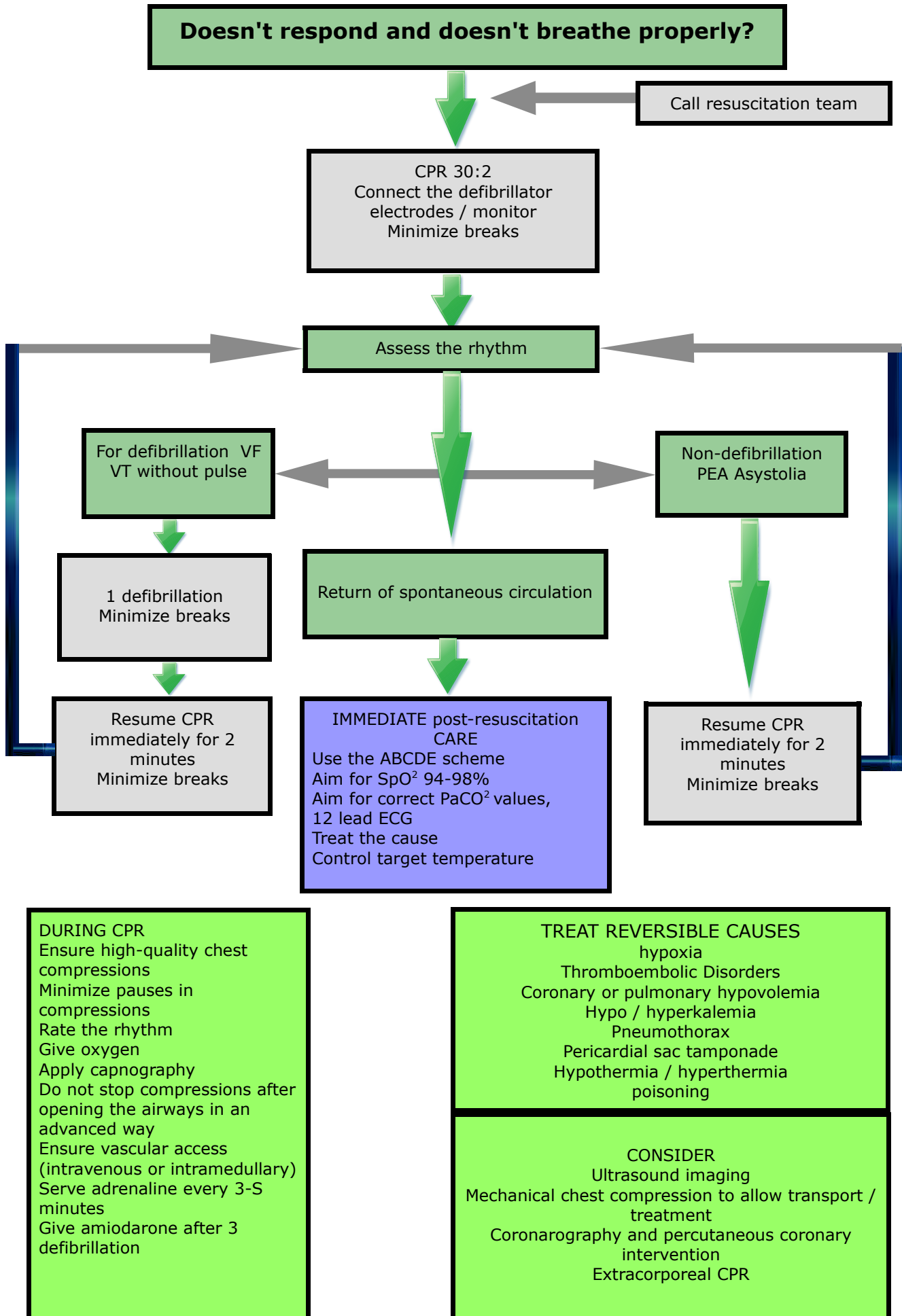


## **ALS ALGORITHM**

The ALS (Advanced Life Support) algorithm of the European Resuscitation Council contains a comprehensive diagram of the management of a patient suspected of sudden cardiac arrest (cardiac arrest). The algorithm elements are, among others cardiopulmonary resuscitation (CPR), electrotherapy, pharmacotherapy or airway patency. The goal of these activities is to restore spontaneous circulation (ROSC) and the scheme itself allows to put together in a logical whole all the activities necessary in the case of cardiac arrest.

