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Handling, Restraint, and Preanesthetic Assessment

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Key Points

- Behavioral considerations
- Handling methods and physical restraint
- Routes of drug administration
- Airway management
- Preanesthetic evaluation
- Mortality and morbidity in feline anesthesia

Introduction

The pet cat population has grown over the last few decades, as has our understanding of disease prevention and treatment in this species. Despite population growth, fewer cats visit a veterinary clinic on a regular basis when compared with dogs. Cat owners often avoid veterinary visits as transportation of the cat to the clinic may be stressful. Handling, appropriate physical examination, knowledge of behavior, and preanesthetic assessment are essential components of feline anesthesia and analgesia.

Box 1.1: Cat-friendly techniques in clinical practice

Safe handling and cat-friendly practices minimize stress, fear, anxiety, and potential personnel injuries related to aggression. They are key components of veterinary care for the anesthetist and staff members.

A cat-friendly practice will provide an environment that reduces the stress of veterinary consultation and hospitalization. More information can be found at http://icatcare.org (June 24, 2017). These practices involve:

- A calm, safe, and quiet clinic with cat-designated areas or cat-only appointment times
- Gentle and efficient physical examination and treatment
- Client education on transporting the cat to and from the clinic
- Client communication about feline anesthesia and analgesia

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Handling and Restraint

Each cat is unique and can exhibit a wide range of behaviors. Experienced handlers will often adapt their approach and handling technique to suit each patient. While there is no substitute for "experience", some principles exist to aid in the restraint of *most* cats. The mantras "go slow to go fast" and "less is more" are commonplace. Good feline handling revolves around the premise of *de-escalation*, where the handler avoids potential actions that may elevate a patient's stress. *De-escalation* minimizes noxious visual, auditory, and olfactory stimuli that could lead to avoidance or aggressive behavior. It should be noted that the major cause of defensive or aggressive behavior is fear. Cats have limited appeasement behaviors, making it difficult to calm them once they are distressed. Thus, avoiding these behavioral triggers is critical to success.

To facilitate handling throughout life, kittens should be encouraged to interact with people, animals, and new environments between 2 and 7 weeks of age. With all ages of cats, positive reinforcement techniques (e.g. rewarding with food, play, brushing) along with behavioral therapy in difficult individuals, help to reduce the stress and anxiety associated with veterinary visits.

Most cats in a calm environment will readily explore their surroundings. Anxious or fearful individuals will tend to remain within their carriers. The cat should be handled with patience and a positive attitude throughout the physical examination. Minimal restraint is required to perform a full physical examination in most cats. Gentle touch and petting around the head and neck are generally well tolerated, and allow for minor manipulations without the need for physical restraint (*Figure* 1.1a, b, c). Timid or fearful individuals who choose to remain in the carrier should be allowed to do so. The top of a carrier may be removed and an examination can be performed with the cat still inside (*Box* 1.2).

Box 1.2: Safe handling in feline practice

Consider using top-opening carriers and baskets for transporting cats into the clinic. This allows for easy handling and provides a safe and secure environment.

It is understandable that most medical procedures in cats require some level of restraint. This makes treatments and procedures safer for both cat and handler. While immobilization is often required, the approach should still be gentle. *Figure* 1.2 shows common methods of control.

Scruffing

Scruffing is a controversial method of restraint. Many clinics have a "no-scruffing" policy. Scruffing should be regarded as a last resort for physical restraint to avoid injuries and accidents. For these exceptional cases, the cat is gently grasped by the skin over the dorsum of the neck and scapulae, and minimal (firm) pressure is maintained. The method should certainly not be used if there is already pain or discomfort present. It is important to highlight that scruffing may lead to fear-based aggression and further escalation of stress. The American Association of Feline

