Many technicians (and veterinarians) do not feel comfortable working with avian patients. There is a decided lack of information on how to appropriately handle, medicate, and anesthetize birds, complicated by the fact that birds are not mammals and have much different anatomy than cats and dogs. However, the number of bird owners is increasing dramatically and more and more of those dedicated pet owners are bringing their family members to veterinary clinics expecting the same kind of care cats and dogs normally receive. Ovariohysterectomies are becoming a common occurrence, as are coelomic surgeries, fracture repairs, wing amputations, and mass removals. The purpose of this lecture is to provide basic information on how to competently provide quality anesthesia for birds in the hopes that technicians will feel more confident about providing a better standard of care for the exotics species that come through the clinic door.

Anatomy
Avian patients have a number of anatomical differences from their mammal counterparts. The gastrointestinal tract includes an outcropping of the esophagus known as the crop, 2 chambers in the stomach known as the proventriculus (a very strong chamber that secretes acid to break down food) and the ventriculus (aka the gizzard; essentially crushes food), and a common outlet for intestinal, genital, and urinary tracts called the cloaca.

The respiratory system in birds is very complicated and can be extremely sensitive. Birds have a very long trachea, slower respiratory rate, and larger tidal volume. They have small, dense lung that cannot handle apnea. They have 9 air sacs that act as a type of bellows and increase respiratory efficiency. Birds have no diaphragm and their entire body cavity acts as a ventilatory force.

Normal values
- Temperature: 100-110, Pulse: varies based on species—up to 1000/beats per minute, Respirations: 30-60
- Packed Cell Volume: 38-50%
- Total protein: 2.4-5
- Glucose: 185-455
- Blood Volume: 55-70 ml/kg
- Remember, these are all VERY species specific!

Premedication
Drug doses for MOST species of bird
- Butorphanol: 0.5-2 mg/kg IM/SQ/IV
- Buprenorphine: 0.01-0.05 mg/kg IM/SQ/IV
- Hydromorphone/Oxymorphone: 0.05-0.2 mg/kg IM/SQ/IV
- Midazolam: 0.1-0.5 mg/kg IM/SQ/IV/intranasal
- Carprofen: 1-2 mg/kg SQ
- Meloxicam: 0.1-0.2 mg/kg SQ/PO
- Ketamine: 10-20 mg/kg IM
- Propofol: 2-5 mg/kg IV* use with caution

As with canine and feline patients, birds should be premedicated with a sedative and analgesic combination before any anesthetic episode. Premedication helps decrease level of stress in patients, reduces anesthetic requirements, and helps to deal with pain associated with the procedure. While it is not typically acceptable to mask induce patients, exotic species are the exception. They are usually not sedate enough from premedication to allow for easy catheter placement. Even if IV induction is an option, many species are require more time to intubate and an induction with an IV agent, such as propofol, may not allow enough time for intubation before it reaches a crisis. Birds however, are exceptionally easy to intubate, so intravenous induction is an option.

The primary site for intramuscular injections is the pectoral area. It often the largest muscle mass and is easy to locate by palpatating the keel and angling the needle laterally. The quadriceps muscles can be used, but the potential hepatotoxic effects of the drug must be considered and weighed.

Subcutaneous injections can be given in the inner thigh or over the keel. The skin in both areas is very thin, which does allow for easy confirmation of placement. The inner thigh is best for larger volume administration although caution should be used as it is near an air sac.
Induction and intubation
Isoflurane and sevoflurane are both acceptable choices of gas inhalant in exotic anesthesia. When performing a mask induction be extra vigilant in monitoring vital signs. Take care not to over- or under-restrain the patient and use caution not to cause ocular damage with the induction mask. Birds do not have a diaphragm and cannot respire appropriately if their chest is restricted.

Birds should ALWAYS be intubated. Avian patients frequently become apneic under anesthesia and their physiology does not tolerate any episodes of respiratory arrest. Birds are also very prone to regurgitation and intubation lessens the likelihood of aspiration. Tube size for birds usually runs from 2.0mm-5.0mm depending on the size and species of the bird (cockatiels and parakeets can be intubated using 16 gauge or 18 gauge catheters with the stylet removed). Do not inflate the cuff. Birds have complete tracheal rings and any pressure from an inflated cuff can cause tissue necrosis. Birds are technically easy to intubate, the tracheal opening is located just off the base of the tongue and can often be visualized without the aid of a light source.

