EMERGENCY INTERVENTION CHART

think ANAESTHESIA

Emergency Checklist[1-3]

There are many variations to emergency checklists. The following **ABCDEF** version is a guide of checks and considerations when dealing with a patient that potentially requires emergency intervention in the event of a cardiopulmonary arrest (CPA) or similar. Note that the order in which these are addressed in an emergency situation is normally CABDEF, however the mnemonic ABCDEF is typically referred to for easy recall of the steps involved.

A AIRWAY MANAGEMENT

- **Check patency of airway and ET tube (if present) as well as placement of ET tube. Take care not to interrupt chest compressions, intubate in lateral recumbency**
- **Clear any secretions (saliva, blood, mucus, etc.)**
- **If not possible, consider a tight-fitting mask, mouth to nose ventilation or tracheotomy**

B BREATHING

- **Provide 100% oxygen. Turn off any anaesthetic gases**
- **If indicated, provide IPPV at 10 breaths per minute; tidal volume 10mL/kg; inspiratory time 1 second**
- **Keep peak inspiratory pressure less than 20cm H_2O**
- **Allow the chest to deflate fully between breaths**
- **Perform simultaneously with chest compressions in uninterrupted cycles of two minutes in duration**
- **If mouth to nose ventilation necessary, deliver repeated rounds of 30 chest compressions and two rapid breaths in cycles of two minutes**

C CIRCULATION

- **Commence cardiac compressions as soon as possible using technique appropriate for patient (lateral recumbency for most patients; dorsal recumbency for barrel-chested dogs) at a rate of 100-120 per minute. Note that the likelihood of causing serious harm if CPA has not actually occurred is very low (<2%)**
- **Perform deep compressions of 33-50% of the width of the thorax (when lateral), allowing it to recoil completely without pressure in between compressions**
- **Perform uninterrupted cycles of compressions for two minutes in duration, simultaneously with ventilation**
- **Alternate personnel performing compressions every two minutes to avoid fatigue and ineffective technique**

D DRUGS

- **Establish IV access if not already present; consider intra-osseous access, especially in young animals**
- **Cease administration of all depressant medications, including anaesthetics**
- **Check doses of all medications administered to assess for possible overdoses**
- **Commence emergency medications as per the table alongside, as appropriate for the patient's condition**

E ECG & EQUIPMENT

- **Place ECG leads if available, particularly in cases of arrhythmias, to identify the type of arrhythmia, to guide appropriate treatment e.g. defibrillation, precordial thump and/or administration of emergency medications as per table alongside, as appropriate for the patient's condition**
- **Check all anaesthetic and monitoring equipment is placed and functioning correctly e.g. capnograph, pop-off valves, oxygen cylinder, breathing circuit**

F FLUIDS

- **Shock volumes of fluids are indicated only if CPA was preceded by volume depletion; euvolaemic and hypervolaemic patients should not be administered supplemental IV fluids during CPR, except to flush emergency medications into the circulation**
- **Crystalloids, colloids or whole blood as indicated by the patient's condition**

Parameter	Indications	Dose Rate & Route	Dose volume	Adverse Effects
DRUGS FOR CARDIOPULMONARY ARREST[1,2,4]				
Adrenaline (1:1000 = 1 mg/mL)	Cardiac arrest; Anaphylaxis	0.01 mg/kg IV	0.01 mL/kg IV	Tachycardia; Arrhythmia
	CPR > 10 minutes	0.1 mg/kg IV	0.1 mL/kg IV	
Atropine (0.6 - 0.65 mg/mL)	Bradycardia, AV Block, Sinus arrest, Asystole	0.04 mg/kg IV	0.067 mL/kg IV	Tachycardia; Transient 2nd degree AV block at low doses
Vasopressin (20 U/mL)	Can be used as a substitute for, or in combination with adrenaline every 3-5 minutes	0.8 U/kg IV	0.04 mL/kg IV	Severe vasoconstriction, Arrhythmia
ANTI-ARRHYTHMICS[1,2,4,5]				
Lignocaine (20 mg/mL)	Refractory ventricular fibrillation, Ventricular tachycardia (if amiodarone not available)	**Dogs:** 2 mg/kg IV CRI: 1.5 – 6 mg/kg/hr IV	**Dogs:** 0.1 mL/kg IV CRI: 0.075 – 0.3 mL/kg/hr IV	Hypotension if bolus given too quickly; Seizures if overdosed
		Cats: 0.25 – 2 mg/kg slow IV in 0.25-0.5mg/kg boluses CRI: 0.6 – 1.2 mg/kg/hr IV	**Cats:** 0.0125 – 0.1 mL/kg IV in 0.0125 – 0.0250 mL/kg boluses CRI: 0.03 – 0.06 mL/kg/hr	
Amiodarone (50 mg/mL)	Ventricular fibrillation, Atrial fibrillation, Pulseless ventricular tachycardia	**Dogs only:** 5 mg/kg IV	0.1 mL/kg IV	Bradycardia; AV block; Hypotension
REVERSAL AGENTS[1,2,4,5]				
Naloxone (0.4 mg/mL)	Opioid toxicity, Reversal of opioids	0.04 mg/kg IV	0.1 mL/kg IV	Lack of analgesia
Flumazenil (0.1 mg/mL)	Reversal of benzodiazepines	0.01 mg/kg IV	0.1 mL/kg IV	Seizures reported in overdoses in humans
Atipamezole (5 mg/mL)	Reversal of α-2-agonists	100 µg/kg IM	0.02 mL/kg IM	Excitation
		Dogs: Equal volume dex/medetomidine administered Cats: Half volume dex/medetomidine administered		
BLOOD PRESSURE / CARDIAC MANAGEMENT[1,2,5]				
Ephedrine (10 mg/mL)	Hypotension	50 – 100 µg/kg IV	0.005 – 0.01 mL/kg IV	Tachycardia, Arrhythmia
Dopamine (40 mg/mL)	Hypotension	2 – 15 µg/kg/min IV Dilute to a 200 µg/mL solution for ease of administration	0.01– 0.075 mL/kg/min IV when using a 200 µg/mL solution	Tachycardia, Hypotension at low doses, Hypertension at high doses
Dobutamine (12.5mg/mL)	Low cardiac output, Acute heart failure	1 – 20 µg/kg/min IV Dilute to a 250 µg/mL solution for ease of administration	0.004 – 0.08 mL/kg/min IV when using a 250 µg/mL solution	Tachycardia, Vasodilation, Seizures