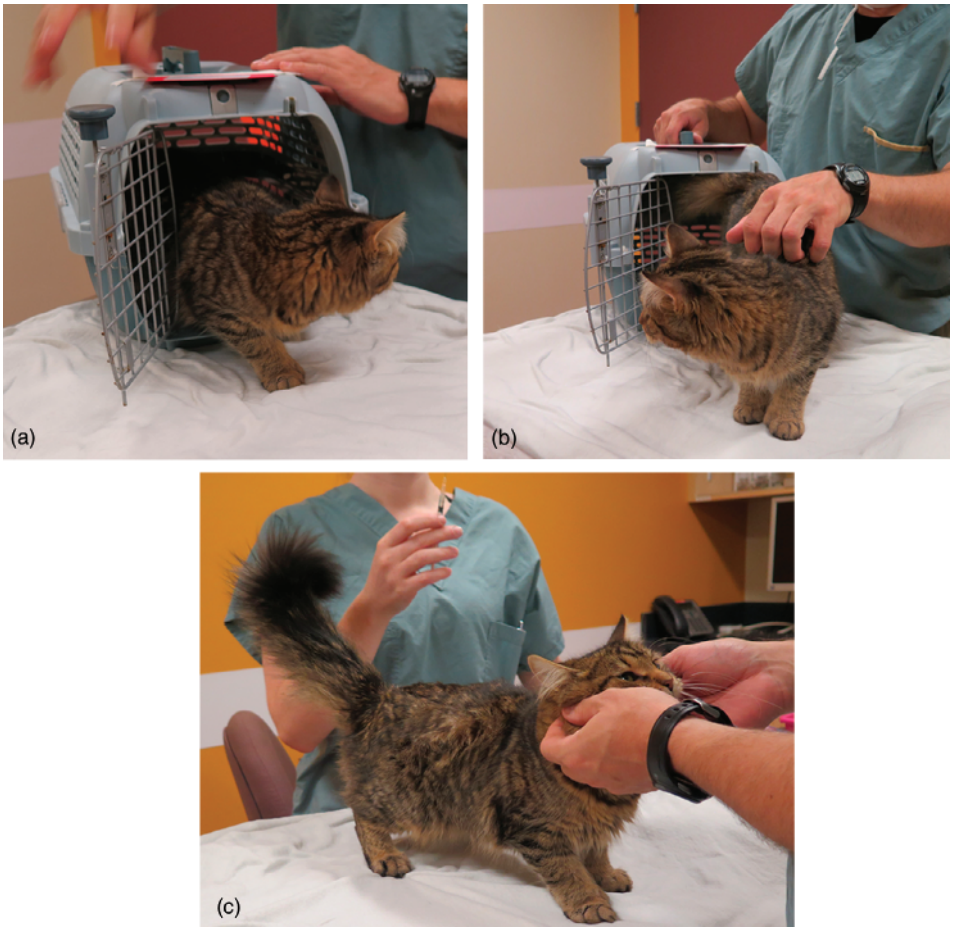

Figure 1.1 A cat-friendly approach in a hospital setting. (a) This cat explores the examination room and its surroundings. (b) The handler gently pets the cat to control its movement without using forcible restraint. (c) Placing the hands under the chin allows for better control of the head and neck.

Practitioners (AAFP) and the International Society of Feline Medicine (ISFM) state that the technique should be used sparingly. A cat should never have its full weight suspended from the scruff.

The Fearful Cat

Fear is the most common cause of aggression in hospitalized cats. De-escalation techniques do not always work in fearful individuals. These cats exhibit strong avoidance or aggressive behavior making handling difficult. In this situation, chemical restraint should be considered before any manipulation (Chapter 3). To assist in the physical restraint of these patients, use of appropriate handling equipment is recommended (description of techniques to follow). In these cases, the equipment for IV catheter placement, and for anesthetic induction, maintenance, and monitoring should be ready.

