

Cardiopulmonary Cerebral Resuscitation (CP-CR)-A Team Approach

Part 1 – Basic Life Support

First Aid, Transport, Triage and CPR for Technicians

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Cardiopulmonary-cerebral resuscitation (CP-CR) has two major components: basic life support and advanced life support. The purpose of basic life support is the maintenance of organ function by promoting perfusion of the two major organs, the brain and the heart. The goal of advanced life support is the restoration of cardiac, pulmonary and cerebral function through evaluation of the ECG, blood gases and neurologic examination, and intervention with appropriate pharmacologic agents. It is important to determine what the underlying disease or problem is and whether the arrest was witnessed or not. This gives the clinician guidelines for procedures during resuscitation and prognosis for recovery. For example, when the patient is seen to vomit and arrest, a vagal reflex with severe bradycardia and apnea is likely. Or, when the initiating event is traumatic or anesthetic, and the arrest is witnessed, rapid open chest heart massage offers the best chances for recovery in large breed dogs. Serious underlying diseases that result in apnea and cardiac arrest offer a grave chance for recovery, with repeated arrests likely should the patient be resuscitated.

If the arrest was not witnessed, the duration of arrest is not known and the chances for recovery are poor. A witnessed arrest provides the optimal opportunity for rapid intervention and minimizing insults caused by the arrest and resuscitation.

The Team Approach

During CP-CR, it is vital that all personnel work as a team with one common goal, the resuscitation of the animal. The most experienced person should assume the position of team coordinator, and direct the most skilled individuals to intubate and do the cut-down. This is not the time to practice these techniques.

The coordinator: The clinician usually assumes this role, however a very experienced emergency or ICU nurse could work in this position when a clinician is less experienced or unavailable. . This person coordinates the arrest procedures and should remain with hands free whenever possible. The primary responsibility of the coordinator is to assure that all aspects of CP-CR are carried out quickly, correctly and efficiently. Each job is quickly assigned to available people, with the coordinator keeping a check as to whether the job was completed as required. This person rapidly interprets the ECG and call for drugs and the volumes to be given. A constant check must be made as to effectiveness of ventilations and compressions, pulse quality, presence of heart sounds, and ECG changes. The clinician determines when open chest heart massage, binding, defibrillation, and ending the resuscitative effort is appropriate.

The ventilator: This person rapidly grabs endotracheal tubes, laryngoscope and oxygen source. The animal is intubated and ventilated. When there are only two people present, this person will also do chest compressions, doing six chest compressions and one ventilation. The coordinator still remains free to do cut-downs, hook up the ECG, read the ECG, and administer drugs.

The compressor: When there are three people available for CP-CR, the third person does the chest compressions as described above.

Basic Life Support

The primary components of basic life support are **Airway**, **Breathing** and **Circulation** (the **ABC's**). Tracheal intubation, ventilation with oxygen and chest or cardiac compressions provides oxygenation of the blood and pressure to push the blood through the circulatory system. The primary organs to perfuse are the brain and the heart, with the large muscle masses, skin, and abdominal viscera significantly less important.

Airway

The first priority of the rescuer is to ensure that there is a patent airway and to be able to maintain. To accomplish this, the patient is placed in a lateral position, leaving the head level with the body. Elevating the head in an animal with low blood pressure can decrease blood flow to the brain. Open the animal's mouth and pull the tongue forward, extending the neck. If it is known that an obstruction is present, the rescuer will insert the index finger down the side of cheek and into the back of throat to the base of the tongue. The rescuer will then "sweep" across the back of the throat in a hooking action to dislodge the obstruction and move the object forward for retrieval. Rescue breathing can be provided by

performing mouth to nose breathing or using a face mask with AMBU bag until a laryngoscope examination and tracheal intubation can be performed. Make sure the endotracheal tube is in the trachea by quickly placing a finger down the pharynx and palpating the dorsum of the trachea over the endotracheal tube.

If the rescuer is unable to remove the obstruction, a large bore catheter can be placed between tracheal rings into the trachea to create a small airway and allow ventilation until the obstruction can be removed. Excessive saliva or secretions should be removed using a suction device. Once an airway has been established, the rescuer will provide artificial breathing.

