Sedation and Anesthesia for Field Surgeries

Keith R. Branson, DVM, MS, ACVA

1. Introduction
A variety of surgeries can be performed in the field. Most are performed on relatively healthy patients. Some procedures are done on awake patients, using sedation and often a local anesthetic technique. Other procedures require general anesthesia.

Short standing procedures can often be accomplished with a single injection of $\alpha_2$-agonist and butorphanol. Drug combinations commonly used include xylazine (0.25 to 1.0 mg/kg) or detomidine (0.005 to 0.02 mg/kg) given intravenously or by intramuscular injection. An opioid such as butorphanol (0.01 to 0.05 mg/kg) or buprenorphine (0.006 mg/kg) can be added for additional sedation and analgesia. If an opioid is used, the lower dose of the $\alpha_2$-agonist should be tried initially to prevent excessive sedation. If longer-term sedation is needed, xylazine can be administered as a constant rate infusion (CRI) at the rate of 0.55 mg/kg per hour or detomidine at the rate of 6 $\mu$g/kg per hour. Dexmedetomidine has also been given as a constant rate infusion (CRI) at the rate of 2.5 $\mu$g/kg per hour after a loading dose of 2.5 $\mu$g/kg. If an $\alpha_2$-agonist CRI is used, an opioid such as butorphanol can be given intermittently or as a CRI infusion. The most commonly used opioid is butorphanol, administered at the rate of 13 $\mu$g/kg per hour. Morphine has also been used at a rate of 30 $\mu$g/kg per hour after a loading dose of 50 $\mu$g/kg.

Often, local or regional anesthesia is used in conjunction with sedation. Although the local blocks on the distal limbs are widely used, I would encourage practitioners to also become familiar with regional anesthetic techniques on the head. Mental and infraorbital nerve blocks are useful for procedures involving the incisors and rostral head (Fig. 1). Likewise, sensory blocks around the eye can facilitate standing ophthalmic procedures.

Caudal epidurals are often used in conjunction with sedation for perineal surgeries. This is done in the traditional manner at the sacro-coccygeal or first intercoccygeal intervertebral space. A dose of 4 to 10 mL of local anesthetic is usually recommended; I usually use the lower end of this dose range. My preference is 4 mL of 2% lidocaine or carbocaine with 1 mL of 100 mg/mL xylazine added. The needle can be inserted perpendicular to the skin surface over the space or at a 30° to 45° angle, as shown in Fig. 2. Correct needle placement can be confirmed by a loss of resistance as the needle enters the epidural space or the use of the “hanging drop” technique. An alternative to a caudal epidural for perineal laceration and right ventricular fistula repair consists of a local infiltration of the nerves lateral to the rectum. After appropriate skin preparation, a long needle is inserted lateral to the rectum along either side to a point cranial of the surgical area. A hand inserted in the rectum can assist needle placement. Local anesthetic is infiltrated as the needle is withdrawn; 20 to 40 mL of local anesthetic is used on each side (Fig. 3).
General anesthesia can also be used for field surgeries. Short procedures can be done under α₂-agonist–dissociative combinations, which are widely used. In general, the α₂-agonist is administered first and then the horse is sedate, the dissociative is administered. These are summarized in Table 1.

If longer general anesthesia is going to be used, the most commonly used regimens include some combination of guaifenesin, ketamine, and an α₂-agonist. There are many combinations, but the most common is 5% guaifenesin, 1 mg/mL ketamine, and 0.5 mg/mL xylazine, commonly called triple drip. To make this, 10 mL of ketamine and 5 mL of xylazine are added to 1 L of 5% guaifenesin. This can be used as a maintenance general anesthetic after induction with xylazine and ketamine. Immediately after induction, a small bolus of triple drip is often needed; it can then be administered at the maintenance rate of approximately 2.2 mL/kg per hour (1 mL/lb per hour). If a long anesthesia is anticipated (more than 1 hour), I prefer to double the ketamine and decrease the administration rate. Detomidine, ketamine, and guaifenesin combinations are also used. It is similar to the mixture containing xylazine, but the xylazine is replaced by 0.01 mg/mL of detomidine. If possible, an assistant should monitor the depth of anesthesia and try to maintain the patient at a light plane of anesthesia. Minimal supportive care is usually provided for these patients because they are healthy and the anesthesia is of short duration. Care should still be taken to correctly position the patient to minimize the chance for neuropathy. Although intubation is not always indicated, it can sometimes be useful. In particular, nasotracheal intubation ensures an airway during oral surgery. The ability to intubate a patient can be of benefit. Intubation and use of a demand valve provides oxygen as well as maintaining an open airway. A standard E tank contains enough oxygen to provide assisted ventilation to an adult horse for 20 to 30 minutes or supplemental oxygen for approximately 1 hour when using a de-

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<th>Table 1. Three α₂-Agonist–Dissociative Combinations</th>
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<td>1. Xylazine 1.1 mg/kg* and ketamine 2.2 to 2.75 mg/kg* butorphanol 0.02 mg/kg or diazepam 0.06 mg/kg can be added. This can be extended by administering a half dose of both the xylazine and ketamine if needed. Detomidine (0.02 mg/kg) or romifidine (0.01 mg/kg) can be substituted for the xylazine.</td>
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<td>2. Xylazine 1.1 mg/kg and Telazol 1.65 mg/kg.</td>
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<td>3. Detomidine 0.02–0.04 mg/kg and Telazol 2 mg/kg.</td>
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Doses are in mg/kg and are to be administered intravenously. *For draft horses, doses should be decreased by 10%.
mand valve. High flow demand valves are available for equine use. Obviously, the demand valve must be compatible with the endotracheal tube (Fig. 4). Human resuscitation kits can be purchased that contain a small oxygen tank, demand valve (lower flow for human use), flowmeter, and even a gas-operated suction unit.

Sources of selected drugs and equipment: Guaifenesin (compounding pharmacies), Wedgewood Pharmacy, www.wedgewoodpetrx.com; Rood and Riddle Veterinary Pharmacy, www.rrvp.com; Equine demand valve, JD Medical, www.jdmedical.com; Equine endotracheal tubes Surgivet, www.surgivet.com

Fig. 4. Specialized equine demand valve (www.jdmedical.com).