Figure 1.2 Restraint for common procedures in cats. (a) Most cats will tolerate gentle extension of the neck to expose the jugular veins for blood sampling. In this image the jugular vein is occluded with the cat in lateral recumbency. (b) Restraint of the forelimb for cephalic blood sampling or IV catheterization. The handler is preventing the cat from backward movement by applying gentle pressure over the cat's hind limbs. Using the same arm, the handler is extending the right limb forward with three fingers behind the elbow to prevent retraction of the limb, and rotating and raising the cephalic vein with their first and second digits. (c) Restraint of the hind limb for medial saphenous blood sampling or IV catheterization. The cat is restrained in lateral recumbency with the dependent limb intended for venous sampling. The handler uses one hand to restrain the contralateral (upper) hind limb and apply medio-lateral pressure over the vein proximal to the sampling site. Once the vessel is visualized, the clinician directs the needle in a distal to proximal direction while maintaining control of the lower limb with the opposite hand. (d) This cat is allowed to stand freely on the treatment table and is only restrained by gentle control of the head and neck. This allows free access to the epaxial muscles for intramuscular injection.

Box 1.3: The handling equipment

Handling equipment should be:

- Safe for the cat and handler
- In good working order with frequent "check ups"
- Easy to use and to clean
- Suitable for the intended task

Some techniques used for appropriate restraint of the fearful and/or aggressive cat are listed below:

- *Towels or blankets* are commonly used for restraining fearful cats. They are often successful in protecting the handler from injury. By covering the patient, they give the cat a place to hide, minimizing visual and auditory stimulation. The handler maintains good dexterity and can assist with the procedure
- *Synthetic feline facial pheromones* mimic natural pheromones that are secreted by cats via facial rubbing when they are comfortable and when they mark their territories. These products have been shown to decrease stress and facilitate handling of some cats
- *Masks* or *hoods* may assist with physical restraint of some cats by limiting visual stimulation. A well-fitted mask will also protect the handler from bites. They are variably tolerated and require judicious use
- *Bags* for restraint protect individuals from aggressive cats. Openings in these bags allow access to the limbs and head
- Feral cats may require the use of *squeeze cages, humane traps* or *nets* for drug administration. Their application is limited to capture and restraint of cats for injection. Nets are used in exceptional conditions such as when a cat escapes or where there are extremely limited facilities. Such equipment can easily cause trauma if not used properly
- *Anesthetic induction chambers* may be used to anesthetize cats. This requires minimal restraint but placing the cat inside the chamber can be a challenge. While the absence of restraint is arguably better for the cat, there is potential for environmental contamination and exposure of personnel with volatile anesthetics. A fearful cat can be briefly restrained using a towel or cat bag for mask induction using volatile anesthetic agents. Techniques for induction of general anesthesia are discussed in Chapters 4 and 6
- *Leather handling gauntlets* or *gloves* can protect the handler from an aggressive cat but they limit dexterity. They should be used only as a last resource for restraint. Leather is also difficult to clean and repeated disinfection is required

Blood Sampling

Restraint for blood sampling can be performed in many ways. The jugular vein is a common site as it is easily identified and allows rapid withdrawal of large volumes of blood compared with distal veins (*Figure* 1.2a). The handler extends the head and neck with the cat in a sternal or lateral position. The clinician approaches the vein with the needle directed either in a cranio-caudal (*Figure* 1.2a) or caudo-cranial direction. The use of a 23-G 1.6 cm (5/8th inch) needle and a small volume syringe (1–3 mL) is recommended.

Peripheral blood sampling, for example from the cephalic vein (*Figure* 1.2b), may be used for low-volume sample collection, or where jugular sampling is contraindicated (e.g. coagulopathies, increased intracranial or intraocular pressure). Another common site for sampling is the medial saphenous vein (*Figure* 1.2c). To limit repeated venipuncture, the blood that is collected in the hub of a catheter's stylet can be used for a basic blood panel during the preoperative period (*Table* 1.1).

Table 1.1 Values for basic blood panel in cats.

Hematocrit (packed cell volume)	30–50%
Total solids (total protein)	60–85 g/L
Blood urea nitrogen	170–320 g/L
Calcium	85–110 g/L
Potassium	3.7–5.4 mEq/L

Drug Administration

A number of routes of administration are available for drug delivery, and the choice will depend on both drug selection and intended purpose.

