to get him outside, away from the dust and mold. Be careful not to expose a patient with an Asthma attack to high variables of temperature – exposing the patient from a warm room to cold air could precipitate the symptoms and worsen the respiratory status due to bronchospasm- you can hear the weezing.

Action 4 As the patient in the scenario discussed, not all chronic patients are aware of how to properly use the medical devices they have at their disposal so learning how to use an inhaler is a useful skill to master seeing as the incidence of Respiratory Diseases is on the rise worldwide with Asthma and Chronic Obstructive Pulmonary Disorder being at the top of Pulmonary related diseases.

It is a good idea to always assume your inhaler has not been used in a while so always try to prime it first and then use it.

- Step 1: Remove the cap that covers the mouthpiece.
- Step 2: Make sure it is clean and there is no debris obstructing it.
- Step 3: Hold the inhaler with your index over the top and your thumb on the bottom and shake the inhaler hard for at least 10 times.
- Step 4: While holding the inhaler with the muzzle away from yourself spray it for 2-3 times. Now the inhaler is ready to use.
- Step 5: Make sure to breath out all the way trying to push as much air as you can.
- Step 6: Place the mouthpiece in your mouth and close your lips tightly around it.
- Step 7: While slowly breathing in deeply through your mouth, push the inhaler all the way down.
- Step 8: After the spray has come and you have breathed in all the way, remove the device from your mouth and close it.

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- Step 9: Try holding your breath for at least 10 seconds or for as long as it is comfortable and while exhaling try to breath out as slowly as you can.
- Step 10: If needed you can use a second puff, but it is recommended to limit them to 4 puffs per 24h.

Action 5 Monitor the patient for further deterioration until EMS arrive and maintain good communication with the dispatch in case of any change. You can use a pulsoximeter to measure the oxigen saturation- normal value more than 94%.

**The don'ts for the teachers and the students**

- Do not let the patient to use by himself the inhaler if he is agitated, which is a sign of lack of oxygen, help him because the chance to do not use it correctly in this circumstances is high.
- Do not use more inhaler administrations then the maximum dose recommended, this medication has side effects, usually they will increase the heart rate to much, increasing the oxygen consumption at heart level, this can lead to severe arrhythmias.
- Do not delay the moment to ask for help at 112

## COPD

Chronic obstructive pulmonary disease (COPD) is defined as a disease characterized by incomplete reversible airflow limitation. COPD includes the following conditions:

1) emphysema, an anatomically defined condition characterized by the destruction and enlargement of the lung alveoli;

2) chronic bronchitis, clinically characterized by chronic productive cough;

3) small airway disease - a pathology in which the small bronchioles are narrowed.

Chronic Obstructive Pulmonary Disorder (COPD) is defined as a disease with airflow limitation that is incompletely reversible..

COPD is the third leading cause of death and affects approximately 200 out of 100,000 people in Europe. It has become a pathology of growing public health importance globally.

COPD is forecasted to become the third cause of death in Europe by 2030 as it already affects almost 200 out of every 100.000 people. This has become a growing Public Health issue worldwide.3

Although cigarette smoke is the major risk factor, only 15% of smokers develop COPD, with exposure to dust in occupational environments, chemical exposure and air pollution being other high-risk factors often encountered alongside genetic factors, such as α1 – Antitrypsin.

Although cigarette smoke is a major risk factor, only about 15% of smokers develop COPD, with a majority of high-risk factors being covered by exposure to professional dust, chemical exposure and airway pollutants but also genetic factors as α1 – Antitrypsin deficiency.

The classic symptoms are chronic and progressive dyspnoea (feeling of shortness of breath), coughing and coughing - these symptoms can vary from day to day. It is not uncommon for haemoptysis (coughing up blood) to occur in large quantities, but keep in mind that this may also be a sign of more serious respiratory damage - cancer.

The classical presentation is chronic progressive dyspnoea (the sensation of breathlessness), cough and sputum production with a day-to-day variability in symptom intensity. Haemoptysis (expectoration of blood) in small quantities is not unusual but we need to remember that this can also mean a more sinister lesion of the airways.

The diagnosis of COPD is confirmed by the investigation called esi nate - this is a simple test that measures the amount of air a person can inhale or exhale in a unit of time - in the case of COPD investigations we track expired volume in the first second by a forced expiration. If, after the application of a bronchodilator, the expiratory vital capacity is

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below 80% of the required one, the diagnosis can be made.
In the acute phase it is difficult to differentiate in the first phase from a cardiac cause and a classic exacerbation of COPD.

Chronic COPD treatment begins with smoking cessation and pulmonary rehabilitation. These, combined, slow down the decline in lung capacity; mortality associated with lung pathology and can lead to increased exercise capacity.

Treatment involves the mobilization of secretions and pharmacological treatment, but they only contribute to symptomatic improvement, control exacerbations, increase the quality of life and the capacity for effort - although desirable they do not change the progression of the disease.
Ultimately, adopted as a long-term treatment is oxygen therapy which has been shown to be effective in reducing COPD mortality. Care must be taken in oxygen therapy to provide large volumes of oxygen to patients with COPD as this can depress their respiratory centre by accumulating large amounts of CO2 - it is important to remember that patients in this situation look good in the first phase, comfortable but become drowsy and unresponsive and the delay in recognizing this status ultimately leads to apnoea and death if no emergency medical measures are instituted.

## Case scenario 2 - COPD Exacerbation Episode

You are going to visit your grandma in the local suburbs. As you get off the bus and head towards her house, you see Mr. Smith (Generic name), the nice gentleman whom always came by to visit on your grandparents, coughing and looking distressed on his porch.

You hastily head to him – Mr. Smith smiles as you approach but starts having another coughing fit and you can see the handkerchief in his left hand to be spotted with bright red dots. He finally manages to compose himself slightly and asks you to get his blue inhaler that fell behind the table; you hand it to him, and he wastes no time using it.

You offer to call for the ambulance, but he waves your request, chuckling through the coughs and saying that it is nothing but his COPD acting up and that he had this a plenty of time before and you need not be worried.

After using the inhaler again, he seems to feel better and asks you to go inside and get his nasal cannula and his oxygen tank. He says that he has two tanks one downstairs and one upstairs, but the one downstairs has no more oxygen in it and he has been unable to climb the stairs for the last two days.

As you walk up the stairs you can hear Mr. Smith breathing fast and heavy, coughing rigorously. You get the tank back down and you see him setting it to 10l/min and he seems really happy saying that he has not had it for the past couple of days, so he needs to catch up – you see his respiratory rate slow down and him looking a lot better.

He kindly thanks you for all your help and asks you to send his regards to your grandmother.

As you turn to leave you have a moment of unease and stop to think.

What do you decide to do next? Would you have done anything differently?

## Step by Step Procedure

Action 1 Recognise the emergency! It is particularly important to assess the situation and act when you see somebody in need of medical help. Studies in Cardiac Arrest survival rates have shown that early recognition is key to proper treatment and in reducing mortality in patients. Early recognition is a critical link in the chain of survival for all medical emergencies.

Action 2 Activate the Emergency Medical Services (EMS) as soon as possible when you think somebody is in need of

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professional help! If available seek help from other people in your proximity!

Not all medical conditions require EMS but the dispatcher on the Emergency 112 (European Universal Emergency Number) or 999 (for the United Kingdom) can help you evaluate, make a decision and even guide you in initiating the first steps of treatment – for example in the case of an Asthma Attack on the proper use of inhalers, in traumatic injuries how to limit blood loss or in even severe scenarios like Cardiac Arrest with the initiation of Chest Compressions.

Action 3 Not all chronic patients are aware of how to effectively use the medical devices they have at their disposal so learning how to use an inhaler is a useful skill to master seeing as the incidence of Respiratory Diseases is on the rise worldwide with Asthma and Chronic Obstructive Pulmonary Disorder being at the top of Pulmonary related diseases.

It is a good idea to always assume your inhaler has not been used in a while or has maybe been dropped as was the case in our scenario so always try to prime it first and then use it.

- Step 1: Remove the cap that covers the mouthpiece.
- Step 2: Make sure it is clean and there is no debris obstructing it.
- Step 3: Hold the inhaler with your index over the top and your thumb on the bottom and shake the inhaler hard for at least 10 times.
- Step 4: While holding the inhaler with the muzzle away from yourself spray it for 2-3 times. Now the inhaler is ready to use.
- Step 5: Make sure to breath out all the way trying to push as much air as you can.
- Step 6: Place the mouthpiece in your mouth and close your lips tightly around it.
- Step 7: While slowly breathing in deeply through your mouth, push the inhaler all the way down.
- Step 8: After the spray has come and you have breathed in all the way, remove the device from your mouth and close it.
- Step 9: Try holding your breath for at least 10 seconds or for as long as it is comfortable and while exhaling try to breath out as slowly as you can.
- Step 10: If needed you can use a second puff, but it is recommended to limit them to 4 puffs per 24h.

Action 4 In patients with Chronic Obstructive Pulmonary Disorder oxygen treatment is often prescribed as it improves the quality of life and decreases mortality so for those in distress administering oxygen will improve control of symptoms. Most commercial oxygen cylinders are limited to a maximum of 4 litres of oxygen per minute but not all, so in situations where it is not - remember that higher oxygen levels will depress a patients with COPD's respiratory centre and decreased respiratory drive which can lead to apnoea and Cardiac Arrest.

Action 5 Monitor the patient for further deterioration until EMS arrive and maintain good communication with the dispatch in case of any change.

**The don'ts for the teachers and the students**

- Do not let the patient to use by himself the inhaler if he is agitated, which is a sign of lack of oxygen, help him because the chance to do not use it correctly in this circumstances is high.
- Do not use more inhaler administrations then the maximum dose recommended, this medication has side effects, usually they will increase the heart rate to much, increasing the oxygen consumption at heart level, this can lead to severe arrhythmias.

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- Do not delay the moment to ask for help at 112.

## Pneumonia

Pneumonia is the most common infectious disease and its management requires increased attention. It is defined as acute inflammation of the lower respiratory tract and lung parenchyma, manifested by a clinical syndrome of fever, cough, shortness of breath and malaise1. Lower respiratory tract infection causes 3.9 million deaths a year worldwide, of which 1.8 million are in children under five2. Pneumonia is also one of the most common infections in elderly patients. As with young adults, the pathogens responsible for pneumonia are similar in the elderly. In elderly patients, pneumonia is associated with increased mortality and morbidity compared to younger patients due to associated cardiopulmonary disease and/or immunodeficiency3. The most common cause of bacterial pneumonia is Streptococcus pneumoniae, accounting for about 40% of cases4. The infection develops in the distal airways and spreads to the adjacent lung, involving partially or completely segments of the lung and occasionally an entire lobe3.

Associated clinical picture: dyspnoea of variable intensity, fever, chills, physical asthenia, chest pain described as a chest stab secondary to inflammation of the parietal pleura. The diagnosis is established based on radiological and biological investigations (inflammatory syndrome of high intensity). Chest radiographs have been shown to be of little relevance in predicting the causative pathogen. Their usefulness is best in determining the severity of pneumonia and in detecting complications such as parapneumonic effusions. Based on the radiographic appearance, in adults, a general classification can be made into: lobar pneumonia, bronchopneumonia and interstitial pneumonia. Most cases of pneumonia can be diagnosed only on the basis of chest radiography as the only imaging form, but through computed tomography (CT) can be detected forms of pneumonia that are not visible on chest radiography in hospitalized patients5.

Therapeutic management involves: complex monitoring of the patient, support of respiratory function (oxygen therapy, assisted ventilation), support of cardio-respiratory function, hydro-electrolytic and acid-base rebalancing and initial broad-spectrum treatment with antibiotics until the antibiogram is performed.

## Case scenario 3 - Severe Pneumonia

72-year-old woman is found at home by her nephew, apparently unconscious. From his statements we note that the patient complains of dry cough, myalgias, headache, marked physical asthenia, fever, shivering at home. Symptomatology declared start 5 days ago. Self-administered treatment at home: antipyretics. You are visiting her nephew and he told you all of this, and you are willing to help her. How do you act?

## Step by Step Procedure

Evaluation of the area for the safety of the rescuer and evaluation of the patient's state of consciousness

Before approaching, we will make sure that the space where the lady was found is safe for both the rescuer and the victim. We will assess the state of emergency. The patient will be stimulated tactilely and verbally. Tactile stimulation will be performed by gently shaking the patient's shoulders and she will be asked "Ma'am, are you feeling well?

- If the patient does not respond - she is considered unconscious.
- Ask the nephew for help.

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- Airway release:
- Initial -gargling

After releasing the airway by performing the hyperextension manoeuvre of the head and lifting the chin (the rescuer will be placed on the side of the victim, will place one hand on the patient's forehead and with the other hand under the chin, make a balance movement and head will be given on the back), clean the patient's mouth of liquid or other foreign bodies, with absorbent materia (something made from cotton)l or with one finger, depending the nature of the foreign body. If it is possible also put for a short time the herad on a side, to help elimination of any fluid which is in the mouth.

