



Guide to Anaesthesia

Skin disinfectants

	Disinfectant	Dilution	Use	Contact Time	Contra-indications
Initial skin scrub	Chlorhexidine	2 % Fill brown bottle halfway with chlorhexidine 4 % and top up with water	Most surgical skin prep. Repeat once moved to theatre.	5 mins	Do NOT use on eyes, inside ears, genitals, open wounds.
	Povidone-iodine	2 % Put 2ml povidone-iodine 10 % solution into 100ml saline	Eyes, external ears, genitals	5 mins	Do NOT use alcohol-based povidone-iodine for sensitive areas. CHECK BOTTLE!
	Saline	0.9 %	Flushing open wounds	n/a	Not a disinfectant but will remove gross organic contaminants
Final skin scrub	Vetasept Chlorhexidine spray	0.5 % chlorhexidine in 70 % alcohol	Final skin prep before surgery. Use after chlorhexidine initial skin scrub for most routine surgeries	Once dry	Do not use cautery when wet – risk of burning.
	Chloraprep applicators	2 % chlorhexidine in 70 % alcohol	Final skin prep before surgery. Use after chlorhexidine initial skin scrub. Use for orthopaedics.	Once dry	Do not use cautery when wet – risk of burning.

Pulse Oximetry

Normal trace



Low perfusion



Troubleshooting:

- Check patient – how do the pulses feel? Is patient hypothermic? Is patient in shock? Is there possibility of a sudden embolus (unlikely, but possible!)
- Wet swab on tongue
- Check other parameters often, including blood pressure, to get an idea of cardiac output.
- If other parameters stable, try to reposition the probe to get a better trace, in case probe has caused local vascular occlusion.
- If as a result of α -2 administration, expect the trace to improve as the effects of the drugs wear off.

Noise artifact



Troubleshooting:

- Ensure probe is aligned correctly and hasn't twisted.
- Eliminate mechanical interference/vibrations from other equipment.
- Move to a different position of patient to see if this reduces noise.

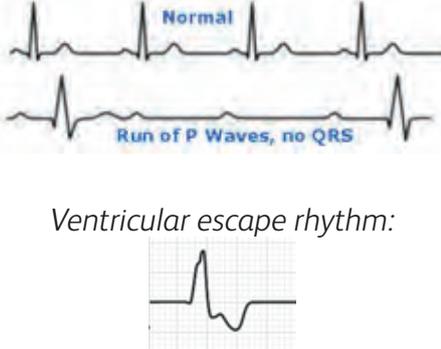
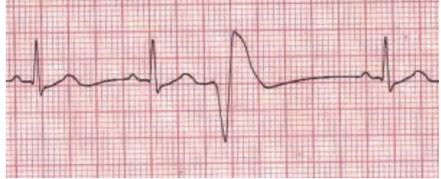
ECG Abnormalities

ECG Abnormalities chart

Abnormality	ECG	What is it?	What should I do?
Respiratory sinus arrhythmia	<p>Faster HR with inspiration Slows down with expiration</p>	<p>HR increases with inspiration and decreases with expiration.</p> <p>Caused by increased vagal stimulation and cardiac filling pressures during respiration.</p>	Nothing – a normal rhythm often associated with healthy cardiac function.
1st degree AV block	<p>1st Degree AV Block</p>	<p>Elongated gap between P wave and QRS complex.</p> <p>Conduction through AV node is slow but all electrical signals get through to ventricles</p> <p>QRS complex for every P wave</p>	Nothing – shouldn't cause any cardiovascular disturbance.
2nd degree AV block: Mobitz type I (Wenkebach)	<p>No QRS Complex</p>	<p>Gradual prolonging of PR interval, with eventual loss of QRS complex.</p> <p>Cycle then repeats.</p> <p>No QRS means no ventricular contraction that beat.</p>	<p>Monitor in case progresses in to Mobitz II or 3rd degree block.</p> <p>Monitor blood pressure to assess cardiac output.</p> <p>If blood pressure low - treat immediately.</p>
2nd degree AV block: Mobitz type II	<p>Single P wave, no QRS Single P wave, no QRS</p> <p>Ventricular escape rhythm:</p> <p>Note the wide QRS, with no P wave.</p>	<p>Sporadic loss of QRS complex ie. Singular lone P waves seen.</p> <p>PR interval is constant</p> <p>No QRS means no ventricular contraction that beat.</p> <p>Might see “escape rhythms” as conductive areas of ventricles fire off their own late signals.</p>	<p>Most commonly seen, often with bradycardia and as a result of α-2 agonists or opioids.</p> <p>Monitor blood pressure to assess cardiac output.</p> <p>-If normotensive, monitor.</p> <p>-If hypotensive, treat.</p> <p>Glycopyrrolate if bradycardic to increase HR or ephedrine.</p>