- *Intravenous (IV)* administration is the most efficacious and reliable method of drug delivery. It is commonly used for anesthetic induction, or for analgesic drugs when a catheter is in place
- The intramuscular (IM) route is commonly used for premedication. Any skeletal muscle may be used but large-bellied and superficial muscles are preferred. The epaxial and muscles of the cranial and caudal thigh are often chosen (*Figure* 1.2d); if using the hind limb, the cranial thigh is more reliable. When using the caudal thigh, it is easy to miss muscle tissue and inject into fascial planes. The location of major blood vessels and nerves is important when selecting an injection site. For example, the sciatic nerve runs beneath the *biceps femoris* in the caudo-lateral thigh, and may be inadvertently injured. Aspiration should precede injection to avoid unintended intravascular injection
- The *subcutaneous (SC)* route is used for perioperative administration of drugs such as nonsteroidal inflammatory drugs. This route can also accommodate large volumes of crystalloid fluids when intravenous fluid therapy is not possible. Most conscious cats will tolerate injection between the shoulder blades
- *Buccal or oral transmucosal* (OTM) administration is not commonly used in hospital settings, as other routes are usually an option. However, it can be used as a less invasive route of administration during long-term hospitalization or "home care." It is accomplished by inserting the syringe tip into the cat's mouth and gently squeezing the syringe contents into the cheek pouch; swallowing must be avoided to allow transmucosal absorption and prevent first-pass hepatic metabolism

IV Catheterization

A wide array of IV catheter types exists in veterinary practice. These are commonly inserted into the cephalic or medial saphenous veins. Catheterization of these vessels is often performed following premedication (Chapter 3). Intravenous catheterization allows easy drug titration during anesthetic induction, administration of fluids, emergency intervention, and minimizes the need for multiple SC or IM injections in the perioperative period. Use of topical local anesthetic creams can facilitate placement of

catheters (*Box* 1.4). The ideal catheter material is inert, long-lasting, and atraumatic. Catheters should be placed using a sterile technique.

Silicone catheters are good choices for long-term cannulation. In cats requiring extended hospitalization, central venous catheters (18- or 21-G) are placed using the modified Seldinger method, peel-away introducers, or cut-down techniques. Aseptic technique is mandatory for the placement of long term catheters.

Box 1.4: Intravenous catheterization in clinical practice using local anesthetic creams

Smaller gauge (≤ 22-G) catheters are commonly used for the cephalic and medial saphenous veins in cats. Application of topical anesthetics (e.g. EMLA; eutectic mixture of local anesthetics, a combination of lidocaine 2.5% and prilocaine 2.5%) at least 30 minutes before catheterization desensitizes the skin, thereby reducing the stress of the whole procedure. This technique can also be used for jugular venipuncture enabling minimal restraint. The cream is applied and covered with an impermeable and non-absorbent dressing. The use of gloves is recommended, as the cream will anesthetize human skin. IV catheters should be examined daily for signs of infection and skin irritation, and to confirm patency. Taping should not be overtight otherwise distal limb edema may occur.

Intubation and Airway Management

Induction of anesthesia is commonly followed by maintenance with a volatile anesthetic and oxygen. Endotracheal intubation protects the airway, minimizing the risk of aspiration if regurgitation occurs; it also enables delivery of oxygen and anesthetic, and facilitates ventilation. *Figure* 1.3 shows appropriate positioning for intubation in a cat.

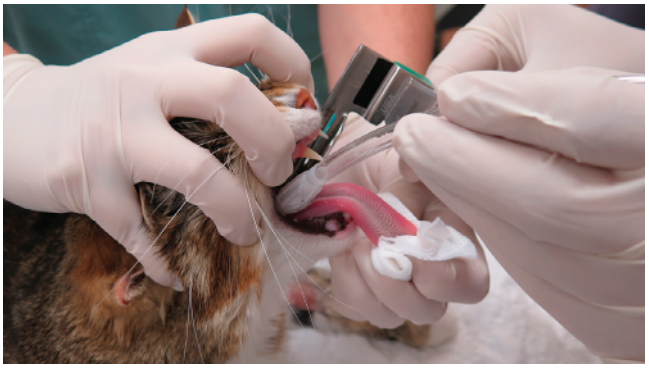

Figure 1.3 Restraint for intubation: with the cat in sternal recumbency, the handler gently extends the neck and head. Either the handler or the individual performing the intubation opens the mouth by exteriorizing the tongue. In this position the larynx is easily visualized with a laryngoscope enabling application of local anesthetic followed by intubation. The laryngoscope (or other instrument) should be used to exteriorize the tongue as intraoral manipulation of cats in a light plane of anesthesia may lead to a reflex bite.