## Advanced resuscitation procedures



## **Algorithm of advanced ALS resuscitation procedures**

CPR - cardiopulmonary resuscitation

VF / VT without pulse - Ventricular Fibrillation / Ventricular Tachycardia without pulse

PEA / asystole - pulseless electrical activity / asystole

ABCDE - Airway, Breathing, Circulation, neurological condition (Disability),

Exposure

SpO<sup>2</sup> - arterial blood saturation

PaCO<sup>2</sup> - partial pressure of carbon dioxide in arterial blood

**Safety:** Before starting, it is very important to check your own safety, the place of the accident and the injured. When it is safe, you can approach, meanwhile, making a general assessment, i.e. in what position the injured person is lying, whether he/she is moving or reacting or bleeding in any way. At this stage, it is important to identify if there are more injured persons in a given situation. In this case, it is reasonable to call for support at this stage. Remember to use disposable gloves, masks and goggles, which are to further increase safety for us.

**Roles:** Every time we start patient rescue operation it is important to share roles in the team. The most important point will be the appointment of the leader unless he/she is known for his competences. The leader will be responsible for therapeutic decisions made in relation to the patient. It is also important for each member of the resuscitation team to have a task at the beginning or better before starting the action (e.g. chest compressions, drug administration, heart rate monitoring / defibrillation)

**Initial assessment and patient examination:** A detailed description of the approach to the injured and verification of his/her vital signs is available in BLS guidelines. An additional activity included in ALS is heart rate. We should perform it on a large artery, e.g. carotid or femoral artery. If no breathing or heart rate is found during the test, CPR should be started immediately after assessing these parameters. If during the assessment you had doubts as to whether the described parameters occur, it is more beneficial for the patient to start CPR. Conducting chest compressions in a person with preserved circulation is not advisable, however, it will do less harm than abandoning CPR in a person without vital functions. To gain time, the measurement of breathing and pulse can be done at the same time, in which case it will be difficult to get an accurate result, but it will give us information whether the patient's parameters are present at all.

**Call for help:** If it is possible to call for help, we do it. Any additional pair of hands to work on the patient will be helpful. This applies to both pre-hospital activities and in-hospital area. It should be borne in mind that a critically ill patient should receive the best possible assistance

**Minimizing interruptions:** Special attention should be paid to minimizing interruptions in chest compressions. When assessing the heart rhythm and defibrillation we try to do so that they do not last longer than 10 seconds. Longer breaks are only allowed if specific medical interventions have a real impact on the patient's condition, e.g. decompression of pericardial tamponade, or obstruction of massive internal hemorrhage, if the procedure is not possible during chest compressions.

**Defibrillation safety rules:**

- ensure the safety of the resuscitation team,
- avoid moisture in the surroundings and clothing,
- dry the wet chest before defibrillation,
- avoid direct and indirect contact with the sick person at the time of discharge,
- during defibrillation, do not touch the equipment: intravenous injection set, patient trolley, ventilation bag, etc.,
- the person performing defibrillation does not touch the electrode surface; gel should be placed only locally in the places where the electrodes are applied,
- the person who triggers the energy discharge must loudly warn: "move away from the patient" and make sure that the staff follow the instructions,
- there must be no oxygen source in the defibrillation zone (ignition may occur), remove the face mask or self-inflating bag with the oxygen cylinder at a distance of at least 1 meter from the patient.
- DO NOT LOAD PADS IN THE AIR. Either we load them while they are locked in the defibrillator or on the patient's chest.
- the rescuer can increase the energy level by using a pad regulator,
- if a pacemaker is present, the defibrillator pads must be about 12-15 cm away from it,
- transdermal patch should be removed if it is on the patient's chest,
- excessive chest hair should be removed before defibrillation because it can evoke an electric arc and burns,
- the electrodes or pad must adhere tightly to the chest skin during discharge.

**Step by step instructions**

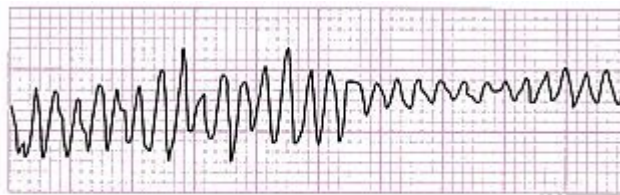
1. Security check,
2. Initial assessment, approach to the patient, check of consciousness, breath and pulse + possible call for additional help,
3. Immediately after the diagnosis of SCA, one of the team members begins CPR in the 30:2 pattern (30 chest compressions and 2 rescue breaths using a self-inflating bag with a filter, reservoir and oxygen source).
4. In the meantime, the team leader puts the defibrillator on in manual

defibrillation mode and, if possible, immediately glues adhesive electrodes to the patient's chest. If there are no such in the set, he must prepare for the first assessment of the patient's rhythm with the help of pads (the so-called Quick Look).

5. There is a short interruption of chest compressions and assessment of the patient's rhythm using gelled paddles or adhesive pads previously attached to the patient's chest.