Evaluation of breathing:

- Keeping the airway clear (the rescuer remaining in the position he had at the time of performing the manoeuvre of hyperextension of the head and lifting the chin) will evaluate the breath for 10 seconds bringing the cheek and ear close to the patient, looking at the chest to see if there is thoracic expansion, if respiratory noises are heard and if the patient's breaths are felt).
- The patient has noisy breathing and increased breathing effort.
- The victim will be positioned in a recovery position (lateral position), periodically evaluating the patient, until the help arrive.
- The unique emergency service 112 will be called, the emergency situation of the patient will be presented, and the location will be specified, providing important landmarks, known to the majority.

**The don'ts for the teachers and the students**

- In the case of a patient who is unconscious but breathing, recovery position will always be used. Do not leave the victim lying down on his back, this increases the risk of regurgitation and aspiration of mouth or gastric contents.
- Do not delay the moment of asking for help at 112, especially if the patient become confuse or even worse, unconscious, in pneumonia. This is due to oxygen deficit. Is very important to administer oxygen as soon as possible to someone with severe pneumonia.

## Pneumothorax

Pneumothorax is a common clinical problem and is defined as the presence of air between the visceral pleura and the parietal pleura with consecutive retraction of the lung[1]. Although intrapleural pressures are negative throughout the respiratory cycle, air does not enter the pleural space but, if air is present in this space, it is possible that one of the following events may have occurred: 1) communication between the alveolar space and the pleura; 2) direct or indirect communication between the atmospheric space and the pleural space; or 3) the presence of gas-producing organisms in the pleural space[2,3].

The exact pathogenic mechanism involved in the spontaneous appearance of a communication between the alveolar spaces and the pleura remains unknown. Most authors believe that spontaneous rupture of a subpleural blister is always the cause of spontaneous pneumothorax. Primary spontaneous pneumothorax (PSP) is defined as the spontaneous presence of air in the pleural space in patients without clinically obvious underlying lung disease. It has an incidence of 7.4 to 18 cases (age-adjusted incidence) per 100,000 men and 1.2 to 6 cases per 100,000 women[4] .

Pneumothorax of traumatic cause is classified, depending on the type of trauma: penetrating and non-penetrating

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(blunt). A special form of traumatic pneumothorax is iatrogenic pneumothorax that occurs secondary to diagnostic and/or therapeutic interventions[5,6].

The clinic of the patient with pneumothorax can vary from an asymptomatic to a life-threatening situation.

The initial therapeutic management is imposed by the patient's clinical condition. In the case of a critical patient with a massive pneumothorax that is associated or not with haemothorax, it is necessary to perform the exsufflation point and the immediate insertion of a thoracic drainage tube. Thoracic drainage tube insertion is still the accepted therapeutic standard, but other procedures, such as aspiration of air through a small needle or catheter, especially for small spontaneous pneumothorax, are also alternative therapy options.

The short-term goal is to possibly treat existing dyspnoea and pain; and in the long term, prevention of cardiorespiratory arrest and prevention of recurrence of pneumothorax[7].

## Case scenario 4 - Tension pneumothorax

25-year-old man, victim of a road accident, frontal impact between two cars, he was on right front seat, wearing a seat belt, complains of pain and difficulty breathing in the right hemithorax. The patient declares that he don't remember what was happening in the moment of accident, is agitated, pale and sweaty. You are on the road to home, stop your car and asses the scene of accident, trying to help the victim. How do you act?

## Step by Step Procedure

- Step 1. Evaluation of the area and evaluation of the patient's state of consciousness
- Upon arrival at the scene of the accident, the area will be evaluated to ensure the safety of both the rescuer and the victim during the provision of first aid measures.
- Step 2. The patient's state of consciousness is assessed by tactile and verbal stimulation (Sir, are you feeling well?)
- The victim himself get out of the car. He is lying on his back on the grass and asks where his phone is.
- Step 3, The patient's cervical spine will be maintained in the axis, explaining the importance of limiting cervical movements until a stiff neck is used.
- Step 4. The unique emergency service 112 will be called, offering details about the location of the accident, the number of victims and details about the severity of the possible injuries present in the victims.
- Step 5. Evaluation of breathing by measuring respiratory rate (RR 24 / min), monitoring chest expansion at inhale and exhale.
    - Inspection: right hemithorax is increased in volume compared to right hemithorax.
    - Increased respiratory effort, asymmetric chest expansion (reduced on the right)
    - Palpation: Sensitivity, subcutaneous emphysema and right hemithorax crackles
    - Percussion: normal resonance on the left, hyperresonance in the right hemithorax
    - Cervical region: trachea deviated to the left, without any wounds, distended jugulars
    - The patient complains of dyspnea, pain and difficulty breathing in the right hemithorax. No wounds at this level.
- We will look for the clinical elements specific to the immediately life-threatening injuries specific to breathing, and all the sign indicate a tension pneumothorax.
- Step 6. Cardiac and circulatory system evaluation: by checking pulse rate, measuring the capillary refill time (apply pressure with one finger on the patient's sternum and measure the recoloration time), check for any visible bleeding.

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- The patient has pale, cold, moist skin without external bleeding CRT> 3 sec, pulse rate is 110/min.

- Step 7. Try to communicate with the victim, explaining do not move his head and maintain his head with your hand if you see that he is trying to move. Stay near him until the help arrive.

**The don'ts for the teachers and the students**

It is not recommended to mobilize polytraumatized victims, in these situations first aid will be granted with the recommendation to keep the head and the spine in the axis. It is allowed to move the victim with minimum head and cervical spine immobilization only when the life of the victim is in danger and we need to move him in a safe area.

Do not delay the moment to ask professional help at 112, Tension pneumothorax is a critical situation which require emergency decompression of the pleural space, otherwise the patient will stop breathing with efficacity.

## Haemoptysis

Hemoptysis means the expectoration of blood from the bronchial trachea tree or from the lungs. Severity varies from mild to severe, which can be difficult to stop. From a medical point of view, the challenge is to stop the bleeding at the same time as diagnosing the patient. Most hemoptysis situations are mild and resolve spontaneously, but it is difficult to predict which of those with an initial minor presentation will progress to significant bleeding.

Hemoptysis occurs from damage to the blood vessels in the walls of the airways from the trachea to the bronchioles and the lung parenchyma. The reason why most bleeding takes place in the bronchial tree is due to the fact that the arterial circulation for it branches directly from the aorta and thus represents circulation with high pressures.

Estimating the amount of blood loses is difficult because patients may exaggerate or not quantify the amount correctly, but it is important to pay attention to each case because even a small amount of blood can lead to asphyxiation of the patient, if the pacient is unconscious.

Many inflammatory and infectious pathologies can promote bleeding. Coughing in the presence of a local acute inflammatory process can cause minimal bleeding even in a healthy patient. Chronic pathologies such as chronic obstructive pulmonary disease (COPD), tuberculosis or neoplasms can lead to local changes in circulation to the alveoli which leads to the creation of fragile local structures, prone to rupture and thus promotes the occurrence of more abundant bleeding.

Trauma can cause hemoptysis through deceleration injuries or penetrating trauma.

It is important to check the source of the bleeding and that it is not as benign as bleeding from the oral or nasal cavity.

The overall risk assessment in patients depends on the rate of bleeding, the patient's ability to remove by himself the blood from the mouth and the presence of an underlying pathology, an assessment that is best performed in a control environment by a specialist.

## Case Study 5 - Hemoptysis

1. It is winter, and you are on a holiday with your friends in one of the best winter resorts in the region. After two days out skiing and snowboarding you see that one of your friends has developed a dry cough.

Later in the night your friend has a coughing bout, and you see him getting anxious after he sees small specks of blood on his handkerchief but does not repeat the episode again.

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Your cabin is a 2h drive from the closest city and medical centre, what do you opt to do?

2. You are visiting your grandparents and they are setting up. Your grandma cannot stop talking about how your grandfather finally stopped smoking and she constantly showers him with praise. Grandfather has stepped out for some time and you must go get him to join you for dinner.

When you get to the door to his workshop you hear him coughing inside, you enter and are surprised to find him with a blood-stained handkerchief to in his hand, breathing hastily and grabbing for the chair.

What do you decide to do?

## Step by Step Procedure

***Action 1*** Recognise the emergency! It is very important to assess the situation and act when you see somebody in need of medical help. Studies in Cardiac Arrest survival rates have shown that early recognition is key to proper treatment and in reducing mortality in patients. Early recognition is a critical link in the chain of survival for all medical emergencies.

***Action 2*** Activate the Emergency Medical Services (EMS) as soon as possible when you think somebody is in need of professional help! If available seek help from other people in your proximity!

Not all medical conditions require EMS but the dispatcher on the Emergency 112 (European Universal Emergency Number) or 999 (for the United Kingdom) can help you evaluate, make a decision and even guide you in initiating the first steps of treatment – for example in the case of an Asthma Attack on the proper use of inhalers, in traumatic injuries how to limit blood loss or in even severe scenarios like Cardiac Arrest with the initiation of Chest Compressions.

In the two scenarios described above there is a clear risk differentiation between the two patients but without the experience to make such a decision on your own we always encourage you to pick the safer route. Call your local Emergency Medical Services and they will help you make the right decision for you or your friend and family.

The don'ts for the teachers and the students

- If someone is coughing and associated have haemoptysis, call 112 and ask for help, sometime this could be a sign of a life threatening situation.
- If the patient is unconscious, but breathing, put him on a side, in recovery position. The biggest threat in this case is asphyxia with his own blood.

## References

[1] Tintinalli J, Stapczynski S, Ma J et all, Tintinallis Emergency Medicine 8th Edition, McGraw-Hill Educational, 2016, pg 436-437, *Treaty of Emergency Medicine*

[2] *Serini, R. Zacchetti, M. Ghislanzoni, and G. F. Villa, "MANUALE DI PRIMO SOCCORSO."*

[3] *Greaves, K. Porter, and J. Garner, Trauma care manual. CRC Press, 2008.*

[4] Jantz MA, Anthony VB Pathophysiology of the pleura. Respiration 2008; 75: 121–133

[5] M Noppen Spontaneous pneumothorax: epidemiology, pathophysiology and cause Eur Respir Rev 2010 Sep;19(117):217-9. doi: 10.1183/09059180.00005310.

[6] Alifano M, Forti Parri SN, Bonfanti B, et al. Atmospheric pressure influences the risk of pneumothorax: beware of

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the storm!. Chest 2007; 131: 1877–1882.
[7] Bense L, Eklund G, Wilman LG Smoking and the increased risk of contracting spontaneous pneumothorax. Chest 1987; 92: 1009–1012.
[8] Zhang J, Xu K, Chen X, Qi B, Hou K, Yu J. Immediate pneumothorax after neurosurgical procedures. J Int Med Res. 2020 Dec;48(12):300060520976496. doi: 10.1177/0300060520976496
[9] Kim KH. Tension Pneumothorax after Attempting Insertion of a Central Venous Catheter. Acute Crit Care. 2018 Nov;33(4):280-281. doi: 10.4266/acc.2017.00598. Epub 2018 Nov 13.
[10] M Swierzy, M Helmig, M Ismail, J Rückert, T Walles, J Neudecker Pneumothorax Zentralbl Chir. 2014 Sep;139 Suppl 1:S69-86; quiz S87. doi: 10.1055/s-0034-1383029.
[11] J H Reynolds, G McDonald, H Alton, S B Gordon Pneumonia in the immunocompetent patient Br J Radiol. 2010 Dec;83(996):998-1009. doi: 10.1259/bjr/31200593.
[12] World Health Organization The global burden of disease WHO Press, 2019
[13] Cunha BA Pneumonia in the elderly. Clin Microbiol Infect. 2001 Nov;7(11):581-8. doi: 10.1046/j.1198-743x.2001.00328.
[14] Tuomanen E, Austrian R, Masure HR. Pathogenesis of pneumococcal infection. N Engl J Med 2009;332:1280–4.
[15] Boersma W, Daniels J, Lowenburg A, Boeve WJ, van deJagt E. Reliability of the radiographic findings and the relation to etiologic agents in community acquired pneumonia. Respir Med 2006;100:926–32
[16] Kasper D, Fauci A, Hauser S, et all, Harrison's Principles of Internal Medicine, McGraw-Hill Professional, 2015, pg 1700-1704, Treaty of Internal Medicine
[17] Ignacio B., Isidro D., Patricia B. et all „Geographical distribution of COPD prevalence in Europe, estimated by an inverse distance weighting interpolation technique", International Journal of Chronic Obstructive Pulmonary Disease, 2018; 13:57-67 PMID:29317811

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# Module 4

# Traumatology

## Introduction

Traumas represent the most common emergency situation. It is reported that traumas cause about 7% of the global deaths and they are classified as the leading cause of death in people younger than 40 years of age. It is very important for first aid responders to know the basics of muscle-skeletal anatomy and which the most common complications and life threatening situations are that patients may undergo when a trauma occurs. We know from the scientific reports that a trauma, when it is not followed by the death of the patient, is associated with important sequelae for patients, and it is a problem also from a social and economic point of view [1].

