

# 1

## Preoperative Evaluation and Patient Preparation

### The Risk of Equine Anesthesia

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- Risks of equine anesthesia have been linked with various conditions and situations and are reviewed in detail elsewhere and summarized in this chapter.

#### I Risk of equine anesthesia

- Anesthesia of the horse always involves an assessment of risk.
- Potential complications range from the less serious (e.g. skin wounds) to the more serious (e.g. long bone fractures, myopathies, and peripheral neuropathies), and to death in some cases.
- There is also risk of injury to personnel and safe handling should be practiced.
- The *goal of the anesthetist* is to minimize the adverse effects (ideally at minimum cost) by:
  - Identifying and defining the risk(s).
  - Selecting the best strategy for controlling or minimizing the risk(s).
- Data from single clinics have cited mortality rates of 0.24–1.8% in healthy horses.
- Data from multicenter studies cite the death rate for healthy horses undergoing anesthesia at around 0.9% (approximately 1:100).
- The overall death rate, when sick horses undergoing emergency colic surgery are included, has been reported to be 0.12% when fatalities were directly related to anesthesia in one study, and 1.9% in another study.

#### II Classification of physical status (see Box 1.1)

- Classification of health status is generally based on the American Society of Anesthesiologists (ASA) system.
- This system uses information from the history, physical examination, and laboratory findings to place horses into one of five categories.
- The classification allows for standardization of physical status only.
- The ASA system does *not* classify risk, although increased risk of complication is associated with a high ASA status.
- These classifications are not always useful for horses: nevertheless, the system serves as a guide to case management.

**Box 1.1 ASA Classification System**

ASA 1	Healthy horse does not require intervention (e.g. castration).
ASA 2	Horse with mild systemic disease (e.g. mild anemia, mild recurrent airway obstruction) or localized injury (e.g. wound repair).
ASA 3	Horse with moderate systemic disease (e.g. stable colic, infected joint).
ASA 4	Horse with severe systemic disease (e.g. recent ruptured bladder, endotoxemia).
ASA 5	A moribund horse not expected to survive longer than 24 hours (e.g. unstable colic, ruptured bladder of several days duration).
E	The letter E is added to status 2–5 under emergency conditions.

**III Risk factors****A Age and physical status**

- The risk increases with age, and horses aged 12 years or older are at an increased risk of mortality.
- Older horses may be more prone to fracture of a long bone in the recovery period, which could result in euthanasia.
- Foals have an increased risk of fatality and this is probably associated with unfamiliarity with neonatal anesthesia, an immature cardiovascular system, and presence of systemic illness.
- Pregnant mares have increased risk of mortality in the last trimester of pregnancy and this is probably associated with a need for emergency surgery. Otherwise, there is no difference between sexes.
- Horses with a high ASA physical status have increased risk of mortality.

**B Type of surgery and recovery**

- In otherwise healthy horses, the risk of mortality (euthanasia) following fracture repair is highest from repair failure or from fracture of another bone.
- However, long periods of anesthesia typical of fracture repair have also been associated with increased mortality, and horses presented for fracture repair may be dehydrated and stressed. *Emergency surgery* (non-colic) carries a 4.25 times higher risk of mortality compared with elective surgery, and for emergency abdominal surgery the risk of fatality is 11.7%. *Colic surgery* is associated with increased mortality because of a higher ASA physical status, emergency procedure with less time for stabilization, and use of dorsal recumbency possibly with episodes of hypotension. *Eye surgery*, in one institution, resulted in longer recovery times and risk of complications and were associated with long anesthesia time compared to non-ophthalmic procedures. *Fluconazole* (microsomal P450 enzyme inhibitor) use was associated with increased risk of postoperative colic and longer recovery time. The use of the lowest effective volume of local anesthetic for a retrobulbar block was also recommended (10 ml/500 kg horse). Ophthalmic procedures have been associated with unsatisfactory recovery quality.
- Assisted recovery with ropes can decrease the risk of fracture and dislocation, although the benefit of assisted-recovery is still debatable.

### C Time of day

- Performing anesthesia outside of normal working hours carries an increased risk for horses. This increase in risk is separate from the fact that most of these cases are emergency in nature.
- Surgeries performed between midnight and 6 a.m. carry the highest risk of mortality. This may be due to the nature of the emergency, as well as to staff shortages and personnel fatigue.

### D Body position

- Dorsal recumbency was found to increase risk compared to either lateral recumbency, but most “colic” surgeries are performed with the horse in dorsal recumbency.
- An increased risk of postanesthetic myelopathy has mostly been associated with draft breeds between 6 and 24 months of age and dorsal recumbency.

