

## Objectives

The aim of this project consist in making a comprehensive, detailed and updated bibliographic review about cardiopulmonary resuscitation (CPR) techniques in veterinary medicine for small animals, with the intention of showing some of the lacks of knowledge regarding this issue that must be taken into consideration for future research.

## Introduction

There are several differences among incidence, causes and survival rate from cardiopulmonary arrest in human and veterinary medicine. In veterinary, the incidence of cardiac arrest is unknown and asystole is the most detected arrest rhythm. Main causes are: hypotension, hypoxia, metabolic and electrolyte disorders. The survival rate are significantly different between humans and animals. In small animals it is placed in percentages from 4-9.6%, while human it is twice.

## Cardiopulmonary arrest

Cardiopulmonary arrest (CPA) is a clinical situation that involves an unexpected, sudden and potentially reversible cessation of breathing and / or spontaneous cardiocirculatory functions. Rapid onset of resuscitation is key for increasing survival rates in animals suffering from CPA. It is vital to recognize the clinical signs of the CPA: loss of consciousness, apnea, absence of heart sounds on auscultation and absence of palpable pulses .

## Cardiopulmonary resuscitation

Cardiopulmonary resuscitation (CPR) is the set of regulated and sequential steps to follow to replace and restore the respiratory and circulatory functions, and prevent hypoxic brain damage. CPR can be divided into three phases: basic life support, advanced life support and post-cardiac arrest care (Figure 1).

### BASIC LIFE SUPPORT (BLS)

Resuscitation is based in the ABC (A: Airway, B: Breathing, C: Circulation). Currently, it is recommended to change ABC by the CAB. Circulation should be addressed first, since the ventilation is ineffective if the cardiac output does not exist .

#### Circulation

Frequency of chest compressions varies between 80-120 compressions/min. The depth with which to perform chest compressions is between 1/2-1/2 of the chest diameter and it is recommended that full chest wall recoil is allowed between them. If after 2-5 min, spontaneous circulation is not restored, internal chest compressions should be initiated. This resuscitation is the first choice if the animal has suffered serious chest trauma, pneumothorax, etc.