Firstly, it is important to keep in mind that rescuer's and patient's safety are the most important aspects to obtain and preserve. Once a trauma situation is safe, rescuers are supposed to perform basic maneuvers aimed at damage control and preservation from future complications for the patient.

Traumas can be divided into:

- Major Traumas (and Politraumas), when the trauma interests two or more body districts with important risks for patients. Patients need to be hospitalized at a Trauma Center Hospital as soon as possible, in order to prevent important complications or death. We call this time "The Golden Hour" as it is crucial for the patient to receive precocious diagnosis and treatments.
- Minor traumas, when they interest a single, peripheral, body district. In these situations, first aid responders should perform basic maneuvers aimed to prevent secondary damages (i.e. by limiting movements in fractures), hemorrhages or infections (in case of exposed tissues) [2], [3].

Another important thing rescuers should remember is that the dynamics of a trauma is a fundamental hint for doctors who will treat the patient, especially in case of late complications. First aid responders should collect all the information about the trauma (i.e., in case of car crashes) and report them once the emergency team arrives.

In the following boxes, rescuers will learn simple maneuvers everyone should perform in trauma situations, in order to give patients the best chance of survival and the lowest complications rate possible.

## Twists

A twist is an injury which results from an abnormal movement, over the normal range of motion. Typically, a twist causes minor damage to ligaments, muscles, and/or blood vessels.

Usually the injured part of the body is painful, swollen and bruising.

A twist is not a life-threatening situation. Indeed, the rescuer should only make sure the injured person prevents any movement which may worsen the twist, applying the RICE algorithm (Rest, Ice, Compression, Elevation).

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## Case Scenario 1 - Twists

It is a sunny day and you and your friend decide to go hiking in the mountains. Since you have studied at school that traumas are the most common situations in this kind of activity, you fill up your rucksack with instant ice and some elastic bandage.

You are walking on an impervious path, when suddenly your friend falls down, because his ankle was twisted in a hole on the path. The ankle is swollen and very painful at any movement. You know that, in case of twists, the best thing to do is to apply the RICE algorithm, so you apply an ice bag on the ankle and fix it with the bandage you brought.

After some minutes your friend is ready to stand up; however, it is very important not to walk on the affected ankle. Conversely, in these cases it is useful to step on one foot and so you offer your support and together you can reach the car and go back home.

## Step by Step Procedure

- Check for consciousness and do the primary survey
- Check for major injuries and treat them first doing the appropriate checklist, especially in case of:
    - Head/spine trauma
    - Hemorrhages
- Uncover the injured joint, remove all things that can restrict or slow down the blood flow
- Place an ice pack inside a gauze or a tissue and keep that in contact with the injured joint as long as possible
- Keep the joint at rest, convince the person to not move or use it

***The don'ts for the teachers and the students***

- Don't fix the joint properly
- Don't observe immobilization of the interested part

## Dislocations and Fractures

A dislocation is an injury in which the ends of bones are forced from their regular positions. A dislocation is usually caused by road accidents, falls, collisions during contact or high-speed sports. As a result of a dislocation it may happen that tendons, nerves, ligaments, muscles and blood vessels near the injured joint are bruised or torn.

A dislocation is characterized by discoloration and rapid swelling. Also, the person is unable to use the joint due to severe pain and muscle spasms. Other possible symptoms are numbness, loss of pulse below the joint and shock. After a dislocation, the articular architecture could be restored spontaneously or it may be necessary to perform some maneuvers to restore it.

A fracture is the medical term used to define a broken bone. Fractures can be divided into closed, if the bone breaks without any puncture or open wounds in the skin, and opened, in case the broken bone penetrates the skin and becomes exposed to external agents and infections.

The principal signs of a fracture are summarized by the acronym DOTS: Deformity, Open Wounds, Tenderness, Swelling.

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In case of dislocations or fractures it is important to move the person only if it is necessary to avoid further injuries and to stop any bleeding that may occur (see the *hemorrhages chapter*). Then, you should immobilize the injured area avoiding to realign or push in the bone. Consider applying a splint to the area above and below the fracture site only if you are trained to do so. In order to limit swelling and pain, you can apply ice, wrapped in a towel, while waiting for professional help. If the person feels faint or is breathing in short and rapid breaths, lay the person down with the head slightly lower than the trunk and elevate the legs only if it does not cause any further injury (Trendelenburg maneuver).

## Case Scenario 2 - Dislocations and Fractures

You are playing a football match with your friends. After a collision between two players, one of them falls down, and he is not capable of standing back up. You notice that, on the surface of his leg, there is a wound and you see part of the bone in it. The leg is not straight and the deformity makes walking on it totally impossible; blood is not flowing from the wound. You check if there is a pulse on the foot and you find it, after that you ask your friend if the sensibility of the foot is preserved, and he answers positively.

You take out from the medical pack some gauzes and sterile water in order to clean up the wound. After that, you pack it and place some wrapped ice on the part. With the help of the other players, you help your friend to lay on the back and you splint the leg in a fixed position using gauzes and wraps. Then, you call the ambulance explaining that either peripheral pulse or sensibility are preserved. Once the professional help arrives, it is possible to definitively splint the leg and to transport the player to the nearest hospital to reduce the fracture and make him recover.

## Step by Step Procedure

- Check for consciousness and do the primary survey
- Check for major injuries and treat them first doing the appropriate checklist, especially in case of:
  - Head/spine trauma
  - Hemorrhages
- Uncover the injured joint, remove all things that can restrict or slow down the blood flow
- In case of exposed wounds try to clean them up with sterile water and gauzes
- Use anything to make a splint and immobilize the injured part as it is, moving the part as little as possible, some advice is: cardboard, paper notebooks, wooden boards or sticks/cane
- Fix the splint from the joint immediately before the wound to the joint immediately after. If the wound is on the thigh, splint the complete leg from the side to the ankle
- Check the most peripheral part for temperature drop, absence of pulses, loss of sensibility and discoloration, if these happen, warn 112 about this

**The don'ts for the teachers and the students**

- Don't try to manually reduce the fracture or dislocation
- Don't move or walk on the fractured/dislocated part
- Don't forget to check peripheral pulses, sensibility, discoloration and temperature

## Spines injuries and head traumas

Traumatic Brain Injuries (TBI) are the leading cause of death among 14-44 aged people. The most common cause is

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represented by car crashes and sport traumas.

As we know, the brain is the most important organ of our body, it is contained inside a “box” represented by the head bones and it is surrounded by the cerebral fluid with the aim to protect it from traumas and hits. The brain is composed by the neurons, a very delicate tissue, very susceptible to rupture and edema. As TBI occurs the brain starts suffering with swelling of the traumatized part and it leads to an increase of the intracranial pressure that normally is very controlled by the vascular system. If this situation of increasing pressure is not recognized and treated on time, it can drive the patient to death; for this reason, it is important to rapidly activate the emergency system and to provide to the patient some basic maneuvers aimed to limit the primary and secondary damages until the ambulance arrives.

Another dangerous condition is represented by spinal injuries: as we know the spinal cord is a crucial part of our nervous system as it brings all the information from the brain to the muscles and the other way around. It is common that major traumas interest the backbone of the patient, sometimes patients suffer from tingling, change in sensibility and pain interesting the upper and lower limbs (it depends on the level where the injury occurred). It is very important, as first aid actors, to prevent any movements of the backbone while transporting the patient to the nearest hospital, or just while waiting for the emergency team to arrive. Remember that in any case you should monitor patients’ consciousness (using AVPU scoring, see Neurology chapter) in any phase of the transport, as any alteration of it is an important sign of an evolving situation and it must be communicated to the emergency system in order to provide the most rapid intervention possible.

## Case Scenario 3 - Spines injuries and head traumas

At the swimming pool you and your friends are plunging from the diving board. Its surface is wet and your friend slips on it, falling 3 meters down. You suppose he has hit his head and, as you learned at school, you know that the most important things to do are to provide your friend's neck immobility and to continuously check his consciousness, while another friend activates the Emergency System.

Your friend is able to speak and he answers correctly to your questions but he is not able to remember what happened. You suppose he is at an A level in the AVPU conscious state scale and you feel a little bit calmer. You ask him if he is suffering from tingling or change in sensibility and he tells you that the sensibility of his right leg is more attenuated than the left one and he is incapable to move right foot.

The ambulance is 10 minutes away from you so you keep your position but now he is not able to keep his eyes open and the speech has become more difficult. You then try to hurt him and he answers correctly shouting and mumbling, you have rapidly passed to a P level and you alert the Emergency System.

As the ambulance arrives, you tell the crew what happened to your friend and that you are supposing a spinal cord injury with interest of the right inferior limb and evolving TBI which need the most rapid hospitalization possible.

## Step by Step Procedure

- Check for consciousness and do the primary survey, avoiding shaking the person and keeping the head-neck-torso aligned
- Check for major injuries and treat them first doing the appropriate checklist, especially in case of

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hemorrhages. Eventually ask the person to stay still or ask someone to hold firm the head in position

- Keep firmly the head of the person in the position you found it

If consciousness is present:

- Ask and persuade the person to not move and wait for rescuers. If the person is not calm and he tries to stand up, let him do it, do not force him down.
- If the person needs to vomit, use the lateral position for trauma

If consciousness is not present:

- Do the cardiopulmonary resuscitation, avoiding a complete hyperextension of the head if possible, doing a moderate extension

If the skull is damaged in any point, avoid putting pressure on the wound

**The don'ts for the teachers and the students**

- Don’t move the patient or let him move
- Don’t forget to continuously check patient’s consciousness
- Don’t waste time before activating the Emergency System

## Hemorrhages

A hemorrhage is the loss of blood from the circulatory system. It can occur internally or externally, either through a natural opening (i.e. mouth, nose, ear) or through a wound.

External bleeding can be defined according to the type of vessel the blood flows out of. In case of arterial bleeding the blood is typically bright red and it comes off the wound rapidly, in a pulsating and spurting way. Venous bleeding instead is characterized by dark red blood and a steady flow. Finally, capillary bleeding is the result of superficial wounds and is marked by small amounts of blood flow. Other than blood flow, hemorrhages may be characterized by shock, bruising and, in case of internal hemorrhages abdominal or chest pain, swelling, blood in the stool, urine, vomit or vaginal bleeding.

A hemorrhage is a medical emergency and the injured person must be evaluated in the emergency room. However, actions should be taken to provide first aid while waiting for professional help. The very first action is to wash the hands and wear gloves. Then, the main concern is to stop the bleeding. This can be achieved by applying pressure directly onto the wound using sterile bandage or a clean cloth. If the bleeding does not stop with direct pressure you can squeeze the main artery which delivers blood to the area. Once the bleeding has stopped it is important to immobilize the injured part of the body and get the person to the emergency room as soon as possible. In case of internal bleeding it is required to assist the victim, checking the vital signs and eventually treating him/her for shock.

## Case Scenario 4 - Hemorrhages

Your grandfather is working in the workshop using a circular saw to cut some wooden panels when he accidentally cuts his left index finger. The left hand starts substantially bleeding and your grandfather is screaming for pain and fright. You invite him to sit down and try to handle the situation: the bleeding is a massive arterial bleeding and you

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know you have to make direct pressure on the part with the use of many gauzes, so you start doing it while you keep the conscious state under control.
As he stops screaming, you notice he is becoming pale and his speech is not fluent, he feels like he is fainting so you make him lie down on the floor.
Your brother has already activated the Emergency System but now you ask him to recall and you communicate to them that the consciousness state is getting worse and that you are not able to feel the radial pulse properly. They suggest you lift his legs and to keep his hand higher than the rest of the lying body, in order to prevent the bleeding from worsening. He becomes completely conscious again and, after the ambulance arrives, he is transported to the nearest hospital to receive the most proper treatment.