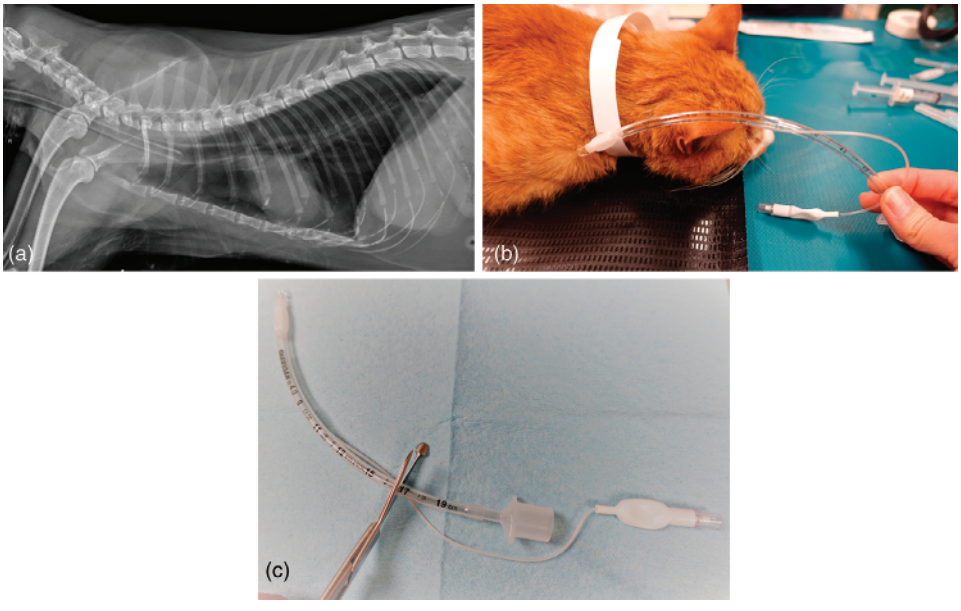

Figure 1.4 (a) The tip of the endotracheal tube should not reach further than the thoracic inlet. (b) Endotracheal tubes should be measured before use; they should reach from the tip of the shoulder (thoracic inlet) to the incisor teeth. (c) Endotracheal tubes should be cut to the correct length prior to use. Excess length adds dead space.

The challenges and complications (i.e. laryngospasm, laryngeal trauma, tracheal rupture or necrosis and airway obstruction) of intubation in cats (*Box* 1.5) are discussed in Chapters 2 and 10. Most adult cats can be intubated with a 3.5–5 mm internal diameter endotracheal tube (ETT). Cuff inflation should not require more than 1.5 mL of air using a small syringe. Small increments of air (0.5 mLs) should be injected at a time into the pilot balloon until a seal is achieved when the pressure in the breathing circuit is 16–18 cmH_2O. Pressure within the high-volume low-pressure cuff can be monitored using a special device (Posey Cufflator Endotracheal Tube Inflator and Manometer®). This will avoid high cuff pressures and the risk of airway trauma. Overlong ETT may cause a range of problems (Chapter 10) and should be cut to an appropriate length before insertion (*Box* 1.5; *Figure* 1.4a, b, c).

It is strongly recommended that the cat is disconnected from the breathing system when turning is required during anesthesia. This will prevent extubation and inadvertent trauma. All endotracheal tubes can damage the mucociliary apparatus, which moves particles in an orad direction, and can cause direct damage to the tracheal endothelium. If an endotracheal tube is used, the tip should not extend beyond the thoracic inlet (point of the shoulder); if a tracheal tear does occur, the prognosis is worse for an intrathoracic tear and it is more difficult to repair than an extrathoracic injury (Chapter 10).