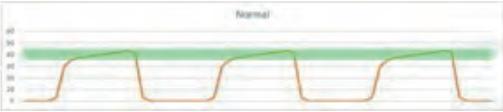
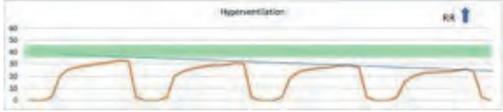
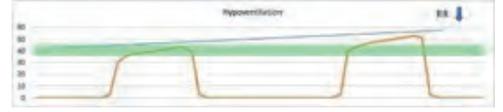
ECG Abnormalities

ECG Abnormalities chart (cont'd)

Abnormality	ECG	What is it?	What should I do?
3rd degree AV block	 <p>Normal</p> <p>Run of P Waves, no QRS</p> <p>Ventricular escape rhythm:</p>  <p>Note the wide QRS, with no P wave.</p>	<p>Runs of P waves with no QRS complexes.</p> <p>No ventricular contraction at all during those runs!</p> <p>Risk of ventricular standstill - ie no blood being pumped out of ventricles!</p> <p>Might see “escape rhythms” as above.</p>	<p>Treat immediately!</p> <p>-If bradycardic, glycopyrrolate or atropine.</p>
Ventricular premature contractions (VPCs)	 <p>Note the wide and bizarre QRS complex</p>	<p>Ventricles contract before signal from AV/ SA node</p> <p>Isolated VPCs have minor effects on cardiac output. Persistent runs of VPCs can be a precursor to ventricular fibrillation, which is fatal without treatment.</p>	<p>Inform your vet immediately.</p> <p>Can be caused by:</p> <ul style="list-style-type: none"> - pain - stress - excitement - hypoxia/hypercapnia - electrolyte imbalance - drugs eg. ketamine. <p>If severe runs of VPCs, treatment with lidocaine.</p>

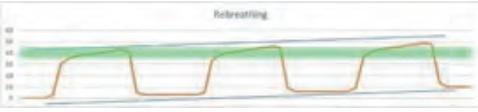
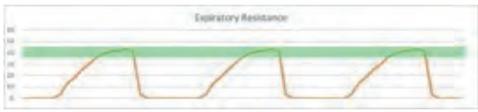
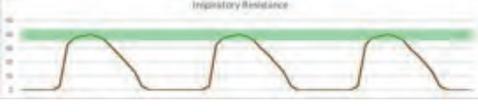
Capnography

Capnography chart

Abnormality	Trace	What is it?	Troubleshooting: What should I do?
Normal	 <p>Looks like a line of elephants holding tails</p>	Normal = 35- 45mmHg - dogs 25-35mmHg - cats	Nothing Baseline should return to 0
Hyper-ventilation		Increased resp. rate leads to reduced CO ₂	Asses why resp. rate has increased. <ul style="list-style-type: none"> - Pain? More analgesia - Insufficient anaesthetic depth? Turn up isoflurane/ give propofol if vet allows.
Hypo-ventilation		Decreased resp. rate leads to increased CO ₂	Asses why resp. rate has decreased. Excessive anaesthetic depth? Certain drugs will cause resp. depression e.g. methadone, α ₂ -agonists. Adjust iso accordingly. If CO₂ >60mmHg , consider IPVV to maintain normocapnia.
Crash OR Patient disconnected from breathing system		Sudden loss of CO ₂ Could be patient crashing i.e. loss of cardiovascular activity leads to reduction of CO ₂ delivery to lungs. OR Patient may have become disconnected from breathing system.	Check patient! <ul style="list-style-type: none"> - Has tubing become disconnected? - Has patient become extubated? - Is patient crashing? If so, tell vet immediately and press crash alarm! Ideally, check all these things at the same time!
Cardiac Oscillations		Normal. Effect of heartbeating on gas movement in airways during inspiration.	Nothing. More often seen if patient is bradypnoeic or deep chested.

Capnography

Capnography chart (cont'd)

Abnormality	Trace	What is it?	Troubleshooting: What should I do?
Rebreathing CO ₂		Trace does not return to 0 baseline. Shows that patient is breathing in CO ₂ during inspiration.	Can be caused by: Excessive dead space in breathing system. - Is ET tube too long? - Has an elbow been connected? Fresh gas flow too low? Especially with T-piece/Bain Exhausted soda lime?
Decreased cardiac output Or Patient breathing around ET tube		Consistently lower than expected CO ₂ Could be due to cardiovascular system not delivering CO ₂ to lungs at normal levels. Could be due to insufficient cuff inflation.	Leak test ET tube cuff by listening for air leak near patient's mouth as another person "gives a breath". Check blood pressure, peripheral pulses and mms/CRT to assess cardiac output.
Expiratory resistance AKA "shark-fin"		Something is causing obstruction or partial obstruction when the patient is breathing out. Biological or equipment related.	Is ET tube obstructed? - Patient position, mucous? Expiratory valve malfunction on breathing system? Bronchospasm?
Inspiratory resistance		Something is causing obstruction or partial obstruction when patient is breathing in.	Is there pressure on patient's chest? - Vet's instruments?! Abdo contents putting pressure on diaphragm? Diaphragmatic hernia? Malfunctioning inspiratory valve? Fresh gas flow too low? Check bag not deflated.