### **Patient rhythm analysis**

Shockable Rhythms:

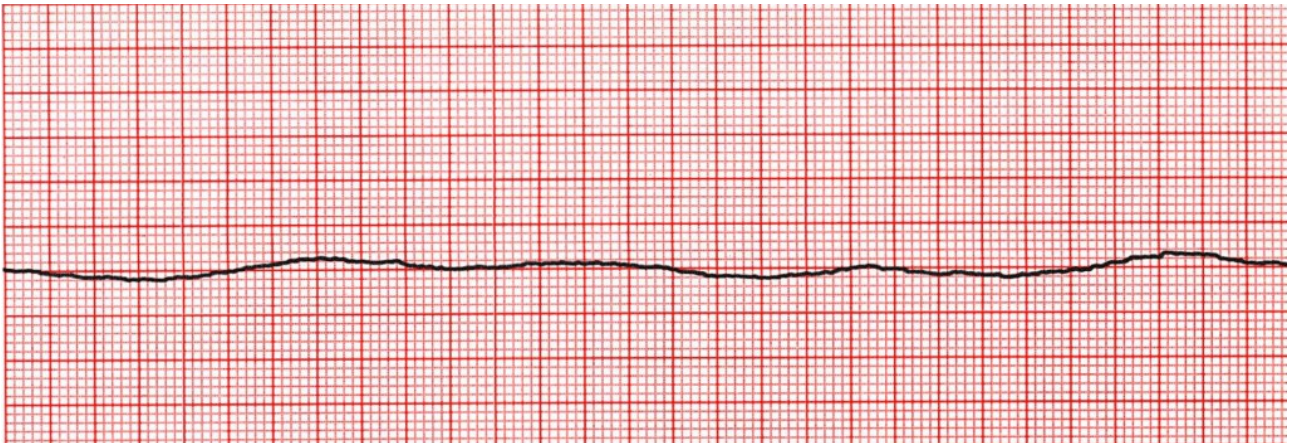


**Ventricular Fibrillation**



pulseless ventricular tachycardia - pVT

## Non-shockable Rhythms:



## Asystole



## pulseless electrical activity – PEA

6. After a short analysis, the rescuer immediately restores chest compressions. In the case of defibrillation rhythm analysis, the team leader immediately after diagnosis charges the defibrillator for the first defibrillation with 120-150 J energy (two-phase defibrillator) as recommended by the manufacturer (clearly marked on the device). If there are no clearly defined recommendations from the manufacturer regarding the amount of energy, the rescuer should use energy of 200 J. In subsequent discharges, the energy will be increased to a maximum of 360 J. After three defibrillations, 1 mg of Adrenaline and 300 mg of Amiodarone i.v. In the case of the first diagnosis of non-defibrillation rhythm, immediate intravenous access and 1 mg of adrenaline i.v.

7. After the first defibrillation, time should be measured carefully, as 2 minutes will pass between subsequent analyzes of the patient's rhythm. It is recommended that every time you analyze your patient's rhythm, you change the person performing chest compressions to get the most effective action possible.

8. If possible, the patient's respiratory tract should be protected as soon as possible. Tracheal intubation is the best way to protect the airways. After inserting the tube, its correct positioning in the airways should be assessed using a stethoscope and a capnometer. After proper intubation, the patient can be ventilated asynchronously at a rate of 10 breaths per minute (without interrupting compressions for inspiration). An alternative to intubation will be supraglottic devices (laryngeal mask, larynx tube, I-gel). If they are used, asynchronous ventilation may be attempted, while in the event of large leaks, 30: 2 ventilation is recommended.

9. During actions, reversible causes of cardiac arrest (4H / 4T) should be considered and treated, including:

**Hypoxia, hypovolemia, hypo/hyperthermia, hypo/hyperkalemia, pneumothorax, cardiac tamponade, intoxication, pulmonary/coronary embolism**

10. Drugs in SCA:

**Adrenaline** 1mg every 3-5 minutes

**Amiodarone** 300mg after three defibrillation and 150mg after five defibrillation attempts

**Lidocaine** 1mg / kg as an alternative to Amiodarone when it is not available, but should not be given when Amiodarone has already been given.

11. Ultrasonography around cardiac arrest is used to recognize its reversible causes (4H / 4T). If a device is available, it's a good idea to use.

it.

12. If spontaneous circulation (ROSC) has returned in the patient, immediately examine him/her with the ABCDE test, maintain a high level of saturation (94-98%), strive for normal PaCO<sup>2</sup> values, perform 12 stress relief tests. ECG, monitor its temperature, treat the cause of SCA.

The information presented above is only part of the guidelines. The entire content of the 2015 Resuscitation Guidelines (ERC) is available on the website of the Polish Resuscitation Council - [prc.krakow.pl](http://prc.krakow.pl)