Venipuncture and intravenous catheter placement
The right jugular veins in birds is usually easily visualized, well tolerated, and excellent for larger volumes. The ulnar/basilic (wing vein) usually requires anesthesia to attempt. The vessel is very fragile and the technician should expect a hematoma. The vessel runs directly alongside an artery so take care which vessel is being used. The medial metatarsal vein is an excellent choice in larger birds and the first choice in waterfowl. The tools necessary for blood collection include a 1cc syringe or small gauge butterfly set, 23g-27g needles, and small collection tubes. It is important to remember to remove the needle before transferring the sample to the collection tube as the cells being forced through a small gauge needle can be lysed. Bird blood can clot quickly, so if it will not interfere with the required tests, it can be advantageous to preheparinize the syringe.

In birds, catheters can be placed in the ulnar vein, medial metatarsal, or jugular vein. The ulnar vein is easy to see, but is located immediately next to an artery so care should be taken not to catheterize the wrong vessel. The ulnar vein is more challenging to secure and is not practical for maintenance beyond the anesthetic and immediate recovery period. The medial metatarsal vein is an excellent choice in long—legged birds and can usually be maintained longer term. The jugular vein is an adequate choice for long term catheters and may be the only choice in very small birds. In birds the right jugular vein is much larger and more prominent.

Equipment needed for intravenous catheters includes 22, 24, or 26 gauge catheters, gentle tape—clear tape or paper tape, and lightweight access ports.

Monitoring
Similar monitoring techniques are used in canine and feline patients, allowing for a smaller scale. Pulse oximetry can readily be used. Probes can be placed on the feet, tongue, wings, esophagus, or cloaca.

Doppler flow detector crystals can be placed over the dorsal pedal artery or ulnar artery in birds and in larger patients can be used in conjunction with a sphygmomanometer to obtain blood pressure readings. The Doppler probe can also be placed in the femoral area, carotid/thoracic inlet, or on the chest and used for sound and heart rate. Be careful not to restrict respirations if taping the probe on the chest.

Capnometry can be used on any intubated patient. Dead space adapters exist that can be connected to the endotracheal tube in place of the regular tube adapter. The size endotracheal tube used is very small and tube obstruction is a concern. A capnograph can be the first alert to an obstruction or inadvertent extubation. It can confirm proper intubation and can alert the anesthetist to issues with ventilation or cardiac output.

Non-invasive blood pressure monitoring is an option on some animals—good pediatric monitors usually work well on medium to large birds. Small blood pressure cuffs can be placed on the wings or legs.

Electrocardiography can be readily monitored. The ECG gives information about rate and rhythm and can be a helpful tool to use under anesthesia. ECG patches can be placed on both wings and the left leg in birds. It is also possible to use 25 gauge needles pierced through skin with an alligator clip attached to the needle. If using alligator clips on skin (without an ECG patch) either flatten the teeth of the clip or use a gauze square to cushion the area and prevent tissue damage.

Temperature monitoring is one of the most vital monitors in birds. Small patients are at a high risk for hypothermia. It is important to note that for as quickly as small patients can cool down, they can warm up just as fast. Without careful monitoring of temperature, patients can easily become hyperthermic. Temperature can be monitored using either cloacal or esophageal temperature probes.

Monitoring anesthetic depth in birds has some similarities to monitoring anesthesia in other species. Palpebral reflexes are not reliable in birds, however, jaw tone, rectal tone, and pedal reflexes are all accurate indicators of anesthetic depth. As with most species, if an avian patient is too light, heart rate and respiratory rate will increase, if it is too deep, heart rate and respiratory rate will decrease.

Recovery
Recovery requires almost as much monitoring as during the anesthetic period. Birds can become hypothermic very quickly and temperature should be monitored closely for several hours postoperatively. It can be difficult to maintain catheters in birds and
watchful eye must be kept. Respiratory depression can quickly lead to cardiac arrest—vigilance can catch an issue before it becomes a critical problem. Always know the reversal drug and dose needed and have an emergency drug dose chart readily available. Birds should be kept in an area where they can be easily watched but not disturbed. Make sure housing is warm, dark and away from predators. If necessary make modifications to food and water sources so they can be easily accessed by debilitated or recovering patients.

References available from the author.