Blood Pressure

Blood pressure chart

Normal values		
	Oscillo-metric	Doppler
Dogs	Systolic: 90-140mmHg Diastolic: 50-80mmHg Mean: 60-100mmHg	Value is reflection of systolic pressure 90-140mmHg
Cats	Systolic: 80-140mmHg Diastolic: 55-75mmHg Mean: 60-100mmHg	Value is somewhere between mean and systolic pressure Aim for >90-100mmHg If less than 100mmHg, inform vet and check other parameters. Monitor trend closely.

Choose cuff width approx. 40% circumference leg/tail

**HYPOTENSION = WHEN MEAN IS <60mmHg
TAKE ACTION IMMEDIATELY**

How to treat Hypotension

Treatment of Hypotension chart

Option	When appropriate?	What effect?
Turn down isoflurane	When anaesthetic depth can be decreased.	Even a small reduction can help.
Fluid bolus of crystalloid (Hartmann's/saline) 5-10ml/kg over 5-15 mins. Can be repeated.	Hypovolaemia i.e. dehydrated or haemorrhage.	Improve circulating volume.
Glycopyrrolate 5-10µg/kg	Bradycardia	Increases HR, therefore improving BP. May see transient tachycardia. Less effective when patient hypothermic. Take care if patient has recently had α ₂ -agonists as this will lead to increased HR whilst vasoconstricted.
Ephedrine 0.1mg/kg Can be repeated 2-3 times.	If the above options don't help or aren't appropriate Patient is vasodilated	Vasoconstricts and improves cardiac contractility. Effects are often short lived.
Dopamine CRI 5-10µg/kg/min.	If all of the above options have no effect or cannot repeat ephedrine anymore.	Increases HR and cardiac contractility.
Colloid bolus (eg. Geloplasma)	Acute hypovolaemia due to haemorrhage when blood transfusion not appropriate/possible. NB Can use crystalloids - some vets will prefer to try this first.	Used to expand blood plasma volume. Patient may still suffer anaemia if blood loss. Check PCV when possible. Anaphylaxis is possible. Expensive. Same effects can be achieved with crystalloids.
Blood transfusion	Acute hypovolaemia due to haemorrhage	Can transfuse packed red blood cells or plasma or a combination. Possibility of transfusion reactions.

Common drug doses

	Drug	Strength	Dose rate
Pre-med/ sedation	ACP	2mg/ml	10-20mcg/kg IV
	Medetomidine	1mg/ml	1-10mcg/kg IV 3-20mcg/kg IM
	Dexmedetomidine	0.5mg/ml	1-5mcg/kg IV 2-10mcg/kg IM
	Methadone	10mg/ml	0.1-0.5mg/kg IV or IM
	Buprenorphine	0.3mg/ml	0.02mg/kg IV or IM
	Butorphanol	10mg/ml	0.2-0.5mg/kg IV or IM
	Fentanyl	50µg/ml	2-5mcg/kg IV
	Ketamine	100mg/ml	2-10mg/kg IM
	Midazolam	5mg/ml	0.2-0.5mg/kg IM or IV
	Alfaxalone	10mg/ml	0.5-1.5mg/kg IM
Induction	Propofol	10mg/ml	2-4mg/kg IV to effect
	Alfaxalone	10mg/ml	1-2mg/kg IV to effect
	Midazolam/ diazepam	5mg/ml both	Co-induction usually 0.2-0.3mg/kg IV
Analgesia	Fentanyl	50µg/ml	1-2mcg/kg bolus/loading dose 0.1-0.2mcg/kg/min CRI (max 0.5mcg/kg/min)
	Lidocaine	2% = 20mg/ml	1-2mg/kg iv loading dose 50mcg/kg/min intra-op 80mcg/kg/min to treat arrhythmias
	Paracetamol	10mg/ml	10mg/kg TID IV
	Meloxicam	5mg/ml	0.1-0.2mg/kg
Cardio-vascular	Glycopyrrolate	200µg/ml	5-10mcg/kg IV
	Atropine		20mcg/kg if bradycardia IV or IM 40mcg/kg if severe bradycardia IV or IM
	Dopamine		5-10mcg/kg/min CRI
	Ephedrine	Vials are 30mg/ml Diluted into 3mg/ml in syringe in fridge	0.1mg/kg IV bolus
Other	Cefuroxime	Reconstitute at 100mg/ ml 2.5ml water for inj into 250mg vial etc	20mg/kg slow IV. Repeat q90mins of surgery.
	Co-amoxiclav	60mg/ml 10ml water for inj. into 600mg vial 20ml water for inj. into 1.2g vial	20mg/kg slow IV.
	Omeprazole	0.4mg/ml Reconstitute with 5ml saline from 100ml bag, then re-inject that back into 100ml bag.	1mg/kg slow IV SID/BID
	Maropitant	10mg/ml	1mg/kg