## Step by Step Procedure

- Check for consciousness and do the primary survey
- Check for major injuries and treat them first doing the appropriate checklist, especially in case of Head/spine trauma
- Uncover the injured point
  - If it is possible to make direct pressure on the wound, apply it with one or both hands, continue to add gauzes, never remove them, until the blood flow stops. Keep pressure for at least 10 minutes
  - If it's not possible to make direct pressure on the wound, make pressure on the compression point of the injured limb, keep the pressure until the blood flow stops and for at least 10 minutes
- In any case of hemorrhage call 112 to bring the person at medical attention
- If consciousness is present:
  - Ask and persuade the person to not move and wait for rescuers. If the person is not calm and he tries to stand up, let him do it, do not force him down.
  - If the person needs to vomit, use the lateral position for trauma
- If consciousness is not present:
  - Do the cardiopulmonary resuscitation, avoiding a complete hyperextension of the head if possible, doing a moderate extension
- If the skull is damaged in any point, avoid putting pressure on the wound

**Special cases**

- Nose Bleeding
  - Pinch the soft tissues of the nose to stop the blood flow and keep them pressed for at least 10 minutes, after that time if the bleeding restarts, call 112
  - Use ice or cold water directly on the nose, do not insert anything (especially cotton) inside the nose
- Ear Bleeding
  - If it's a small bleeding treat it like a wound
  - If it's a big bleeding with blood dripping from the ear and/or especially after any head injury, do not stop the hemorrhage, instead if possible keep the head firm and with the ear facing downward to facilitate the blood to leave the skull
  - In any case of head injury call 112

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**Internal bleeding**

Internal bleeding cannot be seen from an external examination but can be suspected from the accident dynamics., As you cannot stop an internal bleeding any suspicion of it needs to be ruled out in the emergency room

***The don'ts for the teachers and the students***

- Don't waste time before calling for help
- Don't forget to check the consciousness state of the patient
- Don't make pressure below the bleeding wound

## Wounds

Wounds are the most common and simple traumas people usually face. A wound can have different levels of depth, it can be bleeding or not, it can be clean or dirty. In any case, what a rescuer is supposed to do when dealing with a wound is to identify the type of wound, to check for any ongoing bleeding and to provide cleaning of the surface before packing it with gauzes.

It is possible to clean a not-bleeding wound using some sterile water; it is also important to provide sterility using a disinfectant: there are many types of disinfectant, some of them usually cause tissue damage if applied directly on the skin. For this reason it is recommended to use a sterile gauze to put disinfectants on the interested part.

Special attention should be paid to those wounds caused by a dirty iron tool or anything else which has been in contact with the soil: in those cases it is recommended to access the nearest first aid in order to receive tetanus vaccination.

## Case Scenario 5 - Wounds

You have cut your hand with a knife, the wound is superficial and it's not actively bleeding. You are able to dress your wound properly since you have attended a first aid course at your school and you know that it is very important to provide cleaning and sterility of the wound before dressing it. You check the mobility of your fingers and once stated they are ok you wash the cut with sterile water, in order to remove any residue from it. Once cleaned you put some disinfectant on a sterile gauze and you put it on the surface. After this action has been completed, you are able to pack the hand with sterile gauzes and elastic tapes and to go to the doctor in order to assess if it is necessary to stitch the cut or not.

## Step by Step Procedure

- Check for consciousness and do the primary survey
- Check for major injuries and treat them, first going to the appropriate checklist, especially in case of:
  - Head/spine trauma

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- Hemorrhages

- Wash the wound with water or water with basic soap to clean it
- Let the wound dry or dry with a sterile gauze
- Use the disinfectant with another sterile gauze to disinfect all the wound surface
- At least use two layers of sterile gauzes, (possibly more) to cover all the wound surface
- Fix the gauzes in place with any adhesive tape, using it only on the sides of the gauzes, do not cover all the surface with the tape
- In case a pressure bandage needs to be made, fix the gauzes at the desired pressure with one or more bandage rolls before using the adhesive tape

***The don'ts for the teachers and the students***

- Don't pack a bleeding wound without making pressure on it
- Don't pack dirty wounds
- Don't use disinfectant directly on the flesh (especially in case of alcoholic disinfectants)

## References

[1] M. G. Balzanelli, *Manuale di Medicina di Emergenza e Pronto Soccorso. Chapters 10, 12, 14, 15, 17,18,19*
[2] M. G. Cline, D; Ma O., Cydulka R., Thomas S., Handel D., *Tintinalli's Medicina d'urgenza*. Chapter 11, 158, 159, 162-177
[3] *M. Chiaranda, Urgenze ed emergenze. Piccin., 2007. Chapters 28,-33,35*

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# Module 5

# Poison and poisoning

## Introduction

Poisoning is among the most common and dangerous situations that can occur, especially in the domestic environment.

It is estimated that accidental or planned ingestion of drugs and poisons represent a significant global public health problem. According to the World Health Organization, in 2012 an estimated 193,460 people died worldwide from unintentional poisoning. Of these deaths, 84% occurred in low- and middle-income countries. In the same year, unintentional poisoning caused the loss of over 10.7 million years of healthy life [1].

The most important aspect to take in account when facing such a situation is to provide rescuers' safety, as some products may be very dangerous for everyone who enters in contact with them. Another important aspect is the precocious identification of the substance; this is crucial information, as it makes it possible to know in advance the degree of the damage to the patient and to give him/her the correct antidote [2].

The damage resulting from ingestion of poisons may be mechanical, i.e. causing burns on the patient's mucosa; or chemical, i.e. mediated by the direct effect of the poisonous substance on the human body. Some substances have a direct negative effect on the central nervous system and may rapidly lead to coma and death, others may hurt the cardiovascular system causing life threatening arrhythmias [3].

What a rescuer should do when in contact with someone poisoned or intoxicated is to continuously monitor the state of consciousness and, in case it becomes poor or if the patient becomes unconscious (see AVPU scoring system in the neurology chapter), start performing life support maneuvers (see BLSD algorithm).

If the substance has been in contact with the eyes or skin it is recommended to wash it away as soon as possible, using a running water supply (if possible), in order to limit the secondary damage mediated by a prolonged exposure to the toxic.

As these situations are really challenging for a patient's survival, it is recommended to activate the Emergency System as soon as possible and to stay with the patient continuously monitoring his/her conditions.

It may be common for the patient to vomit, in this case place the body in the lateral safety position (see BLSD chapter) to prevent aspiration.

## Ingestion of drugs

Ingestion of drugs may be accidental or premeditated. In both cases, we have to distinguish the kind of substance and the time passed before our intervention. That information is crucial for proper situation management. By searching on the internet or contacting the regional Poison Centre, it is possible to know the nature and possible side effects of drug overdose.

Importantly, any kind of drug can harm an organism that is not supposed to take it, so our level of attention should be

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the highest possible, in order to rapidly recognize any sign of deteriorating patient and to communicate it to the Emergency System, if the advanced first aid has not arrived yet.

Furthermore, we can actively do something in this situation, especially if we see the person directly or immediately after taking the drug. In these cases, getting the patient to vomit can limit the amount of drug the body will absorb through the intestinal mucosa; the best way to make a person vomit is to stimulate the back part of the tongue with the handle of a spoon.

In case we found the person sleepy or not completely awake, we can suppose some time passed from the ingestion; in this case vomiting can be harmful, as the drug is likely already circulating in the body.

In all cases, it is extremely important to identify the kind of poison (drug, acid or any other substance) and to communicate it to the operator. If the person has ingested a chemical substance, it would be sufficient to report the information on the package/bottle. In some cases, the operator would ask the amount of substance, the estimated weight of the person and the time since the ingestion.

While waiting for the ambulance, the only thing to do is to monitor the person and if he/she falls unconscious start the BLS evaluation (see BLS algorithm).

## Case Scenario 1 - Ingestion of drugs

You are informed by your mother that your brother, who suffers from epilepsy, is sleepy this morning, he is slightly responding to her questions and he is not able to stand up from his bed. You evaluate him and find out that his conscious state has deteriorated, he is suffering from difficulty of speech and his eyes cannot remain open.

You ask your mum if your brother took his drugs this morning, she answers yes but starts checking the pillbox. There were two doses last, now the box is empty, hence, it is probable she gave him a double dose.

You call 112 and tell the operator what happened, he asks you which kind of drugs your brother prescribed for his condition and he makes you in contact with the regional poison centre.

You are told the ambulance is already coming, the poison specialist tells you not to make your brother vomit, just to check if something changes before the ambulance arrives.

As the emergency crew is on the scenario they treat your brother with the antidote and bring him to the nearest hospital.

## Step by Step Procedure

What to do if **spotted early**:

- Check for consciousness and do the primary survey
- If consciousness is present: help the person vomit by some rounded and soft tool (like the back part of a spoon), not by your fingers
- Take care of the clues about: what kind of drugs, how much and when he/she has taken it
- Call 112 giving them all that information plus age and weight of the injured.

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- If consciousness is not present: DO NOT help the person vomit, follow the resuscitation guidelines

What to do if **spotted later**:

- Check for consciousness and do the primary survey
- If consciousness is present: get all the information about the ingested drugs
- Call 112 giving them all that information plus age and weight of the injured.
- If consciousness is not present: follow the resuscitation guidelines first, then you can search for all the clues about: what kind of drugs, how much and when he/she has taken
- Call 112 giving them all that information plus age and weight of the injured.

**The DON'Ts for teacher and students**:

- Don't panic
- Don't try to give any other medication to the injured
- Don't waste time before calling 112
- Don't forget to show any pillbox or other packaging to the emergency crew

## Anaphylactic shock/EpiPen use

An allergic reaction is a reaction against some specific or not specific substances.

Usually, an allergic reaction is manifested by rhinoconjunctivitis and cutaneous rash, and normally the use of antihistamines will resolve the situation.

However, in some cases, the reaction is massive with important dilatation of the vascular system, due to the production of histamine from the immune system. The patient will suffer from hypotension and his upper airways will narrow due to the inflammation, with an important struggle to breathe. This situation is called anaphylactic shock and represents a real life threatening emergency.

The most typical situation occurs with some foods, out of which the most dangerous are: peanuts, nuts, kiwis, strawberries and peaches, but those are only a small set, as any food or substance can potentially cause an anaphylactic reaction.

For this reason, be careful not to exchange food at the canteen. Typically, allergic people have differentiated lunch, given that only a small amount of the allergen can activate the reaction.

When facing a person during an anaphylactic shock, it is crucial to rapidly activate the Emergency System and to provide the injured immediate help to evaluate his consciousness, his breathing effort and, if available, help him use his epinephrine injector. This drug will save his life, as it stops the process and opens the bronchi.

Allergic patients usually have a medical prescription for this drug, it is recommended they bring it in their rucksack. You can use it without getting the clothes off, just remove the safety catch, put the pen on the anterior surface of the leg and press it. It is recommended to keep the pressed position for at least 10 seconds in order to let the drug flow in the muscle. After this time release the pressure and the pen will automatically hide the needle.

In all these situations, advanced medical rescue is required, and the 112 operator will guide you through the process. Please keep in mind that a continuous evaluation of the consciousness is essential, as in case of an unconscious patient, the rescuer needs to start BLS evaluation and provide CPR if needed (see BLS algorithm).

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# Case Scenario 2 - Anaphylactic shock/EpiPen use

Your friend is eating a sandwich, after some seconds from the first bite he starts breathing with some difficulties. You ask him what's happening and he says he is allergic to some foods, he rapidly falls to the ground, he is pale and his breathing is noisy. He says he has his EpiPen but he is not able to use it now.

You call the 112 and explain the situation, the operator tells you he is able to guide you during the procedure. You go to your friend's rucksack and catch the pen, rapidly you remove the safety catch and use it on his left leg and wait for ten seconds as the operator is telling you. Your friend becomes less pale and his breathing effort seems to reduce. You check his consciousness and he answers your questions, you tell it to the operator and wait for the advanced medical crew to come. During this period you lift your friend's leg in Trendelenburg position (see neurology emergency chapter). As paramedics arrive, they start giving your friend all the medications and congratulate you: you literally saved your friend's life.

## Step by Step Procedure

What to do:

- Check for consciousness and do the primary survey
- If consciousness is present, go to the appropriate checklist for the predominant symptoms:
  - Respiratory failure for breathing troubles
  - Anti-shock position for pressure drops
- If consciousness is not present: follow the resuscitation guidelines before doing

If the person has his own epinephrine auto-injector let him/her use it or send someone to take the injector and give it to him/her.

If the injector is available but the person is not able to use it, you can do it, following the emergency instructions printed on the EpiPen and this general advice:

- Open the container and prepare it for the injection (each brand can partially differ)
- If possible uncover the thigh or shoulder, if it's not possible do the injection anyway, the needle can pierce through thin clothes
- Apply the pressure directly in the muscle (not on buttock or belly) until the click
- KEEP THE PRESSURE for at least than 10 seconds
- Dispose the empty container, usually there is an automatic needle guard operating, to avoid injuring others

After 1 to 3 minutes the person should feel better, follow the Anti-shock position checklist from this moment on.

**The DON'Ts for teacher and students**:

- Don't panic
- Don't try to give any other medication to the injured different from his own EpiPen
- Don't waste time before calling 112
- Don't forget to continuously evaluate patient's consciousness

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## Poisonous bites/stings

Bites and stings are common situations that occur in our daily life. In these situations our skin is damaged and cells and blood flow are exposed to the biting animals. The major concerns in these cases are related to the nature of the substance injected (if present) and from the exposure to skin bacteria that can lead to important local or systemic infections.