Breathing

Once the animal has an established airway, an oxygen source is attached via an AMBU bag and 3-4 ventilations are given. Often, arrests are only pulmonary, with the heart still beating but at a very slow rate. The initial ventilations may be enough to re-establish breathing and a faster heart rate.

inspiration - When a pressure gauge is available, strive to maintain an inspiratory pressure of 20 cm of water in the dog and 10-15 cm of water in the cat. Inspiratory pressures greater than this will be necessary with pleural or lung parenchymal disease. Over-inflation will interfere with venous return and the thoracic pump, as well as cause ruptures of the pulmonary tree with free air in the thorax. When a pressure gauge is not available, provide enough inspiratory pressure to see movement of the thoracic wall.

When it is difficult or impossible to inflate the lungs, a tension pneumothorax is likely and a large bore needle or tube is rapidly placed in the pleural space to evacuate the air. If the air leak is severe, convert the closed tension pneumothorax to an open pneumothorax.

expiration - Allow the pressure to fall to 0-5 cm of water at the end of expiration. This provides for better pressure change during chest compressions. Should there be severe pulmonary parenchymal disease which is not responsive to increased inspiratory pressures with 100% oxygen, allowing a positive end-expiratory pressure (PEEP) of 5-15 cm of water may assist oxygenation. Remember, however, that this PEEP will interfere with venous return and the thoracic pump during chest compressions.

The rate of ventilation now preferred is rapid. Small sized animals can be ventilated 60-120 breaths per minute, and medium or large sized animals 60-80 breaths per minute. Using these rapid ventilations, it is especially important to allow a low end-expiratory pressure to optimize the thoracic pump effect of chest compressions.

Circulation

It is first determined whether or not there is a heart beat. If there is a heart beat, the rescue team will attach the ECG electrodes, monitor the rhythm and treat accordingly. If there is no detectable heart beat, there are four options: 1. immediate defibrillation; 2. begin chest compressions; 3. open the thoracic cavity and begin cardiac massage; or 4. a combination of the above

Immediate defibrillation: Many clinicians feel that immediate defibrillation of an animal with a witnessed arrest offers the best prognosis for recovery. One of the most treatable arrest arrhythmias is ventricular fibrillation, and defibrillation is the treatment of choice. Should the arrhythmia be other than these, it is felt that one-time defibrillation will do minimal, if no, harm.

Closed chest compression - Small dogs (<12 kg body weight) and cats can often be adequately perfused by closed chest cardiac massage. These smaller animals benefit from the thoracic pump as well as some direct myocardial compression. Medium sized animals (12-25 kg body weight) have little direct cardiac compression and benefit primarily from the thoracic pump effect of closed chest compressions. Large animals (>25 kg body weight) can get some benefit from the thoracic pump but fare best with open chest heart massage. It has been demonstrated experimentally that external chest compressions promote venous return and cardiac output through the thoracic pressure differences that occur during compression and relaxation of the thoracic wall (thoracic pump). This pressure difference is also promoted through chest wall excursions during ventilation.

In small sized animals, chest compressions are best performed by placing the hands around the thorax, with the palm of one hand over the sternum and the palm of the other around the back. Compress with both hands directly over the heart, changing the circumference of the thorax approximately 25-30%. Chest compressions for medium or large sized dogs are best performed with the back of the animal toward the compressor, with the compressor elevated above the animal. With extended arms, the palm of the hands are used to compress the thorax, decreasing the diameter of the thorax approximately 25-30% of normal.

The rate of chest compressions is approximately 80-120 compressions per minute in small sized animals and 60 compressions per minute in medium to large sized animals. When using rapid compression

techniques, it is important to release the thorax completely in between compressions to optimize the thoracic pump effect. Using rapid ventilations and compressions, it is not possible to coordinate all of the ventilations with the respirations.

When slower compressions are utilized (60/minute), the downward compression should be a rapid acceleration with a "down-hold" during compression. Then during release, there should be a rapid acceleration.

Direct cardiac massage – The veterinarian leading the resuscitation team will take an active role in this procedure. Clip the hair from the chest if time permits. Make a skin incision and a stab incision through the intercostal muscles with a scalpel blade. Using the curve tipped metzenbaum scissors to complete the incision through the intercostal muscles and open the pericardial sac (avoid cutting the phrenic and vagus nerves. Do not sharply elevate or twist the heart, since these movements can cause avulsion of large veins from the heart.

The heart is held in the palm of the hand or by both hands and equal compression is applied to both ventricles of the heart simultaneously. The compressions begin at the apex and move upward toward the base of the heart. The descending aorta can be occluded by placing a red rubber feeding tube around it and tightening the circumference. This aids the redistribution of the blood to the myocardium and brain.

Visit our website at www.animalemergencycenter.com "Your Pet's Health" for pictures and a description of mouth to nose resuscitation and chest compressions!!!!