CPCR Update – It May Take Your Breath Away! AETC 2011

Todd Duffy, DVM, DACVECC

Recent reports have emphasized the limitations in the *quality* of cardiopulmonary-cerebral resuscitation (CPCR). It has recently been discovered that there is a significant tendency to hyperventilate CPCR patients, as well as provide chest compressions that are of insufficient depth, too slow, interrupted too frequently and provide incomplete thoracic recoil. These findings, along with facts that most people would rather perform mouth-to-mouth on their pet than on a stranger and most people experiencing out of hospital arrest do so secondary to a non-respiratory illness, have led to the following modifications in CPCR guidelines in people.

1) Previous guidelines have over-emphasized ventilation requirements. Current recommendations in patients with non-respiratory cause of death are to **ventilate 8-10 times/minute**. This lower ventilator rate will help augment cardiac output achieved with chest compressions. Patients that experience cardiopulmonary arrest (CPA) from a respiratory cause warrant higher rates.
2) Tidal volume of positive-pressure ventilations is limited to an initial, visible rise in thoracic wall, typically requiring a tidal volume of <10 ml/kg – know the size and function of your AMBU bags.
3) Positive-pressure ventilations should have an inspiratory phase limited to 1 second.
4) Agonal respirations are associated with improved survival and should be included in respiratory count.
5) There are currently two different, commonly used methods of performing chest compressions in veterinary patients, direct cardiac compression (cardiac pump, used in smaller patients) and indirect thoracic compression (thoracic pump, used in larger patients).
6) Chest compressions, provided from a position of leverage with the intent to restore cardiac output, should be performed between **100-120 beats/minute** and aggressive enough to displace the thoracic diameter by 20-30%. Just remember "*staying alive, staying alive, ah ah ah ah staying alive*".
7) The compression:decompression ratio should be 1:1. It is vitally important for the decompression phase to be complete, thus allowing maximal ventricular filling prior to the next compression.
8) Chest compressions should be performed continuously. Maneuvers commonly associated with interruptions in chest compressions are attaching monitors, endotracheal intubation, defibrillation, rhythm evaluation, establishing IV access, endotracheal medication administration and ventilations in out-of-hospital resuscitation attempts. Do not stop chest compressions to deliver manual respirations.
9) **Exchange rescuers** a minimum of **every 2 minutes**, whether a feeling of physical fatigued occurs or not.
10) Single-shock protocol is now preferred for defibrillation. This change places an emphasis on minimizing the preshock pause (interval between stopping chest compressions and delivering a shock), the application of a single defibrillation, followed immediately by about two minutes of quality chest compressions before subsequent shocks are delivered.
11) In addition to open-chest CPCR being used as a salvage procedure if external cardiac compressions fail, other indications include pericardial disease (pericardial effusion, peritoneopericardial diaphragmatic hernia), presence of rib fractures and pleural space disease (pleural effusion, diaphragmatic hernia, etc). Direct cardiac massage is obviously recommended when CPA occurs during a laparotomy or concurrent thoracotomy.

12) Intravenous access, if deemed necessary, should NOT occur at the expense of performing chest compressions. Therefore, peripheral venous access may be preferred over central venous access. On the contrary, if both a central and peripheral catheters are present, administration of medications through the central catheter are preferred. Follow administration of IV medications through a peripheral line with sufficient crystalloids to centralize the medications. Intraosseous administration is the next alternative, with the endotracheal route being the last alternative. Medications that can be given via the ET route, include the **NAVEL** drugs; *n*aloxone, *a*tropine, *v*asopressin, *e*pinephrine, and *l*idocaine.
13) Current recommendations are to administer **low-dose** epinephrine first.
14) ET administration is of medications is best absorbed if deposited in the lower airways, warranting doses of 2-2.5 times that administered IV, with some studies suggesting the required doses for epinephrine are 3 to 10 times higher than the equipotent IV dose. Medications should be given with up to 10 mls of **sterile H_20** and flushed with several brisk ventilations.
15) Rapid administration of IV fluids may have a deleterious impact, by compromising myocardial perfusion. Therefore, IV fluid loading should be limited to patients that present with volume depletion.
16) ECG monitoring is essential for interpreting the electrical activity of the heart.
17) As a surrogate for cardiac output, end-tidal CO_2 ($ETCO_2$) measurement helps detect quality of compressions, as well as aiding in detecting operator fatigue. $ETCO_2$ readings <10 mmHg require an alternative approach to cardiac compressions.
18) Definitive recommendations for induced hypothermia cannot be made at this time, however, what is clear from this data is that hyperthermia should be avoided.

References:

RECOVER Project to be released soon.

ECC Committee, Subcommittee and Task Force of the American Heart Association. 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2010;122(suppl 3):S640-S946. OR http://circ.ahajournals.org/content/vol122/18_suppl_3/.

Plunkett SJ, McMichael M. Cardiopulmonary resuscitation in small animal medicine: An update. J Vet Intern Med 2008;22:9-25.

Boller M, Kellett-Gregory L, Shofer FS, Rishniw M. The clinical practice of CPCR in small animals: an internet-based survey. J Vet Emer Crit Care 2010: 20(6):558–570.

Seekins MG, Reiss AJ. Application of impedance threshold devices during cardiopulmonary cerebral resuscitation. J Vet Emer Crit Care 2011: 21(3):187-192.