

Canine Catch-Neuter-Return (CNR) Good Practice Guides

Good standards of practice in anaesthesia and analgesia - Induction of anaesthesia

Learning Outcomes:

1. Compare the use of intravenous cannulas versus butterfly needles and the importance of maintaining intravenous access throughout anaesthesia
2. Explain why dogs must be intubated during anaesthesia
3. Review inhalational versus injectable anaesthesia for anaesthesia maintenance

After the pre-medication has had some time to work (typically 15-60minutes), to ensure the dog is relaxed and the analgesia has taken affect, gently move the dog to the preparation area. Ensure that you have all equipment prepared for anaesthetic induction.

Equipment required for anaesthetic induction:

- The patient record to ensure correct identification of the dog prior to induction – otherwise there is a risk of over/under dosing the dog with induction drugs which can be life-threatening.
- Razor or electric clippers to remove a small square of hair on the forelimb of the dog to visualise and allow aseptic preparation of the skin over the cephalic vein.
- Swab/cotton wool with chlorhexidine or povidone-iodine to aseptically prepare the skin for intravenous access to minimise the risk of phlebitis occurring.
- Intravenous cannula or butterfly needle, piece of tape to secure it in place and syringe with sterile saline to connect to the cannula/needle to check that it is in the vein.
- Muzzle available in case it is required.
- Syringe containing the induction drug(s).
- Intubation equipment – selection (at least 2) of appropriately sized endotracheal tubes, bandaging material to tie the tube in place and a laryngoscope (if available) with an appropriately sized blade connected.
- Fully stocked crash kit and stethoscope nearby, in case it is required.
- Additional medications to be administered after induction, for example a syringe containing a non-steroidal anti-inflammatory drug for analgesia.

Many clinics will place the conscious dog on a table which can be very stressful. If using a table, we recommend placing a rubber mat on the preparation table first as this prevents the dog's paws from slipping on the table which can be stressful to the dog and potentially impact on the effects of the sedation. Rubber mats should be cleaned between each dog but ideally the dog should be induced in a quiet area, on the floor as it is more used to this environment.

Once the dog is comfortable and being gently restrained by one staff member, a second staff member should be available to induce anaesthesia. In well sedated dogs, a single staff member may place the IV cannula or butterfly needle alone, using a tourniquet to raise the vein. The use of a muzzle enables less physical restraint which dogs often find very stressful, particularly the free-roaming dogs who are not used to being handled by people. For more detailed information on dog handling and behaviour, please see the previous section on this subject.

Intravenous cannulation

In order to inject the anaesthetic drugs intravenously, and in case of anaesthetic emergencies where intravenous access is essential, an intravenous cannula or butterfly needle should be placed by an experienced staff member into the cephalic vein in the forelimb of the dog. Always secure the

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cannula or butterfly needle to the dog's leg using tape to ensure that it remains in the vein, for further anaesthetic drug administration or for emergency drugs if required.

Intravenous cannulas are composed of a sharp metal stylet with a plastic cannula surrounding the stylet so that once the stylet and cannula are in the vein, the sharp stylet can be removed, and the dog will have only the blunt ended plastic cannula in the leg.



An intravenous cannula being correctly placed in a cephalic vein

The benefits of using a cannula are that it will not cause further damage to the vein if knocked and will stay in the vein if taped securely allowing safe ongoing administration of drugs and fluids.

The use of intravenous cannulas is particularly recommended for sick or complicated surgeries due to the minimal trauma to the vein and the ability for continued administration of medication after the surgery, such as intravenous fluid therapy.



An intravenous cannula securely taped into the cephalic vein providing continuous venous access

Butterfly needles are a cheaper alternative often used in CNR programmes. These are acceptable to use for short duration surgical procedures, if placed carefully, secured on the leg with tape and monitored diligently to ensure the needle remains in the vein.



A butterfly needle correctly placed in the cephalic vein



A butterfly needle taped into the cephalic vein providing continuous venous access

The sharp end of the needle can easily damage the vein and they often become misplaced out of the vein. These are not appropriate for dogs requiring high volumes of intravenous fluid therapy, for

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example when a dog is in shock, and an intravenous cannula must be placed in these cases. Additionally, butterfly needles cannot remain in place for several days like intravenous cannulae can and so cannot be used to administer continuous fluids, as they cause significant trauma to the vein, and pain to the dog.

Induction of anaesthesia

The dog should be completely anaesthetised using an intravenous anaesthetic agent. Intravenous formulations work more quickly than intramuscular ones and result in smoother anaesthesia. Once intravenous access has been achieved in the dog, either by cannula or butterfly needle, anaesthesia can be induced by slowly injecting the anaesthetic agent intravenously. If the anaesthetic drugs are injected too quickly, they may cause apnoea where the dog stops breathing for a short period. The dog must be continually monitored as the dog is now anaesthetised.