Cardiorespiratory & Physiologic Parameters in Anaesthetised Dogs & Cats[2,3,6-10]

	Variable	Dog	Cat
Circulation	Heart rate	Large dog: 60 – 120 beats/minute Small dog: 80 – 160 beats/minute	120 – 220 beats/minute
	Systolic blood pressure	90 – 140 mm Hg	90 – 140 mm Hg
	Diastolic blood pressure	65 – 90 mm Hg	65 – 90 mm Hg
	Mean arterial blood pressure	70 – 90 mm Hg	70 – 90 mm Hg
	Capillary Refill Time	1 – 2 seconds	1– 2 seconds
Ventilation	Respiratory rate	8 – 16 breaths/minute	12 – 24 breaths/minute
	Tidal volume	10 – 15 mL/kg	10 – 15 mL/kg
	End-tidal CO_2	35 – 45 mm Hg	35 – 45 mm Hg
Oxygenation	SpO_2	98 – 100% (assumes patient breathing 100% oxygen, not room air)	98 – 100% (assumes patient breathing 100% oxygen, not room air)
	Mucous membrane colour	pink	pink
Other	Temperature	37.8 – 39.2°C (note: studies have shown 83.6% of dogs develop hypothermia under anaesthesia[9])	37.8 – 39.2°C (note: studies have shown 96.7% of cats develop hypothermia under anaesthesia[10])
	Haematocrit	34 – 59 %	28 – 47 %

Please note: As patient variability and medications used may affect the positioning of these values, they are intended only as a guide, and are not absolute. Where parameters are measuring outside of these ranges, intervention should be considered.
In situations where a patient is showing a changing trend in a number of parameters, intervention is warranted as quickly as possible.

References: 1. Fletcher DJ et al. RECOVER evidence and knowledge gap analysis on veterinary CPR Part 7: Clinical guidelines. JVECC 2012;22(S1):S102-S131. 2. Duke-Novarski T et al. BSAVA Manual of Canine and Feline Anaesthesia and Analgesia 3rd Edition 2016. © BSAVA. 3. Dugdale AHA et al. Veterinary Anaesthesia: Principles to Practice 2nd Edition 2022. © Wiley Blackwell. 4. Plumb DC. Plumb's Veterinary Drug Handbook online edition. https://app.plumbs.com/. Accessed 9/10/2023. 5. Allerton F. BSAVA Small Animal Formulary - Part A: Canine and Feline 10th Edition 2020. © BSAVA. 6. Muir WM. Chapter 22 Cardiovascular Physiology. In: Grimm et al. Lumb and Jones Veterinary Anaesthesia and Analgesia 5th Edition 2015. © John Wiley and Sons; 417-472. 7. Ko J et al. Anesthetic Monitoring Devices to Use & What the Results Mean. Today's Vet Prac 2012;Mar/Apr:23-30. 8. Ko J et al. Anesthetic Monitoring Therapeutic Actions. Today's Vet Prac 2012;May/Jun:29-35. 9. Redondo JI et al. Retrospective study of the prevalence of postanaesthetic hypothermia in dogs. Vet Rec 2012;171(15):374. 10. Redondo JI et al. Retrospective study of the prevalence of postanaesthetic hypothermia in cats. Vet Rec 2012;170(8):206.

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