We can make a difference between poisonous and non-poisonous bites/stings.

A poisonous bite (like of some spiders or vipers) injects into the body a dangerous substance damaging directly the cells, this usually brings to local necrosis of the tissues and, in case of specific poisons, to a general reaction. Poisoned patients can rapidly deteriorate and lose consciousness. In these cases, the rapid administration of the specific antidote is the only way to save a patient's life. In fact, the immediate call to the 112 and the specific knowledge of the poisonous animal are crucial. When facing such situations, first responders should evaluate the state of consciousness and start the BLS algorithm if needed (see BLS algorithm). In some cases, it is useful to place a tourniquet (or any other device to stop blood flow) above the bite site, in order to prevent poison diffusion through the blood flow.

In case of a non-poisonous bite, the most common complication is inflammation and necrosis of the nearby tissues. Another typical complication is the allergic reaction that can drive patients to an anaphylactic reaction (see above).

In case of stings, it is important to remove the needle from the skin as it can slowly release a continuous amount of poison. To remove it just slide something flat on the skin paying attention not to squeeze it.

Indeed, any common poisoning is slower than the anaphylactic shock, so our main concern remains the rapid activation of the emergency system and the continuous evaluation of the patient's conditions. Remember than the anaphylactic shock can occur from 30 seconds to 12 hours after the bite.

## Case Scenario 3 - Poisonous bites\stings

You and your family are spending a holiday on the lake. During the night, a spider has bitten you brother and the skin around the bite has swollen and is very painful. Your brother seems to be suffering and the bite site is getting worse. At the end of the morning you notice that your brother is breathing with some difficulties and he feels very tired without any strength. You call 112 and explain the situation, the operator warns you about the possibility your brother is having a massive allergic reaction to the injected poison and sends you an ambulance. The shortness of breath worsens and your brother starts losing his consciousness. You, still talking to the operator, start BLS evaluation and find breathing is absent. The operator tells you to start CPR and wait for the ambulance to arrive. The advanced rescue crew arrives in a minute and adrenaline is administered to your brother. They continue the evaluations and rapidly bring him to the hospital where he can be supported in breathing until his complete recovery.

## Step by Step Procedure

What to do:

- Check for consciousness and do the primary survey
- If consciousness is present, help the person to remain calm and don't let him walk
  - Let him lay down and keep the limb above the hearth level.
  - Do a pressure immobilization bandage
  - Wait for the rescuers

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- If consciousness is not present: follow the resuscitation guidelines first of all

In case of bee sting:

- Check the zone for the sting, if it still in the skin, use a flat surface to slide it out without squeezing it

**The DON'Ts for teacher and students:**

- Don't panic
- Don't waste time before calling 112
- Don't forget to continuously evaluate patient's consciousness

## Bigger bites

In case of bigger bites the main concern is represented by bleeding. The first thing to do in these cases is to ensure safety. In particular if the animal is still on the scene, just wait for expert personnel before acting. Once the situation is safe you must evaluate the bite and the presence of active arterial bleeding (see Traumatology chapter). In case of blood actively flowing out just make a pressure on the wound and place a tourniquet or any other device to stop blood flow above it. It is crucial to call 112 for help and to tell the operator which kind of animal is involved.

In case of not massive bleeding bites just lift the part above the heart level and wait for help. Even in those situations the continuous check of the consciousness is the most important aspect.

It can be useful to do a simple wound dressing while waiting for help in order to prevent any other infection.

It may be useful to know the vaccination card if the bite is made by a domestic animal, as this information must be told to the emergency crew.

## Case Scenario 4 - Bigger bites

You and your cousin are playing football in the park when a dog comes and bite your cousin's leg. The bite is important and the leg starts bleeding while he falls down to the ground. The dog immediately runs away and the scene is safe. You notice active bleeding from the leg and use your shirt to actively press on the wound. Another player gives you a belt and you are able to apply it above the bite site. The bleeding has stopped. Immediately, you call the 112 and explain the situation. The operator warns you about possible complications; while the ambulance is coming, he also explains to you how to evaluate the state of consciousness of the boy. Your cousin is in extreme pain, but he is able to answer your questions. No other signs of ongoing bleeding are present and you lift his leg above the heart level. You wait for the ambulance to arrive, that will take him to the hospital to be stitched and to do vaccinations for the risk of infections.

## Step by Step Procedure

What to do:

- Check for consciousness and do the primary survey
- If consciousness is present, help the person to remain calm and don't let him walk
  - Let him lay down and keep the limb above the hearth level.
  - Do a wound dressing bandage
  - Wait for the rescuers

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- If consciousness is not present: follow the resuscitation guidelines first of all

**The DON'Ts for teacher and students**:

- Don't panic
- Don't waste time before calling 112
- Don't forget to threat any active bleeding
- Don't forget to continuously evaluate patient's consciousness

## References

[1] Poisoning Prevention and Management. World Health Organization http://apps.who.int/iris/bitstream/handle/10665/41966/9241544872_eng.pdf;jsessionid=43AFE177519B2B760FF42D3370652722?sequence=1 Chapters 5,6

[2] M. Chiaranda, Urgenze ed emergenze. Piccin., 2007. Chapters 37, 38

[3] M. G. Cline, D; Ma O., Cydulka R., Thomas S., Handel D., Tintinalli's Medicina d'urgenza. Chapter 102

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# Module 6

# Environmental Injuries

## Frostbites

Cold-induced lesions form at the tissue level and are following the action of low temperatures; frostbite occurs when skin temperature reaches -4 ° C. This type of injury has been described since historical times by soldiers from Hannibal armies. Frostbite is an injury caused by freezing of the skin and underlying tissues. First the skin becomes very cold and red, then numb, hard and pale. Exposed skin in cold, windy weather is most vulnerable to frostbite, but frostbite can occur even on skin covered by gloves or other clothing.

The predisposing factors for frostbite are represented by low temperature, humidity, wind, duration of exposure to cold, fatigue, dehydration, equipment with inadequate protection, pre-existing pathology, individual variability.

Frostbite mainly affects the extremities: nose, ears, face, hands and feet, and the clinical manifestations range from local burning to important pain depending on the severity of the lesions.

It is especially important to prevent frostbite, the treatment sometime imply the amputation, because the cells are destroyed in frostbite process.

To prevent the apparition of frostbites injuries limit time for outdoors activities in cold weather, check weather forecasts. In very cold, windy weather, exposed skin can develop frostbite in a matter of minutes.

Wearing appropriate type of clothing accordingly to temperature is also crucial, wear several layers of loose, warm clothing, because the air between the layers of clothing acts as insulation against the cold. Windproof and waterproof garments will protect against wind, snow and rain. Wet clothing must be changed as soon as possible, mostly gloves, hats and socks. We should wear something that fully covers the ears. Also be sure that the socks you wear do not make your boots too tight, restricting blood flow.

Check for the early signs of frostbite like red or pale skin, prickling, and numbness. In case this are present seek warm interior. When traveling in dangerous weather condition, carry emergency supplies and also tell other people about your route and expected return date.

Other important things to respect in cold environment is ~~not to~~ to avoid drinking any kind of alcohol because this cause the body to lose heat faster than normal. ~~To do exercises~~ Keep moving is also important, this will increase the temperature of blood flow and help staying warm.

The frostbites can be classified in superficial and deep frostbites.

Superficial frostbite presented as reddened skin that turns white or pale. The skin may begin to feel war. If we rewarm the frostbite at this moment, the surface of skin may appear mottled. A fluid-filled blister may appear after rewarming the skin.

Deep frostbite is a severe injury. As frostbite progresses, it affects all layers of the skin, including the tissues that lie below. Skin turns white or grey and numbness, losing all sensation of cold, pain or discomfort in the affected area are present. Joints and muscles will no longer work. Large blisters appear after rewarming. Afterward, the area turns black and hard as the tissue dies. This will require amputation of the affected segment.

Initial treatment includes combating hypothermia and dehydration, removing wet and cold clothes, usage of dry sterile dressing, heat loss avoidance is very important, and patients will require gradual reheating.

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## Case Scenario 1 - Frostbite

It is in plain winter, and you with your friends are playing in snow, near a frozen lake. Outside are -10 Celsius degree. One of your friends run on ice surface, but he broke the ice and one of his feet enter inside the icy water up to the knee. Immediately you help him to reach safely the shore, and he began to complain about pain at the feet, accompanied by a sensation of warm skin.

Near you notice a small cottage, apparently inhabited and probably heated, considering the smoke coming out of the chimney. All of you bring your friend inside that cabin.

What will you do to help him?

## Step by Step Procedure

- Action 1 Without walking using frostbitten leg, help your friend to reach a heated place.
- Action 2 Protect the affected area from further cold by removing the wet clothes. Also, this will protect from installing associated hypothermia.
- Action 3 Examine the skin of the leg, it was red initially but now turn to be pale, and very cold.
- Action 4 Use some dry, heated bandages to cover the feet.
- Action 5 Heat on stove some water at around 40 Celsius degree and put the leg in the warm water for 20 minutes. Give him to drink some heated tea (warm fluid).
- Action 6 Call 112, describe the situation and ask for advice and help.

**The DON'Ts for teacher and students**:

- Do not rewarm frostbitten skin with direct heat, such as a stove, heat lamp or fireplace. This can cause burns.

## Burns

Burning is an injury to the skin or mucous membranes caused by exposure in intense heat or by contact with a physical object, chemical substance or electricity.

Depending on the mechanism of production, burns can be: thermal; chemicals; electrical.

The burn injury is a progressive injury both locally through release of vasoactive substances, disorders of cell membrane function, formation of perilesional edema, as well as systemic by activating the neurohormonal response. In the end, through all these mechanisms, one can develop multiple system and organs failure (heart, lung, kidney, liver, metabolism).

The factors that influence the prognosis are: the severity of the burn (there are fourth degree burns, which can affect from the superficial layer in first degree up to the bone in forth degree), the existence of inhalation injuries (injuries located at airways level like mouth, trachea, bronchia's and lungs, produced by the inhalation of hot air or vapor), the presence of associated injuries (trauma, hypothermia), age, pre-existing pathology.

Minor burns can be treated at home and they usually heal within 2 weeks.

For serious burns, after appropriate first aid and wound assessment, treatment involve medications, wound dressings, therapy and surgery.

People with severe burns which cover large areas of the body will require treatment at specialized burn centres. In severe burns there is a high risk to develop infections.

The general treatment of burns before arriving to hospital follows several principles:

- Stopping the combustion process,

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- Airway clearance,
- Pain treatment,
- Protection of the burned area,
- Fast transport to the hospital.

Chemical burns have the following characteristics:

- Substance products from agriculture, industry, laboratories, industry, military or domestic use;
- Acids (organic and aorganic) cause coagulation necrosis;
- Alkaline substances cause liquefaction necrosis;
- Lesions (erythema, edema, blistering, necrosis) depend on: concentration of substance, quantity, contact time, mechanism of action, area affected, skin integrity.

Principles of treatment:

- Dilution of the chemical agent and removal from the skin;
- Decreasing the speed of chemical and physical reactions;
- Abundant irrigation with water or ~~SF~~ Normal Saline

Electric burns occur at the point of contact with electricity and have several specific elements.

The severity of the injuries depends on: Intensity (A); Voltage (U); Type of current (continuous or alternating); Resistance at the point of contact and exit; Contact duration; The route of the current in the body; Associated environmental factors.

The patient will presents electrical mark, fourth degree burn at the entering point of current and can present other associated injuries, the most important are heart rhythm disturbances which can lead to cardiac arrest.

Treatment:

Stop the contact with electricity, cardiopulmonary resuscitation in case the patient is in cardiac arrest, transport the victim to hospital as soon as possible.

## Case Scneario 2 - Thermal burn with hot water injury scenario

You are visiting your grandparents. Your grandmother is very happy about this, and she want to prepare you a cake she knows you like a lot. Cooking at the stove, she accidentally overthrows a pot with boiling water on the left hand.

Immediately you approach her to help.

What will you do?

## Step by Step Procedure

- Action 1 Cool the burn. Hold the burned area under cool running water or apply a cool, wet compress until the pain eases.
- Action 2 Remove rings or other tight items. Try to do this quickly and gently before the burned area swells.
- Action 3 Once a burn is completely cooled, apply a lotion, such as one that contains aloe vera or eucalyptus. This helps prevent drying and provides relief from pain.
- Action 4 Bandage the burn area (hand in this case). Cover the burn with a sterile gauze bandage. Avoid putting pressure on burned skin. Bandaging, reduces pain, protects blistered skin and reduce the risk for infection.
- Action 5 If there is concern that the burn is deeper and may be second or third degree call 112, describe the situation and ask for advice and help.