Monitoring involves checking, vital signs such as heart rate, pulse rate, and respiratory rate and recording these in a written anaesthetic monitoring record. If the dog's vital signs are within normal limits and a patent airway is secured, the dog can be aseptically prepared for surgery. Further clinical examinations, such as pregnancy and TVT assessment, can be performed if these were not completed during the pre-anaesthetic clinical exam. Later, other additional treatments, such as rabies vaccination can be performed.

Intubation

Anaesthetised dogs are unable to protect their airway from obstruction by fluids, vomit, or soft tissues and so regardless of the type of anaesthetic used, all dogs should be intubated with an endotracheal (ET) tube once anaesthetised.

- Choose a clean, appropriate size ET tube.
- A subjective method of choosing the correct diameter ET tube involves using the width of the nose between the nares as an approximation of tracheal diameter.

The ET tube length is chosen by ensuring that the distal end (the end situated away from the point of attachment) does not extend past the point of the shoulder and the proximal end (the end situated nearer to the point of attachment) does not extend past the incisor teeth.

Identifying the correct size ET tube to use



The head and neck correctly extended for tracheal intubation

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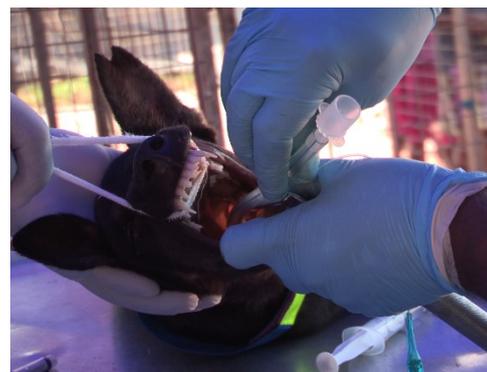
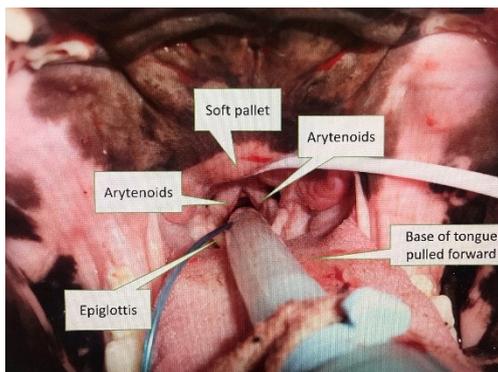


- With the dog adequately anaesthetised and lying in either sternal or lateral recumbency, ask an assistant to lift and extend the neck and head by placing one hand behind the ears and the other behind the canines on the upper jaw holding the mouth open.
- A length of open weave bandage can be placed behind the canine teeth to help lift the head if necessary.
- The neck and head must be in a straight line.

Pull the tongue forward and, using a laryngoscope if you have one, depress the base of the tongue and visualise the larynx and arytenoids.



The larynx of a dog ready to be intubated



If necessary, lift the soft pallet with the ET tube, then press down the epiglottis and direct the ET tube into the ventral (lower) space you can see which should be the trachea and NOT the oesophagus.



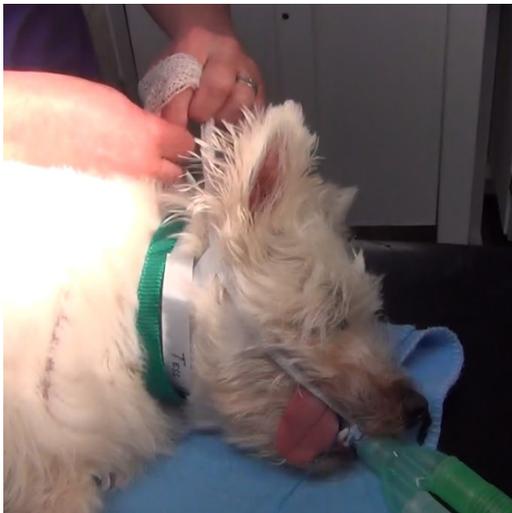
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- Advance the ET tube so that the tip is located midway between the larynx and the thoracic inlet.
- To check the ET tube is in the trachea and not the oesophagus, look for condensation within the ET tube, or use your hand to feel for breath at the entrance to the ET tube.



Checking that the tube is in the trachea using a piece of bandage to see if it moves when the dog breathes.

- If you have an anaesthetic machine you can check the ET tube is in place by connecting the ET tube to the breathing system, turning on the oxygen then closing the APL valve and squeezing the reservoir bag. If the chest inflates then you have intubated the trachea correctly. If it doesn't then, then the ET tube is probably in the oesophagus and a second attempt should be made.



If the ET tube is correctly placed in the trachea, tie a length of bandage around the ET tube and then gently tie the rest of the bandage behind the dog's ears securing the ET tube in place.