Box 1.5: Endotracheal tubes

Cuffed tubes

- The inflatable cuff seals the airway but has the potential to cause damage
- The cuff and its pilot tube occupy a substantial proportion of the tube diameter, potentially reducing airway size. Modern tube construction minimizes this effect (e.g. soft silicone)
- Potential for damage caused by the cuff (Chapter 10)
- An inflated cuff may cause local pressure ischemia to the tracheal lining (Chapter 10)
- Lubricant gel on the cuff enhances the seal at a given pressure
- Cuffed tubes are required for IPPV (or a supraglottic airway device see below) and reduce the risks of fluid aspiration

Noncuffed tubes

- Used to be considered best for cats
- Avoid potential for cuff-induced tracheal damage but more difficult to seal the airway
- Require pharyngeal packing to prevent fluid entering the airway
- The Cole tube is cuffless; the seal is produced by advancing the shoulder until it impacts onto the larynx. These are difficult to place reliably without causing damage and are now rarely used

Supraglottic airway devices

- This device does not enter the trachea and ends above the larynx
- Distal elliptical component with an inflatable bladder on the dorsal aspect seals the airway
- The v-gel® developed for cats is easy to place
- Limited evidence so far suggests that the v-gel® is less likely to cause damage than standard ETT
- Suitable for IPPV

Endotracheal tube length

- Overlong tubes may cause excessive airway dead space, tracheal tears, and endobronchial intubation (Chapter 10)
- The length of the endotracheal tube should be measured in each cat before placement (*Figure* 1.4b) and cut as needed (*Figure* 1.4c)
- The endotracheal tube should reach from the incisor teeth to the point of the shoulder
- The tip should reach the mid to lower third of the trachea and not enter the thorax
- The connector end can be cut to shorten the tube

A stylet can be used cautiously to increase dexterity especially with silicone ETT. The tip of the stylet should never go through the distal part of the ETT.

Supraglottic airway devices (SGAD) (e.g. the v-gel®) are another option for airway management in cats. The device comprises a tube with a distal elliptical component that has an inflatable bladder on the dorsal aspect that is used when needed to create a better seal (*Figure* 1.5a). It is a practical alternative to endotracheal intubation in cats, leading to

Figure 1.5 (a) A v-gel® has been selected, lubricated and is sitting in its cradle to avoid contamination; a side stream capnograph has been attached to confirm proper placement. (b) The v-gel® has been placed and secured in place.

a lower incidence of upper airway discomfort after extubation when compared with an endotracheal tube. The v-gel® can be inserted at a more superficial depth of anesthesia than an endotracheal tube. It can be used for mechanical ventilation and a variety of procedures. Placement is relatively easy and can be performed by inexperienced individuals. However, v-gels are much more expensive than endotracheal tubes.

Preanesthetic Assessment

The purpose of the preanesthetic examination is to assess the suitability of a patient for anesthesia, prevent complications, assess risks, and determine whether any special consideration, material, preparation or equipment is required. Planning is a key component to prevent anesthetic-induced complications such as hypothermia, hypoventilation, bradycardia, and hypotension.

A checklist for preanesthetic assessment is recommended. The Association of Veterinary Anaesthetists (AVA) have examples available for download at http://www.ava.eu.com/information/checklists/ (accessed June 24, 2017). The checklist should include:

- Patient identification, history, and signalment
  - A full history should be taken, with emphasis on previous anesthetic and surgical procedures, as well as current medication. Age is particularly important in identifying individuals at risk (pediatrics or geriatrics)
- Concomitant diseases/conditions
  - These have a potential impact on anesthesia and pain management. Particular considerations apply for managing anesthesia of neonatal, pediatric, and pregnant cats as well as for those with, for instance, diabetes, cardiomyopathy, and urinary tract obstruction (Chapter 9). Some cats may require stabilization before anesthesia
- Physical examination
  - Emphasis should be given to the cardiovascular, respiratory, hepatic, and renal systems as their roles in perfusion, oxygenation, and drug metabolism affect many aspects of anesthesia. Unfortunately, the hospital visit itself is stressful, generally elevating heart and respiratory rate, blood pressure, and body temperature (*Box* 1.6). Therefore, recognition of stress and anxiety is important in

clinical assessment of these values. Body condition scoring allows objective recognition of extremes in body weight, which may increase the patient's risk. An accurate weight should be obtained

- Risks associated with the surgical procedure
  - This includes planning for the potential of bleeding and perioperative pain, the effects of positioning, technique (e.g. laparoscopic procedures) and duration. Crossmatching and blood typing may be required for some cases and is discussed in Chapter 8. Certain surgical procedures require special equipment, materials or changes in the layout of the operating room. Team meetings prior to a nonroutine procedure prevent mistakes and misunderstandings, and save valuable time
- Fasting
  - Fasting has been recommended to allow time for gastric emptying, which should decrease the risk of vomiting, regurgitation, and aspiration. Withholding food for periods from 2 to 10 hours have been suggested; short fasting times are appropriate in some instances, for example pediatric patients and cats with diabetes mellitus. The anesthetist should never assume that fasting will result in an empty stomach and must be prepared to act if vomiting occurs in the perioperative period (Chapter 10)
- Risk assessment (ASA status)
  - Full discussion of all possible presenting conditions is beyond the scope of this chapter, but interpretation of clinical data should allow the patient's health status to be classified according to the American Society of Anesthesiologists (ASA). The five-point scale used in people is adapted in *Table* 1.2 for use in veterinary medicine. ASA status is correlated with risk of anesthetic death
- Set up
  - All materials and equipment should be tested and ready before general anesthesia is induced. Supplies include tape, catheters, eye lubricant, flush solution, airway devices, laryngoscope, stylet, anesthetic record, surgical preparation solutions, gauze and fluid bags. Monitors should be calibrated beforehand. Anesthetic machines and breathing systems must be in good working condition

Box 1.6: Normal physiological values in cats

- **Resting heart rate**: 120–200 beats per minute
- **Resting respiration rate**: 20–30 breaths per minute
- **Rectal Temperature:** 37.5–38.9 °C

Ancillary tests are recommended when abnormalities are identified from the history and physical examination. This may include a basic blood panel (*Table* 1.1). Low hematocrit may indicate anemia, limiting the patient's ability to carry oxygen. Decreases in total protein may increase the effect of highly protein bound drugs and may also require adjustment of the anesthetic dose and fluid therapy. Many clinicians extend their screening to include a complete blood count, biochemical panel, total thyroxin (T4), and a urinalysis in geriatric patients. The rationale behind geriatric screening is the detection of subclinical disease despite normal clinical findings. However, *it is important to highlight that blood collection may cause stress and results will not change the anesthetic plan in the majority of cases.*

Hypertrophic cardiomyopathy is often asymptomatic in cats and can be only diagnosed using echocardiography. A workup is recommended when murmurs are

Table 1.2 ASA physical status classification system.

ASA classification[a)]	Definition
ASA I	A normal healthy patient
ASA II	A patient with mild systemic disease
ASA III	A patient with severe systemic disease
ASA IV	A patient with severe systemic disease that is a constant threat to life
ASA V	A moribund patient who is not expected to survive without the operation

Note:
a) Each classification is further subdivided with the inclusion of an "E" to represent an emergency surgery, where delay may affect outcome.
Source: ASA House of Delegates. (2014) ASA Physical Status Classification System, American Society of Anesthesiologists, www.asahq.org/resources/clinical-information/asa-physical-status-classification-system (accessed June 24, 2017).

auscultated and if cardiovascular disease is suspected as this could change the anesthetic protocol (Chapters 9 and 10).