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**The DON'Ts for teacher and students***:*

- Don't use ice. Putting ice directly on a burn can cause further damage to the tissue.
- Don't break blisters. Fluid-filled blisters protect against infection. If a blister breaks, clean the area with water (mild soap is optional) and cover with sterile dressing.
- Never apply butter, greases, or other home remedies to a burn surface
- Do not use fluffy cotton for bandaging a burn injury

## Hyperthermia Sunstroke/Heatstroke

Hyperthermia are a group of events occurring in the context of exposure to heat (not only in the sun); they occur more frequently in summer, but not exclusively. Groups of people at risk: the elderly, patients with cardiopulmonary disease, athletes who make physical effort in warm environment.

Environmental factors that predispose to hyperthermia are: temperature; humidity; sun exposure; air currents; the way of dressing.

For emergencies caused by heat, the risk factors are represented by: physical factors: fever, dehydration, chronic diseases, dermatological diseases, mental disorders, increase in body weight, alcohol consumption; prolonged effort (athletes, military, firefighters); extreme ages: very young and elderly (vasodilation capacity is high, low heart rate); medication and drugs.

Increasing the central temperature stimulates peripheral vasodilation with decreasing blood pressure and heart rate. Dehydration occurs through perspiration and hypovolemia worsens.

The clinical forms of hyperthermia are as follows:

- Oedema: They appear in conditions of high outdoor temperature; favorized by orthostatic position;

Treatment: exercise, lifting the legs.

- Muscle cramps: Painful muscle spasms; appear on the upper and lower limbs.

Treatment: oral hydration with water or adding a teaspoon of salt in a glass of water.

- Syncope: Orthostatic syncope; Postural hypotension.

Treatment: clinostatic position, liquid oral or i.v.

- Dehydration: Central temperature 38-40.5 ° C;
- Patient will present profuse sweating; headache, vertigo, asthenia; nausea, vomiting; tachycardia, hypotension;
- Treatment: liquids i.v..
- Cerebral oedema or stroke due to heatstroke:

Central temperature (measured oesophageal, rectal) is > 40.5 ° C;

Patient present changes in mental status (coma); injuries of all organs and systems.

Clinical manifestations of cerebral edema due to heat: central temperature (oesophageal, rectal, bladder)> 40.5 ° C; tachycardia, tachypnoea, hypotension; irritability, confusion, dullness; convulsions, coma, hemiplegia; ecchymosis, epistaxis, hematemesis, hematuria. If heat stroke is suspected or symptoms persist, 112 must be called immediately or the patient must be taken to the emergency room.

The general treatment consists in the application of fast and effective cooling measures, maintaining of vital functions and treatment of complications. First the patient should be in a cool, shaded, well-ventilated area. The measures of cooling should be initiated as soon as possible in order to lower the temperature of body below 39.4 ºC. There is no cause for concern about speed temperature correction, on the contrary, we must initially use simple means that we

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often have them at hand to achieve faster cooling: complete undressing of the patient, applying ice bag in contact with the skin, covering the patient with a wet sheet, use a ventilator oriented to the patient on which it was applied a wet sheet and/or ice. Patient also should receive fluids (water, if possible with electrolytes), oral or iv.

## Case Scenario 3 - Hyperthermia scenario

You are relaxing at the seashore, on a sand beach, in a very hot day in summer.

Near you, a person who apparently felt to sleep, being also exposed to the sun, begin to accuse head ache and nausea. You go near this person and try to help him, thinking that he maybe is developing hyperthermia. His skin is very warm, and red, and he is sweating a lot.

What you will do in order to help him?

## Step by Step Procedure

- Action 1 Ask the person to come with you, helping and sustaining him, to a cool, shaded, well-ventilated rom, with air conditioned.
- Action 2 cold him under a shower, with cold water
- Action 3 Spray the person with cool water, or apply cold wet sheets or ice packs to the armpits and neck. Fan air across the person to increase cooling. Cover him with a wet, cold sheet, in order to decrease faster the temperature.
- Action 4 Put him on a couch, with feet elevated, and remove the t-shirt he is wearing.
- Action 5. Give him to drink cold water and salt to replace the lost by dehydration.
- Action 6 Call 112, describe the situation and ask for advices and help

**The DON'Ts for teacher and students**:

- Do not give the patient anything to drink if is not alert or is vomiting

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## Drowning

Drowning is a type of suffocation induced by the submersion or immersion of the head in a liquid, usually in water. Most instances of fatal drowning occur alone or in situations where others present are either unaware of the victim's situation or unable to help. Submersion or "near drowning" defines the determined accidental asphyxiation of a victim, with the head under water. Cardio-respiratory arrest mechanism in this case is the obstruction of the airway, caused by the water, with hypoxia that will causes secondary heart attack.

That is why ventilation and circulation must be restored as soon as possible. Initiating resuscitation maneuvers at the accident site is essential for survival and recovery of neurological function.

The victim of drowning may have an increased risk of hypothermia if the water temperature is <25 ºC.

First aid in case of submersion (drowning)

First of all, in the provision of first aid, the safety of the rescuer is paramount. He must analyse all possible situations that could endanger his life and/or the victim's.

The differences between submersion in sea or lake water are important mostly by the point of view of flotability, usually in salty water the victim will present immersion, when the head and body stay usually on the surface of the water. The most important factors in resuscitation and recovery of victims are the duration of submersion and associated hypoxia.

Recovery of the victim from the water

The rescuer must reach the victim as soon as possible, preferably using a means of transport (boat or any other device); the rescuer must constantly consider personal safety and try to minimize the danger to both himself and the victim. In all cases of accident by submersion, the existence of the spinal cord injury must be assumed, requiring the immobilization of the cervical and thoracic spine; spinal injuries are frequently associated with diving activities, but should be considered each time the accident occurred in the absence of witnesses. When a spinal cord injury is suspected, the rescuer will use his hands to stabilize the victim's neck in a neutral position (without flexion or extension); Before being removed from the water, the victim is placed, floating, in a horizontal position, on a rigid support. It is important to get out of the water quickly so that resuscitation manoeuvres can begin as soon as possible.

Ventilation should be started as soon as possible, in water, with sternal compressions delayed until the victim is removed from the water. The first therapeutic measure for the victim is mouth-to-mouth ventilation, prompt initiation of ventilation has a positive impact on survival. It can start as soon as the rescuer's safety is ensured, and the victim's airways can be opened. It will start with 1 minute of ventilation in water or with 5 ventilation when the victim is out of water. As soon as the victim has been removed from the water, after opening of the airways and 5 ventilation mouth to mouth, check for signs of life: movement, breathing, coughing in response to ventilation. If there are no sign of life, continue with resuscitation manoeuvers.

## Case Scenario 4 - Drowning

You are relaxing at the seashore, on a sand beach, in a very hot day in summer.

In front of you, in shallow water, 5 meters from the shore, you observed a child, approximately 10 years old, who stay with his head, face down, in water, without moving his limbs at all. In the proximity is no lifeguard. You consider yourself a good swimmer, and the sea is calm.

What you will do in order to help him?

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## Step by Step Procedure

- Action 1 Ask the persons from the beach to ask for help as soon as possible, from 112 and also to look for lifeguard.
- Action 2 You asses the risk of take the victim out from water, and you decide you can do it without risk for you, the water is shallow (0.5 m deep) and without waves. Enter in water, approach the victim and asses him. He did not respond in any way to you.
- Action 3 Perform 5 mouth to mouth ventilation in water, after that extract the victim from water.
- Action 4 When you reach the shores, put the victim on ground, out of the water completely, open the and asses the airway and perform 5 mouth to mouth ventilation. There is no sign of life for 10 second after ventilations. That way you begin to apply chest compression and ventilations, 30/2 ratio (Alternate 30 chest compressions to 2 ventilations).
- Action 5. In the meantime, the lifeguard approach with an AED. You connect the AED to patients, but no shock advised. Continue CPR. After approximately 2 minutes the victims begin to cough. You stopped the CPR manoeuvres, the victim opens his eyes and begin to move spontaneously. Explain him what was happening with him, and try to calm him down, waiting for Emergency Services Team to arrive.
- Action 6 The EMS arrive, hand over the patient and explain every thing you do until they arrive.

**The DON'Ts for teacher and students**:

- Do not routinely use the Heimlich manoeuvre to resuscitate the victims of a drowning, because among other complications it only delays the establishment of life-saving ventilators; there is no clear evidence that the use of this maneuver, as a first step in resuscitating the victim of a submersion, would be beneficial.
- Do not try to drainage the lung, it will delay the initiation of CPR, the water quantity from lung is small.

## References

[1] Diana Cimpoesu et all Guides: Algorithms Into The Emergency Medicine, Edit. Gr. T. Popa - Iasi, 2019, p 7-11.
[2] European Resuscitation Council Guidelines for Resuscitation: Basic life support, Special situation in resuscitation, 2021.
[3] Tntinalli JE, Kelen GD, Stapczynski JS. Emergency Medicine, A Comprehensive Study Guide 8th Edition American College of Emergency Physicians, 2016.
[4] Adult Basic Life Support: Provider Manual. European Resuscitation Council, 2015.

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# Module 7
# Nervous System

## Introduction

Neurological disorders are among the most common emergency situations. Even though pre-hospital management normally requires basic manoeuvres and evaluations, it is very important to rapidly recognize a deteriorating situation in order to reduce the time for the patient to reach the nearest hospital possible. This means that the rescuer needs to provide the fastest intervention and to activate the emergency system as soon as possible. Even if an acute neurological disorder can be scary for non-medical personnel, as it often drives the patient towards a loss of consciousness, a correct first aid training can help the rescuer to systematically approach such situations. There are few manoeuvres that are useful to use in case of a neurological emergency, which can be attempted by untrained population and they are very helpful for paramedics to activate the most suitable emergency resources available. The first step is to evaluate the state of consciousness using the AVPU (Alert, Verbal, Pain, Unresponsive) scale [1]; in case of an unconscious patient, it is required to follow the BLS (Basic Life Support) evaluation algorithm and to provide support to vital functions if needed. In the presence of unpaired consciousness state rescuers must rapidly rule out the most dangerous situations, the most common is the acute stroke attack, but also in case of intoxication patients need to reach the hospital as soon as possible. In other situations, it is recommended to perform the simplest actions possible and just to preserve the patient's safety [2]. Another important thing to keep in mind is that sometimes performing complex and invasive maneuvers can be dangerous for the patients, this is the case, for example, of an epileptic attack: we will learn though the paragraph that the most important thing to do is to be sure that during convulsions he/she won't hurt himself/herself and that we are not supposed to keep the mouth opened using objects that can be harmful for patient's safety (sticks or anything else that can damage teeths).

## Syncope

A syncope is a temporary loss of consciousness due to a reduction of the blood amount that reaches the brain (cerebral hypoperfusion), it is usually characterized by a complete and spontaneous recovery in a short time [3],[4].

This phenomenon usually affects around 3% of the general population and it's one of the most common causes of emergency department admission [5].

The most common cause of syncope is the "vasoactive syncope", this is due to a transitory reduction of the vascular capacity with a drop in the amount of blood that reaches the brain (the most common situation is the "orthostatic Syncope", due to a loss in the pressure of blood when standing up too fast), usually the person falls down and the blood pressure returns rapidly in a normal range.

In some cases a syncope is due to a cardiac dysfunction (usually arrhythmias) and in other cases it has a neurological cause (stroke, autonomic dysfunction, *hypoglycaemia*).

Usually syncope is preceded by premonitory symptoms like: dizziness, sweating, nausea and asthenia, but sometimes it comes suddenly. If you recognize some of these prodromal symptoms, the best thing you can do is to kindly invite

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the person to sit and, if necessary, help him/her to assume that position.

It's very important to recognize a syncope because it's a kind of alarm, it could be a symptom of a heart disease, so it's important to: recognize it early, call the first aid and, while you're expecting the rescuers, try to deal with this on your own, following the instructions below.

When dealing with such conditions the first thing to do is to remain calm, your intervention could make the difference for the life of that person. Seeing that a syncope could be a sign of a full pattern of different illnesses we need to distinguish among them and to perform actions aimed to preserve the patient's safety while waiting for the emergency crew to arrive.

## Case scenario 1 - Syncope

You and your friends are travelling on a bus, suddenly you notice that the woman who was sitting in front of you falls down while standing up from her seat.

You and your friends have just finished a First Aid course at school and know that the first thing to do is to ensure the patient's safety and keep calm.

After that you start checking the patient's consciousness by calling her: "Hey! Can you hear me?". The woman answers positively to your question, but she cannot open her eyes and she is not able to reach the sitting position. You can say that the consciousness level is a V in the AVPU scale.

With the help of your mate, you lift the woman's legs up 20 cm from the floor and invite the woman to remain calm and speak to her telling what happened and that you are able to help her.

After 10 minutes the woman is still not able to keep the sitting position so you ask your friends to call 112 and to activate the emergency system.

You ask the patient if there are any pathological conditions, if she takes some drugs and you write them down on your smartphone ready to be told to the ambulance crew.

