Key Points:

- Careful planning and research should be undertaken when building or renovating an equine surgical suite in order to optimize the efficiency of the space and decrease the risk to the patient.
- Different recovery systems can be used to minimize complications during anesthetic recovery. These include: deep padding, head and tail ropes, the Anderson sling system, tilt table recovery systems, and pool recovery systems.

Due to the increasing number of referral centers throughout the world, equine surgery is now commonly performed in a hospital setting. Careful consideration should be given to operating room layout and the different types of recovery systems available when choosing to build or remodel an equine surgical facility. Operating room (OR) layout is particularly important not only in providing a functional space that requires minimal staff to perform routine surgeries, but also in helping decrease anesthetic complications and surgical site contamination (and by default post operative infection rates). An ideal equine surgical unit layout should include separate areas for induction, surgical site preparation, the OR itself, and a recovery stall, and the flow of traffic should always be in that order to decrease contamination within the OR. Although preparation can be done inside the OR this increases the contamination within the surgical suite so for “clean” procedures preparation should be done in a separate room if possible. Similarly, although the induction stall can also be used for recovery, workflow is more efficient with a separate space for each. Typically a hoist and monorail system is used to lift the horse once it is anesthetized and place it on a movable table that can be taken from the patient prep area into the OR. It is also best to have two ORs-one for “clean” (i.e. elective orthopedic or soft tissue surgeries) procedures and one for “contaminated” procedures such as colic surgeries, laceration repairs, lavage of septic structures, etc. The recommended size of an equine OR is 25 square feet. Other things to consider when building the OR are constructing the floors and walls of a surface that is easy to clean and will hold up to daily cleaning with potentially harsh chemicals and making sure that there is adequate drainage in the center of the room. It is also beneficial to place electrical outlets at least at waist level in order to avoid them becoming submerged in water or other fluids.

Although often not readily apparent or planned for, a fair amount of space within the surgical unit should be allocated for “other” areas. These include space for storage of anesthesia and OR equipment (arthroscopy equipment, oxygen supply, anesthesia machines, recovery and table pads or mats, fluoroscopy or radiography equipment, IV fluids, etc.), scrub areas, a central/sterile supply area, and locker rooms. Ideally the scrub room should be located just outside of the OR. It is convenient to have the central/sterile supply area directly adjacent to the surgery suites(s), and if possible have a window from this area into each OR-this cuts down on traffic (and therefore contamination) within the surgical suite and also decreases surgical time. Finally, some allowance should be made for provision of power in case of emergencies-some lights can be run by battery power, but things such as the hoist system and anesthesia machines should be connected to a generator in case a power failure occurs during surgery.

Just as important as the design of the surgical unit is the consideration of the different types of recovery systems available for equine use. Recovery from anesthesia carries a relatively high...
risk of injury in horses versus other species, with an approximately 1% anesthetic-associated mortality rate (compared to 0.11% in small animals and 0.008% in humans), while life-threatening fractures occur in 0.2% and other serious injuries such as myopathies or neuropathies occur in up to 2.3%. Therefore, recovery aids and specialized recovery systems are indicated at the very least in horses that are debilitated, systemically compromised, or have undergone fracture repair or major orthopedic surgery, and they may be beneficial in any horse recovering from anesthesia. Recovery aids readily available include head and tail ropes and deep recovery mats. Head and tail ropes should be placed through rings high on the wall (≥ 6 feet); these are not used to lift the horse per say but to provide some support to the ataxic horse as it is attempting to stand. Deep mats are used not only to help prevent myopathies and neuropathies, but also to make it harder for the horse to attain a sternal position, therefore delaying the horse’s attempt to stand until it is awake enough to do so. A similar result can be obtained by using deep straw bedding or shavings, but these carry the obvious risk of contaminating the OR and are harder to clean.

Other specialized recovery systems are available at select referral centers for horses considered to be at increased risk of fracture or other problems during recovery. These include a rapidly inflating-deflating air pillow, tilt-table systems, the Anderson sling, and various pool recovery systems. The air pillow system was designed at Kansas State University and uses the same concept as a deep recovery mat—i.e. the thick cushion keeps the horse in lateral recumbency for longer, allowing them to be more “awake” and more coordinated when they do attempt to stand. The pillow deflates within 30-60 seconds, allowing the horse to stand once an attempt is made. Compared to horses allowed to recover without assistance, those on the air pillow took significantly longer to become sternal and to stand, with fewer attempts to stand. However, there was no significant difference in recovery scores obtained between the two groups. The Anderson sling has been used successfully for recovery of horses considered at risk for fracture—typically horses who have undergone orthopedic surgery. Horses are usually sedated after discontinuation of inhalant anesthesia and placed in the sling connected to a hoist in a recovery stall. As the horse begins to move the sling is slowly lowered to allow weight bearing when the horse is judged to be awake enough to do so. This system does require extra personnel with experience in placing the sling, and occasionally horses will not tolerate the sling, in which case they have to be re-anesthetized and assisted to recover by some other means. A tilt table recovery system has been described; horses are strapped to a table that is moved from a horizontal to vertical position hydraulically. Although successfully used in the majority of cases, complications were more commonly seen using it than other specialized recovery systems, with 1.9% having failure of the orthopedic fixation necessitating euthanasia, 15% experiencing injuries including skin abrasions, myositis, cast breakage, and partial implant failure, and 11% were not able to be recovered on the table and had to be transferred to a traditional recovery room.

Pool recovery systems have been successfully used for horses considered at high risk of fracture during recovery; however, these systems are not widely available. There are two types of systems available—a pool raft recovery system used at the University of Pennsylvania’s New Bolton Center and a hydro-pool system that is in use at several institutions. In the pool raft system the horse is placed into a raft with “sleeves” for each limb via a sling; once the horse is judged to be awake enough to stand it is lifted from the raft in the sling with a hoist and placed into a recovery stall. It is during this process that injuries can still occur if the horse is uncooperative in the sling. Using this system, 7% of horses had complications within the pool, 13% had complications within the recovery stall, and 2% died or were euthanized due to pulmonary dysfunction or implant failure. However, this system does appear to decrease complications of recovering from anesthesia.
for at-risk patients, and one advantage with this system versus the hydro-pool system is that the incision can be kept sterile because it is not submerged in water. Disadvantages of the system are the added expense and manpower necessary to build, maintain, and use the system, and size restrictions due to the size of the raft itself (i.e. it can’t be used for foals/small horses or very large horses). In the hydro-pool system, the horse is placed via a sling and hoist into a smaller rectangular pool with a hydraulic scissor table acting as the floor. The floor is initially lowered, and as the horse begins to wake the floor and sling are raised. In a report on this system from Washington State University, 25% of horses experienced a complication, including pulmonary edema, myopathy/neuropathy, and incisional infections or septic joints; one horse with pulmonary edema was subsequently euthanized. However, this system was still considered useful for recovering at-risk horses, and compared to the pool-raft system fewer people are needed to operate and maintain the system. The primary disadvantage of this system is the potential for incisional infections, since the limb is immersed directly in water.

References: