CRITICAL CARE TECHNIQUES FOR AVIAN WILDLIFE EMERGENCIES

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LafeberVet Webinar RACE #776-38004

TRIAGE

Triage is the process of prioritizing patients based on presenting condition and the resources available, to deal with that condition. Therefore, triage of avian wildlife may necessarily vary to some degree based on individual philosophy, case load, local, state, and federal regulations, and the presenting situation (i.e., oil spill affecting hundreds of animals versus the normal daily load of injury and illness). In any case, the primary objective during the triaging process is the expectation of eventual return of the patient to the wild with 100% function. When triaging birds in a private practice setting, there are some considerations that may help set triage policy. Guidelines about what the practice is willing to accept should be made clear to staff and to the public prior to accepting wildlife cases, including, for example, recognizing when a young animal should be returned to the wild, as is often the case with abducted nestlings and fledglings. It is also important to be aware of reasons why a bird may not be releasable or have a good quality of life in captivity. The goal of wildlife medicine is always eventual release and the reality of euthanasia needs to be kept in mind during triage if chances of release are remote. Realistic resource allocation is especially important in a for-profit clinic that is underwriting wildlife treatment.

Catheters

Placing *intravenous* (IV) or *intraosseous* (IO) catheters is a simple, quick procedure that every clinician should be able to perform in any species of bird. Most patients presented on emergency will warrant venous access. For wild birds, where the patient would be expected to return to eventual flight or hunting performance, IV catheters are usually preferred since IO catheters may cause joint injury/infection. If unable to place an IV, an IO catheter may become a life saving necessity. These are extremely stable, effective, easily and rapidly placed. It is recommended that peripheral catheters, whether IV or IO, be maintained for no more than 3 days.

In many species of birds, a jugular catheter is often most easily placed using the right (the larger) jugular vein. The basilic vein (wing), also referred to as the cutaneous ulnar vein, and medial metatarsal vein (leg) may also be utilized. The latter is most useful in wading birds, raptors and waterfowl. Pouch veins may be used in some species, such as pelicans.

In birds, IO catheters are generally placed in the distal ulna from the lateral aspect. They may also be placed in the proximal tibiotarsus on either the lateral or medial aspect (try to avoid the patellar ligament). Remember that drugs given IO in the caudal half of the body may go through the renal portal system in birds; thus, this may have some bearing on the choice of catheter placement.

Subcutaneous Fluid Administration and Intramuscular Injections

*Subcutaneous fluid* or drug administration is often a viable choice in avian cases. Particularly in birds, be certain that the needle is subcutaneous, not IM, or in an airsac, lung, or intracoelomic space. Besides visualizing the needle beneath the skin as you begin the administration, you should also notice an immediate bleb. If any resistance is encountered, it is likely that you are against a bone, and it is advisable to retract your needle slightly. Be aware of the patients’ respiration throughout the procedure.

Maintenance volume of crystalloid fluids varies with species and is related to metabolic rate. For birds this may be anywhere from 50-150 ml/kg/day depending on size, species, age, and natural history (i.e. xerophilic vs. aquatic birds).

Again, remember that drugs given IM in the caudal half of the body may go through the renal portal system. Therefore, in many species of birds, the pectoral muscle is a good choice for *IM injections*. 
Critical Care

Fluid support and analgesia are a critical part of early intervention in trauma cases. If the patient is dehydrated or hypothermic, it is important to take a day or so to rehydrate and warm the patient prior to giving any food or medications or metabolism of these substances may be impaired and make the animal worse. Crystalloids, such as Plasmalyte, Normasol-R, LRS or ½ strength LRS + 2.5% dextrose are all acceptable empiric choices prior to obtaining bloodwork. Colloids may also be indicated, especially in cases of hypovolemic shock, common in trauma cases. Hypertonic saline may also be used to address hypovolemia and there has been increasing interest in human and small animal medicine in the use of hypertonic saline in traumatic brain injury (TBI) for its hyperosmotic potential. The author uses a bolus dose of 4 ml/kg IV of 7.2 % NaCl over 10 min in avian species. The increase in intravascular volume after hypertonic saline administration can be transient lasting approximately 15-30 minutes, but these effects can be prolonged by the concurrent administration of colloids. Research suggests, however, that with or without colloids, hypertonic saline-induced reductions in intracranial pressure (ICP) persist for much longer than the vascular effects and significantly longer than mannitol. Hypertonic saline should be avoided in patients with significant sodium derangements or advanced dehydration.

Clinical and research data are gathering which suggests hypertonic saline may reduce ICP faster, more significantly and for longer than mannitol with less undesirable effects. The use of corticosteroids in birds is generally contraindicated, but particularly in cases of TBI. In human medicine the use of glucocorticoids in head-trauma patients has been shown to increase mortality. Corticosteroids will also induce hyperglycemia which has been linked with increased free radical production, excitatory amino acid release, cerebral edema, and altered cerebral vasculature, which could potentiate further neurological injury.

Blood and Plasma Transfusions

Trauma or disease resulting in hemorrhage is a common emergency presentation in wild birds of any age. Total blood volume in birds is estimated to be approximately 10% of BW (i.e. a 1,000 gram bird would have a 100 ml blood volume). Interestingly, birds are less susceptible to shock from blood loss than are mammals. An otherwise healthy bird can lose up to 30% of its blood volume with no apparent ill effects. In one study, the removal of 60% of the blood volume in healthy pigeons did not cause significant clinical affects and resulted in a return to normal PCV by day 7 without treatment. This is due to a bird’s ability to quickly mobilize large numbers of RBC’s from the bone marrow and also probably from an ability to rapidly replace vascular fluid loss from the extravascular space.