Risk Factors, Morbidity, and Mortality

The risk of anesthetic-related death in cats varies between 0.1% and 0.3%. A study in the United Kingdom reported an overall mortality rate of 0.24% in cats, which was

Table 1.3 Timing, number, and percentage of anesthetic- and sedation-related deaths in dogs, cats, and rabbits.

Timing of death	Dogs (%)	Cats (%)	Rabbits (%)
After premedication	1 (1)	2 (1)	0
Induction of anesthesia	9 (6)	14 (8)	6 (6)
Maintenance of anesthesia	68 (46)	53 (30)	29 (30)
Postoperative death[a)]	70 (47)	106 (61)	62 (64)
0–3 hours post-op	31	66	26
3–6 hours post-op	11	9	7
6–12 hours post-op	12	7	13
12–24 hours post-op	13	12	9
24–48 hours post-op	3	10	3
Unknown time	0	2	4
Total	148 (100)	175 (100)	97 (100)

Note:
a) Postoperative deaths were additionally categorized by time after anesthesia. The percentage values are given in parentheses.
Source: Brodbelt 2008. Reproduced with permission of John Wiley & Sons.

higher than the 0.17% reported in dogs. Healthy cats (ASA I to II) are >12 times more likely to survive anesthesia than those that are sick (ASA III to V). This demonstrates the importance of preanesthetic assessment and health-status classification. An ASA classification of ≥ 3 should not discourage clinicians from important procedural interventions, but the increased risk should be taken into account when the anesthetic protocol and monitoring are planned and should be discussed with the owner. Since disease increases the risk of anesthetic-related mortality, elective procedures should be delayed until the patient is stabilized and/or treated. Perioperative monitoring is crucial because it is associated with reduced anesthetic risk. *Almost two-thirds of all anesthetic-related deaths in cats occurred in the postoperative period, in particular during the first three hours after extubation* (*Table* 1.3) (Chapter 10).

Other risk factors associated with perioperative mortality in cats include:

- *Extremes of age*
  - Neonatal and geriatric cats are at higher risk of anesthetic-induced fatality (Chapter 9). However, healthy kittens over 1 kg tolerate general anesthesia remarkably well
- *Extremes of body weight*
  - Weight loss in cats may indicate underlying disease (e.g. hyperthyroidism, renal disease, lymphoma), which may affect drug metabolism, protein binding, and cardiovascular reserve. Small cats may be at a greater risk for becoming hypothermic. On the other hand, obesity may be associated with disease (e.g. cardiovascular disease, diabetes, lower urinary-tract disease). Obese cats (*Figure* 1.6) have increased intra-abdominal and thoracic fat, potentially limiting respiratory function when in dorsal recumbency and potentially putting them at higher risk of airway obstruction (Chapter 10). Obesity increases the volume of distribution for lipophilic drugs into tissues that do not actively participate in drug metabolism
- *Endotracheal intubation*
  - Endotracheal intubation protects the airway while providing means of oxygenation, ventilation, and administration of anesthetic gas mixtures. A study reported that 63% of cats that died after surgery were intubated compared to 48% of nonintubated cats. One of the most common causes of perioperative death in cats is airway obstruction, which may be a result of laryngeal trauma during intubation (Chapter 10)
- *Absence of, or excessive, fluid therapy*
  - The benefits and risks of fluid administration during anesthesia are discussed in Chapter 8. Cats are at higher risk of fluid overload when compared with dogs. Administration of fluids has been associated with increased anesthetic-induced fatality (Chapter 10)
- *Spay-neuter clinics*
  - A retrospective study from a large volume spay-neuter clinic reported the risk of mortality in cats as 0.05%, 5 times that of dogs in the same setting. The risk of mortality in females was twice that of males and most deaths occurred postoperatively. The lower mortality risk in these cats compared to the Confidential Enquiry into Perioperative Small Animal Fatality (CEPSAF) study is probably due to the young, healthy population and the skills of experienced veterinarians.

Figure 1.6 An obese cat (9.5 kg) immediately after the end of abdominal laparotomy for foreign body removal. Extremes of body weight are associated with increased risk of perioperative mortality in cats.

Further Reading

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