You keep speaking to the patient and wait for the ambulance to arrive.

## Step by Step Procedure

- Action 1: Ensure patient's safety
- Action 2: Check for consciousness (continuously) using AVPU scale
  If consciousness becomes absent go to: Cardiopulmonary Resuscitation
- Action 3: Align and cover the person
- Action 4: Rise the legs of about 20 cm (Trendelenburg Manoeuvre)
- Action 5: Convince the person to keep lying down for 10 minutes
- Action 6: Check if person can keep sitting position**; if this is not possible call 112**

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***The don'ts for the teachers and the students***

- Don't try to force patient to stand up if you see he/she is unstable
- Don't raise patient's legs in a vertical position (it may cause brain haemorrhage)
- Don't create panic

## Stroke

A stroke occurs when the blood is unable to reach some part of the brain tissue that rapidly starts dying [2]. Typically, a stroke happens for two reasons: (1) obstruction in a vessel stopping blood flow; (2) hole in the blood vessel causing a brain haemorrhage. In case of a haemorrhage, two situations can occur simultaneously: (1) the blood does not reach all the neurons; (2) the blood leakage from the vessel causes damage to the brain [6].

Unfortunately, the rescuer cannot perform any action to remove the actively main cause of a stroke. However, he/she can promptly recognize and evaluate the situation, continuously monitoring the patient and calling the emergency system.

The most important thing at this level is the rapid recognition of an acute ischaemic attack, as the only thing a rescuer can do is to get the patient to the nearest Stroke Unit as soon as possible.

There are different ways to detect a stroke, among the most used there is the FAST scale which stands for *"Facial drooping, Arm weakness, Speech difficulties and Time to call emergency services"* (see below).

As soon as a stroke is identified, it is required to activate the emergency system providing all the information gathered with the FAST survey. During the ambulance waiting, the rescuer should keep the person calm: this would decrease the oxygen consumption, and consequently the death rate of neurons. This includes staying with the person in a quiet environment, putting him/her in a sitting or semi-sitting position, helping him to breathe normally and continuously monitor level of consciousness and breathing status.

## Case scenario 2 - Stroke

You are driving your car with your grandfather and are speaking about the last soccer match of your favorite team.

Suddenly you notice that your grandfather has started speaking differently: words are not fluently pronounced and the speech becomes difficult.

You stop your car and watch his face; you notice that the mouth line is not symmetric as the right corner of the lips is higher than the left one. You ask him to lift his arms, but the left arm falls down and it is impossible to keep it at the same level as the right one.

He is now very scared and asks you to help him; you know he is probably having an acute ischaemic attack and you have studied during your first aid school course that you need to call for help and not to waste time in doing it.

While waiting for the ambulance you speak quietly to your grandpa and you tell him he is safe, that you have called for help and that the ambulance crew will bring him to the hospital as quickly as possible.

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**Step by Step Procedure**

- Do FAST survey:
  - **F**ace asymmetry (ask to smile)
  - **A**rm weakness (ask to raise both arms or squeeze both your hands)
  - **S**peech difficulties (ask to say a basic sentence)
  - **T**ime –> If **any of the preceding is present react quickly**
- Call 112 for an ambulance
- While waiting for the ambulance sit, cover, keep the person calm and quiet
- In case of loss of consciousness go to Cardiopulmonary resuscitation

**The don'ts for the teachers and the students**

- Don't waste precious time and call 112 as soon as possible
- Don't create panic
- In case of loss of consciousness don't raise patient's legs in a vertical position

## Epilepsy

Epilepsy is a disorder of the central nervous system, it is due to an abnormal brain activity that dives to seizure, behavioural abnormalities till the loss of consciousness. This condition can be congenitale (due to a malformation of the cortical development) or acquired (usually after a stroke or a traumatic brain injury). It can affect males or females in the same percentage and does not differ between races [7].

A *status epilepticus* can show different signs: if the electric signal short-circuit affects a small part of the brain (i.e. the area controlling a muscle), then that muscle can start shaking without the possibility of being controlled. If, instead, the short-circuit is bigger, the electric signal is sent to a bigger amount of nerves, and the brain activates a mechanism to protect itself. In this case the patient falls down unconsciously, shaking in seizures. In both cases the crisis ends in a few minutes, the patient feels tired, sleepy, and noxious, and his/her head aches. In some cases, patients can lose urine and faeces, due to the temporary loss of the nervous system control over gut and sphincters.

As it is not possible to stop an epileptic crisis, what the rescuer can do is to avoid any traumatic injury. At the end of a crisis, it is useful to put the person in the Lateral Safety Position, letting him/her to sleep and to call the emergency number.

When the person is shaking, it is important to avoid any injury, for instance by placing something soft between the shaking part of the body and the floor or dragging the person into a safe position. However, it is also important not to stop him/her, in order to avoid any damage to muscle, tendons and bones. It is very important to know that during a crisis, the person cannot suffocate or bite its own tongue. Yet, the person can bite the rescuer's fingers, so stay away from the mouth!

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# Case scenario 3 - Epilepsy

You are walking in a park where some children are playing. You hear a shout and see that people around you start running to the place where kids were playing. You see a child on the ground, shaking his arms and legs, his mother is crying and asks for help. You know that maybe he is having an epileptic crisis, you ask his mother if he takes some drugs and she says he takes a pill for epilepsy twice a day. You keep the kid's head and put your suit under his neck.

You know that you have to wait for the crisis to end and that the only thing to do is to prevent traumas for the child. You ask a passer-by to call 112 and to activate the emergency system.

After a minute has passed the kid stops shaking and falls asleep. You notice some urine on his pants but you know that it is normal in those cases. You put the child in the lateral safety position in order to prevent any vomit aspiration.

After a while the ambulance arrives and you tell the crew what happened and how long the crisis lasted, they write that information down on their sheet and bring the child to the nearest paediatric department.

## Step by Step Procedure

- Place something soft under the head
- Keep record of the exact duration and wait for the crisis to finish
- Place the person in lateral security position
- In case of first crisis, worst-than-usual episode or other injuries, call 112
- In case the person has his own medication, follow the Medical advice on the life-saving medicine container, use them only if the crisis duration is protracted.

***The don'ts for the teachers and the students***

- Don't try to stop the shaking using your muscles
- Don't put your finger in the patient's mouth

Don't keep the person lying on his back after the crisis ends, it may cause vomit aspiration

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## Hypoglycaemia

Hypoglycaemic syndromes are caused by a reduction in blood sugar levels. This phenomenon is related to a brain neuronal suffering and is characterized by pale skin, sweating, tachycardia, sense of anxiety and impaired mental status (loss of consciousness is not infrequent) [5].

The onset of those symptoms is sudden, patients usually are not conscious of the condition and sometimes they are not able to explain what they are experiencing so the diagnosis may be very challenging.

Rescuers should recognize this condition, especially in those patients who are at risk of metabolic diseases (i.e. diabetic people or patients who are assuming thyromimetic drugs). When you are in front of such symptoms you should administer sugar as soon as possible and to activate the emergency system.

Since hyperglycaemic clinical features are sometimes indistinguishable from the hypoglycaemic ones, it is recommended to administer sugar in all cases presenting with those characteristics, since it may be a life-saving procedure for the hypo situations and it won't affect in a considerable way the hyperglycaemic conditions (as it will rise the total blood amount of sugar less than 5%) [5], [6].

Please pay special attention to those diabetic patients who are assuming insulin since they need to be monitored through the time and, if another crisis occurs, another sugar administration may be needed to contrast the drug activity.

Another useful tip, especially in young patients affected by type 1 diabetes, is to check sugar levels from their continuous monitoring sensors (usually connected to the smartphone via Bluetooth) in order to formulate the correct diagnosis.

## Case scenario 4 - Hypoglycaemia

You have a classmate affected by diabetes. During the math class you notice that he starts sweating and shivering, his pulse is accelerated and he becomes anxious. You know he is at risk of dysglycemia and, as you learnt during the First Aid course, you ask him if he had breakfast that morning. He answers that he didn't have breakfast as he was missing the school bus and that he forgot to eat the biscuits his mother gave him before leaving.

While speaking he faints and falls down to the ground, you know you have to keep calm, you ask the teacher to call 112 to activate the emergency system and ask your classmates to bring you some sugar.

Once sugar arrives you give it to your mate and he quickly becomes conscious and is able to answer you again.

You check on his smartphone the level of blood sugar and you read that the alarm is not active.

You keep talking to your friend, you help him to stand up and together you wait for the ambulance to arrive.

The patient should go to the hospital and see a diabetologist in order to check therapy and sensors.

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## Step by Step Procedure

- Recognize the clinical characteristics of an hypoglycaemia
- Ask the patients about diabetes or any other drugs taken, if possible check blood sugar levels form a glycaemic senso
- Invite the person to sit or to lie down (in order to prevent any trauma in case of falling)
- Call 112 and activate the emergency system
- Administer sugar as soon as possible

***The don'ts for the teachers and the students***

- Don't administer any drugs
- Don't create panic

## References

[1] G. Teasdale and B. Jennett, "Assessment of coma and impaired consciousness: a practical scale," *Lancet*, vol. 304, no. 7872, pp. 81–84, 1974.
[2] C. Serini, R. Zacchetti, M. Ghislanzoni, and G. F. Villa, "MANUALE DI PRIMO SOCCORSO." Chapter 3
[3] "Fainting or Syncope." *https://www.firstresponse.org.uk/3-general/first-aid/71-fainting-syncope*
[4] W. N. Kapoor, "Syncope," *N. Engl. J. Med.*, vol. 343, no. 25, pp. 1856–1862, 2000.
[5] M. G. Balzanelli, *Manuale di Medicina di Emergenza e Pronto Soccorso*. Chapter 64
[6] M. G. Cline, D; Ma O., Cydulka R., Thomas S., Handel D., *Tintinalli's Medicina d'urgenza*. Chpaters 78, 81, 143,144,145, 147
[7] J. S. Duncan, J. W. Sander, S. M. Sisodiya, and M. C. Walker, "Adult epilepsy," *Lancet*, vol. 367, no. 9516, pp. 1087–1100, 2006.

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# Module 8

# Chemical, Biological, Radiologic, Nuclear or Explosive Events

## Accidents caused by hazardous chemicals substances

A chemical accident is represented by the uncontrolled release into the environment of a toxic substance during its production, storage or transport.

Environmental pollution accidents caused by chemical substances, even without human casualties, can affect an entire community. The most likely situations are accidental emissions of chemicals from industrial sites or as a result of accidents during transporting such substances.

When chemical emissions occur, they create an epicentre area with high level of exposure to chemicals substances and around it there will be a much wider area of fear and panic which affects people, but with lower levels of exposure, usually non-toxic.

Chemical substances could be solid, liquid or gases, each with particular risks.

Most particles of dust are deposited on the ground over time due to gravity; but in an environment where the wind blows or in the event of an explosion, these particles can spread through the air and can contaminate mucous membranes, or they can be inhaled.

Liquid substances have a fixed volume, and take the shape of the container in which they are stored. They flow down and can accumulate on clothes and shoes. A liquid forced to penetrate through a small orifice under pressure can be aerosolized under the form of fine liquid droplets (e.g. aerosols). Aerosols, too, like dust, will settle over time, due to gravity.

Vapours and aerosols can reach the skin through clothing, causing damage.

Gaseous substances have variable volume and once released will diffuse to fill an enclosed space. Many compressed gases are stored in liquid form in the cylinder, and then turn into gas when they are released. Gases can be inhaled into the lungs where they will cause injury.

Most accidental emissions of chemicals are recognized in the early stages because many chemicals have early warning properties, including a toxic or unusual odour, or cause irritation to the eyes or to upper respiratory tract. Exposure to toxic substances can cause rapid death at the site of emission. Sometimes there are more subtle clues, such as a large number of dead animals in an open environment.

The area in the immediate vicinity of the place where the event is located is called the hot area. Access to this area is allowed only to staff trained and wearing protecting equipment There is an increased risk of contamination side effects, and therefore toxic effects for any rescuer or observer who enters the hot area without wearing the equipment with adequate protection. The most important thing is to save the victims by removing them from the exposure area, decontaminating them and keeping the airways permeable. Subsequently, the support of vital functions and specific treatment will be administered, depending on the substance involved.

## Case Study 1 - Chemical accident

You, together with your brother are in your backyard, playing badminton in the afternoon. At a moment, you hear a loud noise, similar to an explosion, followed by a dense smoke, on the highway, which is relatively close,, 1 km distance away from your home. On the radio news it was announced that a car accident took place, involving a cistern transporting a chemical substance, but there are no details about what kind of substance was involved. The smoke is pushed by the wind in the direction of the only road connecting your home, and is passing through the nearest vicinity

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of the accident site.

What is the best course of action to be performed by you and your family in these circumstances?