Whether to transfuse an avian patient with acute blood loss should be given careful consideration. Pigeons suffering from acute blood loss had a better response to IV fluids than to heterologous or homologous blood transfusions. The same study showed a single iron dextran given IM (10 mg/kg) to pigeons was associated with a significant increase in packed cell volume within 48 hours. In another study in chickens, birds were divided into 4 groups: untreated controls, and treated with intravenous hetastarch, with a hemoglobin-based oxygen carrier, or by autotransfusion. No significant differences were found in mortality, respiratory rate, heart rate, PCV, or hemoglobin values among the 4 groups at the end of resuscitation. However, in similar a study in mallard ducks, while there was no statistical difference in mortality rate among 3 fluid resuscitation groups with crystalloids, hetastarch, or hemoglobin-based oxygen-carrying solution (HBOCS), a trend of decreased mortality rate was observed in the HBOCS group.

If the PCV from acute hemorrhage is less than 20% or in more chronic cases less than 15% (normal PCV for most adult birds is in the 35-55% range; keep in mind that normal PCV and RBC counts tend to be lower in young and female birds) and the patient is demonstrating clinical signs of anemia, a whole blood transfusion may be beneficial. Also, if the patient is hypoproteinemic and has an anemia of less than 20%, a whole blood transfusion may be beneficial for the plasma proteins as well as the RBCs. Whole blood and plasma transfusions should ideally be from same species. However, if a homologous donor is not available, a single heterologous transfusion from a donor of the same genus (i.e. Buteo to Buteo) may be of some benefit. The half-life of whole blood heterologous transfusions may range from 12 hours to 4.5 days (depending on whether the donor is within the same genus) whereas a homologous transfusion may have a half-life of 6-11 days.
There is no information on blood grouping in wild birds. In chickens, at least 28 different blood group antigens have been found. A rough cross match (major and minor) can be performed mixing donor and recipient red cells and serum on a glass slide. An absence of gross agglutination or hemolysis suggests compatibility. The recommended anticoagulant is sodium citrate, although acid citrate dextrose (ACD), citrate phosphate dextrose (CPD), or heparin can also be used. The recommended ratio is 0.1 ml of citrate per 0.9 ml of blood or 2 IU of heparin per ml of blood. The amount transfused is 10-20% of the patient’s blood volume (1-2% BW) and can be given IV or IO. This amount would be expected to increase the PCV by 2-5%. Donor blood should be used immediately; there are no reports on the effects of any time of storage for whole blood in raptors. Long term storage of avian blood is not recommended as mammalian storage media appears to be inadequate to support avian erythrocyte metabolism. An 18 μm blood filter should be used. The patient should be evaluated every 15 minutes for the first hour for signs of a transfusion reaction, such as panting due to increased body temperature. Anaphylactic reactions following a single transfusion are rare, but the patient can be premedicated with diphenhydramine. Transfusion reactions have been reported in birds given multiple heterologous transfusions. Supportive care for anemic patients should include B vitamins and iron.

Analgesia

Birds are probably commonly undertreated for pain. In general, if a procedure or injury would be expected to be painful in other species, it is probably a safe assumption that it is equally painful in a bird. Employing balanced, multimodal analgesia is both a medical and ethical imperative. With the opioid epidemic in the U.S., procurement of appropriate analgesic medications is becoming more challenging, forcing avian practitioners to examine viable alternatives. The DEA substantially reduced manufacturing quotas for Schedule II opiates and opioid medications for 2018 and this will continue in 2019. Therefore, some flexibility and knowledge of the current options for pain control in birds is warranted.

Euthanasia and Assessing Life

Full understanding of pertinent federal, state, and local laws and regulations is important when treating wild birds and considering euthanasia. For the most part, wildlife management regulations are delegated to individual states. However, certain federal regulations apply to specific species and specific situations. Veterinarians generally do not need a special permit to possess, stabilize, and euthanize sick or injured birds protected under the Migratory Bird Treaty Act. However, for some species, Federal or State permission may be required prior to euthanasia. Federal migratory bird rehabilitation regulations (50 CFR 21.31) stipulate that any bird that “cannot feed itself, perch upright, or ambulate without inflicting additional injuries to itself where medical and/or rehabilitative care will not reverse such conditions” must be euthanized. Also, “…any bird that is completely blind and any bird that has sustained injuries that would require amputation of a leg, a foot, or a wing at the elbow or above (humero-ulnar joint)” must be euthanized unless a licensed veterinarian submits a written recommendation that the bird should be kept alive. Additional regulations regarding admission, euthanasia, and documentation apply for migratory birds, and the reader is referred to 50 CFR 21.12 and 50 CFR 21.31 for further details. Other federal Acts may also apply in certain instances, such as the Endangered Species Act (ESA), Marine Mammal Protection Act (MMPA), Bald and Golden Eagle Protection Act, and Lacey Act. Check with the wildlife authorities in your area if you are not sure what the law may entail.

Euthanasia should be conducted without undue patient stress or restraint. Premedication and a multi-modal drug delivery approach to euthanasia should strongly be considered. For example, birds can be premedicated with drugs such as dexmedetomidine and midazolam prior to induction with a gas anesthetic or before administration of sodium pentobarbital IV. If sodium pentobarbital or other barbiturates are used, proper carcass disposal must be practiced, as fatal secondary barbiturate poisonings have been documented.

Euthanasia solution or potassium chloride (KCl) may be given IV, IO, intraperitoneal (IP), intracardiac (IC), or into the supraoccipital sinus. For the last 4 of these routes or if KCl is used, general anesthesia or heavy sedation is recommended. The dose for both is 1 ml per 10 pounds of body weight. A stethoscope or Doppler can generally be used to verify cessation of heart beat.