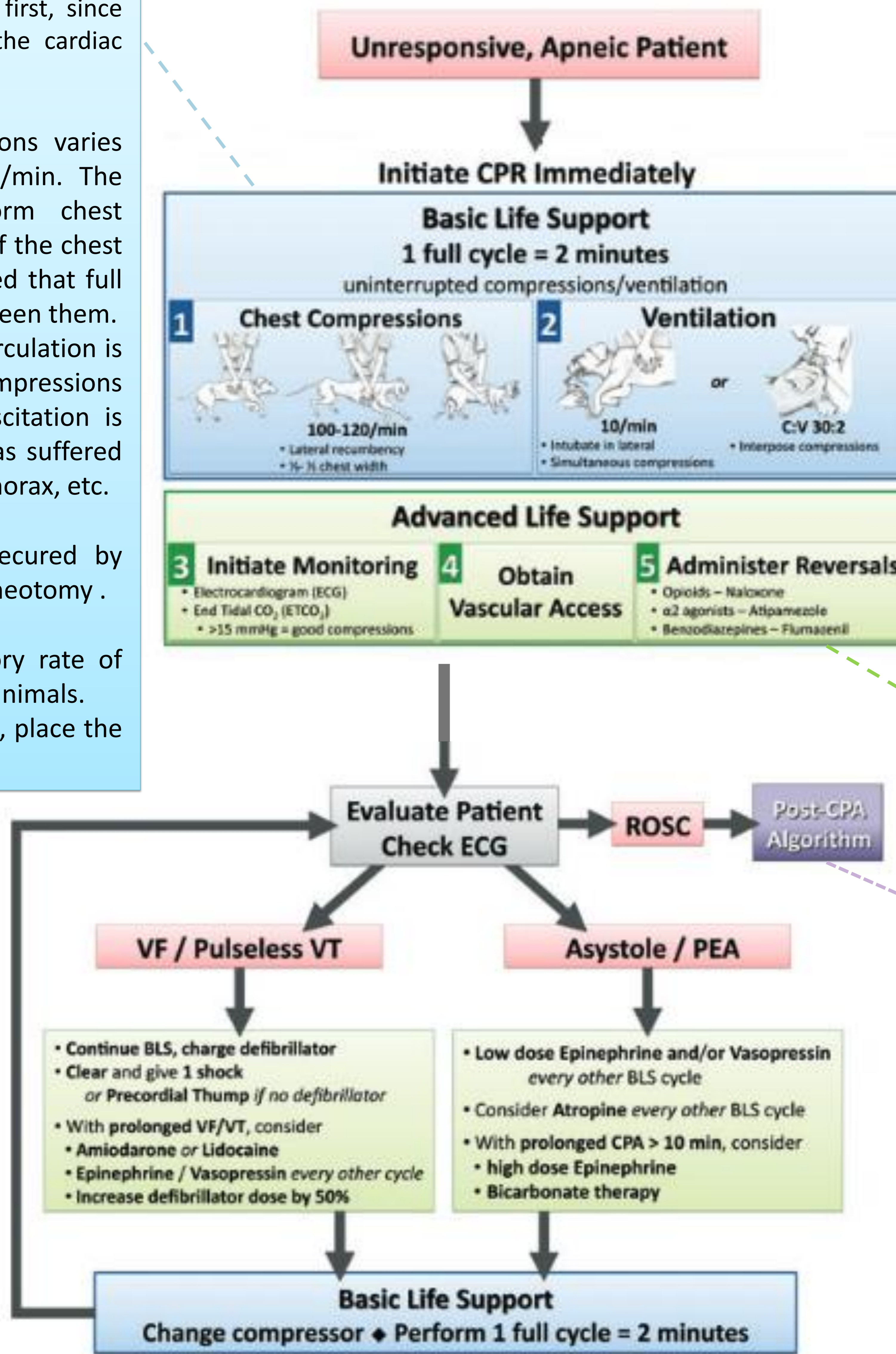
#### Airway

A patent airway should be secured by endotracheal intubation or tracheotomy .

#### Breathing

It is recommended a respiratory rate of 10-20 breaths/min, in intubate animals. If unable to intubate the animal, place the mouth-to-snout breathing.

## CPR Algorithm



### ADVANCED LIFE SUPPORT (ALS)

#### Drugs therapy

Vasopressor: increasing peripheral vasoconstriction and maintaining perfusion. Adrenaline is recommended to a low or high dose or vasopressin. Anticholinergic: useful on asystole or pulseless electrical activity with increased vagal tone. The most common anticholinergic is atropine. Antiarrhythmic: recommended in ventricular fibrillation refractory to defibrillation. Amiodarone is proposed or, failing that, lidocaine. Reversers agents: suggested in recent administration of anesthetic/analgesics drugs. Depending on the agent to reverse, yohimbine/atipamezol, flumazenil or naloxone should be used.

#### Defibrillation

Electrical defibrillation is the treatment of choice in cases of cardiac arrest due to ventricular fibrillation or pulseless ventricular tachycardia. There are different energy dosage protocols that can be used in defibrillation. The differences are due to the recommended Jules that must be used in each shock and the existing controversy of using increasing doses of energy.

### POST- CARDIAC ARREST CARE (PCAC)

One of the most important systems which suffers most damage is the nervous system, so its monitoring and support is especially important.

#### Neurologic support

It is convenient to establish neuroprotection measures to minimize neurological damage. Among the most described, is the use of mild therapeutic hypothermia. This is protective of organs, improving the neurological and cardiac outcome. The decrease in body temperature can be achieved by induced hypothermia or hypothermia permissive to the 32-34°C.

If the animal develops cerebral edema, administration of mannitol or hypertonic saline is recommended. Thiopental can also be used to control seizures and electroencephalic activity.

Figure 1. CPR algorithm chart. This chart summarizes the clinical guidelines most relevant to the patient presenting acutely in CPA

## Conclusions

There are limitations in veterinary CPR. On the one hand, there are only a few available studies, many of them are not standardized; extrapolations from human medicine and lower survival rates to those found in humans since the physiology of the arrest is different and research about it is limited. In the future, existing gaps have to be covered, disseminating the latest developments and raising awareness of the importance of renewing the expertise. In addition, there is a need to develop standardized studies to fill gaps in knowledge and in the criteria disparity on the application of resuscitation protocols.