### E Drug choice

- Using total inhalational anesthesia regimen in foals (<12 months of age) *without premedication* carries the highest risk.
- Halothane sensitizes the myocardium to circulating catecholamines. Fewer cardiac arrests occurred when isoflurane was substituted for halothane, although overall mortality did not differ between groups because limb fracture in recovery was prevalent for the isoflurane group.
- Isoflurane and sevoflurane may be associated with unsatisfactory recovery, and sedation is often used following anesthesia to reduce the risk of excitable recovery.
- Use of isoflurane and sevoflurane was linked with increased mortality, but this was because these drugs are more likely to be selected for sick horses.
- Not using any premedication is associated with the highest risk, probably owing to increased circulating catecholamines from stress. It may be prudent to premedicate foals before induction of anesthesia, especially when using halothane.
- *Acepromazine* lowers the risk of mortality when used alone as a premedicant, because it reduces the incidence of ventricular arrhythmias in the presence of halothane.
- No particular injectable induction regimen is associated with greater risk when used with inhalational anesthesia.
- Total intravenous anesthesia (TIVA) is associated with the lowest risk of all, but TIVA is often used for short procedures. TIVA has been associated with reduced stress response.

### F Duration and management of anesthesia

- Long periods of anesthesia (>2 hours) with volatile anesthetics are often associated with cardiovascular depression and poor tissue perfusion, leading to problems such as cardiac arrest or postanesthetic myopathy.
- Intraoperative *hypotension* during anesthesia has clearly been associated with postanesthetic myopathy, and can still occur with short anesthetic periods. Direct arterial pressure monitoring should be used during lengthy anesthetic periods.
- *Postanesthetic myopathy* may lead to bone fracture or dislocation.
- Postanesthetic airway obstruction and pulmonary edema may be prevented by keeping the head in a normal position thereby reducing the risk of laryngeal nerve paralysis, and with good airway management in the recovery period.

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## Patient Preparation

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### I Preparation of the horse

#### A Evaluation

- *History* and *physical examination findings* help with evaluation of health.
- Many emergency cases, especially intestinal emergencies, are in cardiovascular shock and must be stabilized as much as possible prior to induction of anesthesia.

#### B Laboratory tests

- In normal horses undergoing elective surgery, there is generally no value in performing extensive laboratory tests.
- In emergency cases, performing laboratory tests such as electrolyte and metabolic acid-base status may be vital to the management of the case (e.g. a foal with uroabdomen).

#### C Physical examination

- During the examination, attention should be directed to the neurological, cardiovascular, and respiratory systems.
- Musculoskeletal problems, which may affect recovery, should be considered, and a plan should be made to assist recovery if deemed necessary.

#### D History

- May reveal information that affects case management.
- A recent history of coughing may indicate a viral infection of the airway, in which case elective surgeries should be postponed until one month following resolution of clinical signs.
- Owners might report that the horse previously had a “bad” or “over” reaction to an anesthetic or sedative drug. These concerns should be investigated.

#### E Fasting

- Fasting (~12 hours) was previously advised because of the potential benefits for lung function and the reduced risk of stomach rupture from trauma at induction or recovery.
- Many equine hospitals *do not fast* horses prior to elective surgery. In one study, the PaO<sub>2</sub> values during anesthesia were not significantly better in fasted versus non-fasted horses, and not fasting might reduce the incidence of postanesthetic colic due to changes in gastrointestinal motility.
- However, it is generally the case that grain is removed.
- Water should be made available up to the time of surgery.

## F Medications

- It is best to administer all ancillary drugs (e.g. antimicrobials, anti-inflammatories) prior to sedation. Sodium penicillin can reduce systolic arterial pressure by 8–15 mmHg in anesthetized horses. If antimicrobials are administered during the anesthetic event, this effect can be minimized by administering the drug slowly.

## G Jugular catheter

- An intravenous (IV) catheter should *always* be placed prior to anesthesia.
- This reduces the likelihood of perivascular injection and provides ready access for further IV anesthetic or emergency drugs.

## H Flushing the oral cavity

- It is important to flush food debris from the oral cavity, especially if the airway is to be intubated (see Figure 1.1).

## I Removal of shoes

- Removal of shoes prevents damage to the horse and hospital flooring.
  - However, removal of shoes is not popular with owners. An alternative is to apply bandage material or tape to improve grip and to cover metal points.
- Certainly, loose shoes and nails should be removed.
- Removal of shoes and metallic debris is necessary when an MRI is to be performed.



**Figure 1.1** Rinsing of the mouth with water prior to induction of anesthesia using a large dosing syringe.

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