## Step by Step Procedure

- Action 1: Alert your family and go inside, closing all the doors and windows. Put wet clothes on the floor, in front of the doors, blocking the air from outside.
- Action 2: Call 112 and announce your position and ask for guidance.
- Action 3: Cover your mouth and nose with a mask or something similar. Try to avoid inhaling gases and smoke.
- Action 4: Try to stay upstream, uphill, and upwind of the accident. Chemicals may be carried by water, gravity, or wind. By doing this you will minimize your exposure. Fortunately, the position of your house is excellent by this point of view.
- Action 5: Stay away from the accident site until the hazardous material has been identified, neutralized and authority declare that it is safe to approach.
- Action 6 In case you were exposed, wash hands, arms, or other parts of the body that may have been exposed to the chemical. Discard any clothing that may have been contaminated.

**The don'ts for the teachers and the students**

- Do not expose to substances involved. Chemicals may be carried by water, gravity, or wind. Minimize your exposure.
- Stay away from the spilled substance and avoid touching it. If you are not sure of a substance or its effects, wait for authorities on the scene to advise you of proper measures.

## Accidents caused by hazardous biological substances

A biological accident is defined as the uncontrolled release into the environment of a pathogen during its production, storage, handling or transport.

There are biological hazards that have adverse effects on human health and/or the environment. As a result, the person exposed will be infected, developing an infection. The common ones are the infections produced by bacteria, fungi, protozoa and viruses. Animals and plants may host one or more of these agents. Human and animal fluids may also contain such agents.

Biological agents are classified into 4 risk groups, depending on the importance of the risk of infection they present:

a) group 1 - biological agents that are not likely to cause a disease in humans.

b) group 2 - biological agents that can cause a human disease and constitute a danger; their spread in the community is unlikely; there is generally effective prophylaxis or treatment.

c) group 3 - biological agents that can cause serious diseases in humans and constitute a serious danger; they may present a risk of spread in the community, but there is generally effective prophylaxis or treatment.

d) group 4 - biological agents that can cause serious human diseases and constitute a danger; they may be at high risk of spreading in the community and there is generally no effective prophylaxis or treatment.

Pathways of the pathogens into the human body are:

1. Respiratory tract: is the most likely route of infection. For example, a large number of manoeuvres, common in the hospital environment, produce aerosols that can be infectious. They are produced during the handling of

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liquids, the improper opening of vacuum bottles, spraying, changing the bedding of patients, handling laboratory animals (e.g. tuberculosis).

2. . Digestive contamination often occurs due to non-compliance with hygiene rules (e.g. digestive diseases: acute enterocolitis, viral hepatitis A - "diseases of dirty hands").

3. Skin: the passage of microorganisms through the skin can be done by presence of wounds, stings, bites and occurs quite frequently during various medical activities (dental treatments, washing instruments, during surgery). Acute viral hepatitis B or C occurs frequently in surgeons or dentists.

4. Conjunctival mucosa: the eye is highly vascularized, that way is an important route of contamination, especially by eye splashing.

Preventive measures: hand hygiene, cleaning the workplace, preventing the formation of aerosols, using personal protective equipment (PPE) designed to protect the skin and mucous membranes of eyes, nose and mouth against the exposure to potentially infectious materials, and vaccinations, if it is possible (e.g. hepatitis A/B, Tetanus, and now Covid19).

Minimizing morbidity and mortality it is based primarily on preventing exposure and ensuring prophylaxis and adequate immunization, followed by treatment of symptomatic infected patients. Treatment may involve the use of pharmaceuticals in specific or general supportive treatment. Prophylaxis, immunization, or treatment may be indicated even in the absence of some obvious signs of disease or reliable information on exposure.

## Case Study 2 - Biological agent escape from a laboratory

You just hear on the news that a severe incident took place at a research laboratory in your city. Apparently, a very virulent biological agent (a virus) was accidentally released and contaminated a number of scientific personal working in that lab one week ago. You don't know if you were in contact with any of these people. What you should do in this situations?

### Step by Step Procedure

- Action 1: Asses yourself for fever accompanied by other symptoms like rash, skin blistering, difficulties in breathing, or any unusual signs or simptoms.
- Action 2: Ask immediately for medical help if any of these are present
- Action 3: Practise good basic hygiene with regular hand washing. Basic respiratory precautions are important also, wear a mask covering mouth and nose.
- Action 4: Limit contact with other people, limit your walking out of home to strictly essential out of door activities.
- Action 5: Wait for instructions from authorities about the best way to react to this incident.

**The don'ts for the teachers and the students**

- Methods of transmission of an organism include droplet spread, direct physical contact, or airborne spread. Thus the exposure required for transmission will depend on the mode of transmission of the organism or toxin. It is essential to limit your mobility until the authority make an official announce.
- Do not use sharp tools- appropriate precautions are taken to prevent transmission by exposure to potentially infectious body fluids like blood, and to avoid injury by potentially contaminated sharp instruments.
- Because it is impossible to tell whether a person is carrying a disease, particularly in the early stages of an

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incident, a minimum level of precautions must be followed at all times, in order to limit your exposure.

## Accidents caused by nuclear/radiation events

When certain atoms disintegrate, either naturally or under man-made circumstances, they release a type of energy called ionizing radiation. This energy can propagate either in the form of electromagnetic waves (X or gamma radiation) or in the form of particles (neutrons, alpha or beta radiation).

In the event of abnormal operation of a nuclear power plant, it may emit radioactivity in the surrounding area in the form of a mixture of products generated in the reactor. The population can be exposed to these radionuclides (atoms that emit radiation) either directly from the air or indirectly through contaminated water and food.

Health effects occur only if a person is exposed to radiation. Therefore, the most important protection measure is the prevention of exposure. Therefore, when a radioactive or nuclear accident occurs, public health measures consist of evacuating and sheltering people near the plant.

The measures required depend on the estimated exposure (i.e. the amount of radioactivity emitted into the atmosphere and on weather conditions such as wind or rain). The actions taken consist in evacuating the resident population at a certain distance from the plant, sheltering to reduce the exposure, and administration of potassium iodide tablets (only at the doctor's indication), to reduce the risk ofthyroid gland cancer. When a nuclear or radiological event occurs, public health authorities may order residents in the affected areas to stay in their homes. You may be advised to take shelter in your home, at work, or in public shelters. This recommendation is usually issued in order to protect the population from radiation exposure. If you have been advised to stay indoors, choose the safest room in the house or institution where you work, which does not have windows or doors to the outside. Ventilation systems (heating or cooling) must be closed. If deemed necessary, the consumption of vegetables and dairy products produced in the areas adjacent to the nuclear power plant may be restricted in order to reduce the exposure of the population. Only the competent authorities can recommend which of these measures should be taken, after a careful analysis of the situation.

If after being exposed to radiation you enter the house, undress, and take off your shoes at the door to avoid contamination of the home or shelter. Put your clothes and shoes in a plastic bag. Close the bag as tightly as possible and place it in a safe place away from living areas, children, and animals. Take a bath with warm water (not hot) and soap and rinse in the shower. Inform the authorities that you have clothes and objects that could have been contaminated, so that they can take over and manage them according to the procedures established at national level. In case of manifestations such as nausea, vomiting, diarrhoea, hyperthermia, drowsiness - call the emergency services.

## Case Study 3 - Nuclear power plant explosion

It's a hot summer day and you and your friends are in a cherry orchard. While picking cherries, you learn on the radio that, about 30 minutes ago, there was an explosion at one of the reactors of the nuclear power plant located at a distance of about 10 kilometres, in the neighbouring town. Authorities recommend that the entire population of the area take shelter.

In the orchard there is a cottage where you can take shelter. How will you proceed?

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## Step by Step Procedure

- Action 1: Stop eating fruits (cherries). The risk of them being contaminated is very high.
- Action 2: Take shelter as soon as possible in the nearby building.
- Action 3: From the entrance - remove possible contaminated clothing and footwear, place them in a tightly closed plastic bag in a safe place.
- Action 4: Close the ventilation system and all doors and windows.
- Action 5: Take a bath with warm (not hot) water and soap.
- Action 6: Call 112, describe the situation and ask for advices and help.

**The don'ts for the teachers and the students**

- Do not run, get inside. Sheltering in place, beneath as many layers of protection as possible, is the best way to avoid the radiation. Find and stay in the nearest closed place. Staying inside a car is better than staying outside. Anyway, houses are considerably safer than a car, particularly if there is room to shelter down in a basement.
- Avoid by any means to stay in plain air, which is probably contaminated. The main goal is to put as many walls as possible and soil between human body and the radioactive material outside. The recommendation is to stay inside for at least 24 hours unless authorities recommend something else.

## Accidents caused by explosions

Explosions are the instantaneous transformation of a solid or liquid substance into a gas, which leads to an important release of heat and kinetic energy causing a blast wave. The blast wave consists of a shock wave of high pressure followed by the blast wind.

There are a varying number of factors that influence the blast injury resulting from explosions, consisting of the type of explosive (there are of two types low-order where the blast wave moves at < 1000 m/s and high-order this produce supersonic blast waves that move at speeds > 4500 m/s), if the explosion happens in an enclosed or open space (e. g. enclosed spaces are chambers, means of transportation etc.), the proximity of the victims from the explosion site.

Explosions are unexpected events that have the potential to cause multiple-casualty involvement with a varying number of victims.

It is important to obtain information about the nature of the explosion, be it accidental or purposefully set off: the location of the blast site and the associated complications, such as fire, release of toxic elements, and possible structure collapse and obtain a possible victim count. If there is any suspicion of terror attack, special security measures need to be undertaken to ensure the safety of the personnel looking after victims and the victims themselves.

The approach to events as these is done by multiple specialised teams, consisting of teams from police, firefighters, and emergency medical services. These teams work as a whole, securing the site for any complications related to the initial event, securing the site from any malicious purposes, and also providing quick, efficient and effective triage of the victims with quick organisation of flows for medical care.

As civilians, it is important to always be aware of events around us and try and prevent disastrous events as these

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from happening. This can be achieved through proper education in use of potentially hazardous materials, reporting defects and malfunctions in a timely fashion, and the reporting of any suspicious behaviour carried out by other people that may or may not be authorised to be in certain places.

## Case Study 4 - Explosion event caused by a gas leak

You are out walking around the neighbourhood when you suddenly hear a big boom close by, coming from one of the surrounding small apartment buildings. You rush towards the sound and see smoke coming from one of the windows on the ground floor and the window frame is smashed around one of the trees in front of the building.

People are getting out of the building, scared and crying, and a lot more people are gathering around with their phones out filming the event. You see a young man covered in smoke soiled clothes querying everyone of they all made it out and that he is sorry he does not know what has happened.

You hear him sigh of relief when he sees everyone is out safely and you then see him dart towards the building saying that he must save his laptop.

What would you do in this scenario?

## Step by Step Procedure

- Action 1: You need to enssure your personal safety, make sure you keep a good distance from the site of the explosion and that it is safe to approach.
- Action 2: Everybody is on their telephone, but nobody is calling the authorities, make sure you call 112 – the European Emergency Number, and give them proper information about the location you are at, any complications you spot (such as fire, building collapse etc.), the number of people at the site and possible access ways. Make sure to follow any instructions the operator informs you of.
- Action 3: Offer help to anyone in need of aid but make sure not to expose yourself to any risk. If people are out, try and have them move back from the accident site until the authorities arrive and secure the area.
- Action 4: Try to discourage anybody trying to get back into the building to rescue items or valuables as this may only expose them to unnecessary danger. The person with the soiled burned clothes is the person that was probably in the apartment that had the deflagration, make sure you pay attention to them as they might be agitated and not thinking clearly. They are also the peoplemost likely to need medical assistance.
- Action 5: Wait for the authorities to arrive and secure the area.

**The don'ts for the teachers and the students**

- Do not approach the affected area as future explosions might still happen, the building might catch fire or collapse from the deflagration.
- Make sure you announce the authorities as soon as possible and offer aid to anyone in need. Discourage any unnecessary re-entry into the affected site.

## References

[1] Tintinalli JE, Kelen GD, Stapczynski JS. Emergency Medicine, A Comprehensive Study Guide 8th Edition American College of Emergency Physicians, 2016

[2] J. Marx, R. Hockberger, R. Walls, Rosen's Emergency Medicine Concepts and Clinical Practice 8th edition, 2014

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The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

[3] Diana Cimpoesu et all Guides And Algorithms Into The Emergency Medicine, Edit. Gr. T. Popa - Iasi, 2019,
[4] Centrul National de Monitorizare a Riscului din Mediul Comunitar, Ghid pentru populatie in caz de urgenta radiologica sau nucleara
[5] P. Hunt, I. Greaves, Oxford Manual of Major Incident Management, Oxford University Press 2017
[6] Guidance on Change of Ownership in Hazardous Facilities, Environment, Health and Safety, Environment Directorate, OECD (2018).

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