An ET tube being correctly tied in place

Intubation of the trachea in the dog should be performed gently to prevent soft tissue trauma. The endotracheal tube will protect the airway and prevent respiratory arrest due to airway obstruction. It also enables the administration of oxygen in an emergency. The endotracheal tube should then be secured in place using a piece of bandaging material or rope behind the ears to prevent the tube

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moving in the trachea which can irritate the lining of the trachea and to prevent the tube being inhaled or coming out of the trachea. There is no need to inflate the cuff of the endotracheal tube if the dog is not receiving inhalational anaesthesia and oxygen.



Inflating the cuff of the endotracheal tube prior to the use of gaseous anaesthesia

Intravenous fluid therapy (IVFT)

IVFT should be started once the dog is anaesthetised to support the circulating blood volume to the liver and kidneys where all the injectable anaesthetic drugs are metabolised and excreted. Often the dogs will be dehydrated before surgery due to stress, hyper-salivation, high environmental temperatures, and a lack of drinking water during catching and transportation to the clinic.

Additional fluid losses will occur during surgery. The administration of IVFT will help to rehydrate and compensate for these fluid losses. The continuous IVFT will also maintain the intravenous cannula or butterfly needle to prevent blood clots forming.

Isotonic crystalloid fluid either 0.9% saline or Ringer's lactate solution should be used and administered at a rate of 5-10ml/kg/hr. This is higher than the maintenance fluid rate of 2ml/kg/hr to compensate for additional fluid losses and support organ function during anaesthesia and surgery. For a standard giving set and a fluid rate of 10ml/kg/hr, this is equal to one drop every second in the drip chamber for dogs weighing between 11-26kg. Dogs weighing 10kg or less will require a slower drip rate.

How to calculate fluid rate for 5ml/kg/hr:

$$\begin{aligned} ?\text{kg} \times 5\text{ml} &= ?\text{ml/hr} \\ ?\text{ml/hr} \div 60 \text{ mins} &= ?\text{mls/min} \\ ?\text{mls/min} \div 60 \text{ mins} &= ?\text{mls/sec} \\ ?\text{mls/sec} \times \text{drip factor} &= ? \text{ drops/sec} \end{aligned}$$

Drip factor:

Standard giving set = 20drops/ml
Paediatric giving = 60drops/ml

A small volume of Lidocaine can be aseptically injected into the fluid bag or bottle to provide further pain relief during anaesthesia. The constant rate infusion (CRI) dose for lidocaine is 2 mg/kg IV followed by 20–50 µg/kg/min. Many patients will benefit from a loading bolus dose of 1 mg/kg slow IV.

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Typically this is 3ml of 2% Lidocaine mixed into a 500ml bottle of fluids or 6ml of 2% Lidocaine mixed into 1000ml bottle. Care should be taken to dose this correctly as lidocaine may cause cardiac arrhythmias. This should not be used in cats.

Moving the dog to the surgical area and maintenance of anaesthesia

Once the dog has been clipped or shaved and aseptically prepared for surgery, the dog should be carefully carried to the surgical area and positioned on the surgical table taking care not to contaminate the aseptically prepared surgical site. The dog must be monitored throughout by an experienced staff member and adequate anaesthetic depth maintained by either injectable or inhalational anaesthesia (see section XX for information on anaesthetic monitoring).

Inhalational anaesthetics require more expensive equipment, but they are safer for use in sick or debilitated animals. This is because there is minimal metabolism, the amount of anaesthetic administered can be controlled and one can cease administration as the situation dictates. If using inhalational anaesthesia, endotracheal tubes should be cuffed sufficiently to prevent the dog from breathing around the tube. However, over-inflation of the cuff may cause tracheal trauma and even tracheal rupture so care should be taken. Assessing whether the cuff is sufficiently inflated can be done by listening for breath sounds around the endotracheal tube, and if detected the cuff should be inflated until breathing around the tube no longer occurs. There is no need to inflate the cuff of the endotracheal tube if the dog is not receiving inhalational anaesthesia and oxygen.

Injectable anaesthetics are, in general, metabolised by the liver and excreted by the kidneys. Animals with signs of liver or kidney disease should not be anaesthetised with these agents and the cost: benefits of neutering should be evaluated. However, injectable anaesthetics offer the advantage of requiring less expensive equipment. In many projects, economics and drug access dictate the use of injectable anaesthetic drugs rather than inhalational anaesthesia, even though the anaesthetic risk is greater and recovery often longer.

Checklist:

- ✓ Place rubber mat on preparation table
- ✓ Secure intravenous cannula or butterfly needle in place with tape
- ✓ Intubate with an endotracheal tube to protect the airway
- ✓ Intravenous fluid therapy at 5-10ml/kg/hr during anaesthesia
- ✓ Aseptically add a specified volume of Lidocaine to fluid bag for additional analgesia
- ✓ Inhalational maintenance anaesthesia safer, but requires expensive equipment

References:

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