



## **Raptors in Rehabilitation: First, Do No Harm!**

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### **Introduction**

Birds of prey can be a very rewarding group of species to treat in a wildlife rehabilitation setting; however, the rehabilitation process is not benign, and additional problems may arise while these animals are in care. Appropriate handling, caging, and diet are essential for the successful rehabilitation of raptors. Knowledge of common captivity-related problems and how they can be treated and prevented is crucial, and all birds should be monitored for these problems at every stage of the rehabilitation process.

### **Hospital Caging**

Hospital caging can be as simple as typical transport crates or wall kennels that are used for cats and dogs. Metal cage banks should be avoided if possible because they tend to be quite loud as these relatively heavy birds move around. The fronts of cages should always be covered with a towel or other solid barrier to avoid stress from visual stimuli and to avoid malimprinting or habituation of young birds. The inside of the cage can be lined with just newspaper or a soft towel or fleece, keeping in mind that some species (owls in particular) will occasionally tear up and sometimes ingest terry cloth. A species-appropriate perch should be provided, which is often either covered with astroturf, neoprene, or bike tire rubber or wrapped in fleece or other soft towel/pillowcase. The bird's feet should wrap between one-half and three-quarters of the way around the perch. It is advisable to change the texture of the perch to help prevent pododermatitis (bumblefoot). All falcons and vultures are flat footed and should always be provided with flat perching to avoid pododermatitis.

Shift caging (caging with a removable divider) for hospitalized raptors is extremely helpful to decrease stress and risk of injury (to birds and handlers!) from needing to handle birds daily in order to clean their cages. Shift cages consist of two adjacent cage banks that can be separated by a board that is slid in between the two sides of the cage. The majority of the day the bird can choose to be in either side of the cage. During daily cleaning, the shift board is placed in between the cages, the empty side is cleaned, the shift board is slid out, the bird is encouraged to move to the other side, the shift board is replaced, and the other side is cleaned and refreshed. Medications can easily be hidden in the whole prey diet.

Solid-sided caging and doors are always preferable to bars in order to protect feather quality and decrease visual stimuli and stress. Padded walls can be an added bonus! If all sides of the cage and door are solid, ventilation holes can be provided in the back of the cage and dim lighting can be shined through to allow diurnal birds to see their food. If solid-sided caging is not possible, vertical bars or slots are preferable to horizontal to decrease feather breakage.



*Shift cage setup for a small owl species (screech owl, burrowing owl).*



*Custom-made shift cages. Movable dividers, located on the right side when not in use, can be placed to contain birds to one side of the cage while the other is being cleaned and refreshed. Birds are provided with a perch on each side of the cage.*



*One side of an empty shift cage showing some of the ventilation and dim, flicker-free lighting that can be remotely turned off at night.*

## Outdoor Caging

Outdoor cage walls should also ideally be solid-sided or have vertical slats for ventilation. Slats need to be narrow enough so as not to allow any wing or leg to fit between them and become trapped. Avoid wide netting or chain-link fencing - these are often not appreciated as solid barriers by many species, who may injure themselves by flying into the barriers and/or clinging onto them with their feet, which can cause various problems including fractures, feather damage, foot lesions, and facial and carpal trauma. If solid walls are not feasible, flights can be lined with "Pet Screen" (<https://www.phifer.com/product/petscreen/>). Pet Screen is a vinyl-coated polyester and is extremely strong and resistant to tearing. It provides a visual barrier to the birds but allows good lighting and ventilation and should not cause injury to birds that fly into it. Ideally with all types of cage structures, the frame should be present on the outside of the structure, and the flat surface should be on the inside. If this is not possible for enclosures using Pet Screen, be sure to at least secure the screen to all contact points with the frame so that birds can not become trapped between the screen and frame. A visual barrier should be present between adjacent enclosures, particularly if they house different species.

A vestibule with a double door should always be placed at the entrance to any size of enclosure to prevent animals from escaping. Depending on the species being housed, the enclosures should be appropriately predator proof, which may include reinforcing the floor with hardware cloth to prevent digging species (i.e., skunks!) from entering. Large water bins should be provided for bathing, particularly in hot climates, and staged perching that is of appropriate size and variety for the species being housed is particularly helpful for animals still recovering from wing injuries to get up on high perches. Birds living in outside enclosures should never be spending a significant amount of time on the ground; pododermatitis lesions will often result.

Substrates for outdoor enclosures can be sand, pea gravel, dirt, grass, or turf. Avoid wood chips, hay, or straw, as these can easily grow fungal and bacterial organisms.

Prey pits to allow live prey training with rodents should be as large as is feasible within flight enclosures, and obviously, it should be rodent proof to prevent escaping prey. Prey pits should be lined with leaf litter and other natural hiding places for rodents, and food and water should always be provided to live prey within the prey training pits. The sides of prey pits should be lined with turf or other comfortable perching material, as birds will often perch on the sides. Some flight spaces can be designed so that the entire floor is rodent proof, allowing the entire flight cage to be used as a prey pit.

Barn owls, screech owls, and other cavity-nesting birds should be provided with appropriately sized nest boxes in their flight space.

## **Minimum Exercise Flight Pen Sizes**

(in Width x Length x Height)

Small owls (screech owls, burrowing owls, etc.), sharp-shinned hawks, kestrels: 8' x 16' x 8'

Barn owls, broad-winged hawks, Cooper's hawks, red-shouldered hawks: 12' x 30' x 12'

Barred owls, great horned owls, red-tailed hawks, northern goshawks: 12' x 50' x 12'

Eagles, peregrine falcons, vultures, osprey: 16' x 100' x 16'

## **Species Cohabitation Concerns**

Accipiters (e.g., Cooper's hawks, goshawks) should always be housed individually. If necessary, juveniles of the same sex (estimated based on size) can be housed together, but males and females should not be comingled in the same flight spaces, and adults should always be housed individually. Never place a debilitated/poorly flighted accipiter in an enclosure with any other more robust accipiter, even juveniles. Fighting amongst these species can result in death. Most owl species and hawk species, however, can do well in large flight enclosures with other members of their same species, but avoid mixing different species together. The only exception to this rule is that red-tailed hawks appear to house well with golden eagles, turkey vultures, and osprey.

## **Handling**

A lot of wildlife centers will have slightly different handling procedures, all of them usually accomplishing the same goal. Here I will attempt to walk you through the handling procedure we use at Ojai Raptor Center.

When catching a raptor from a small enclosure, start with an appropriately sized towel (or pillowcase for smaller birds) and welding gloves or raptor handling gloves. Our favorite gloves that we use for most species aside from eagles are Tillman Elkskin welding gloves, which provide protection while also being soft enough to provide some feel and dexterity. Protective eyewear should be worn when handling more aggressive or jumpy patients.

Start with the towel positioned horizontally, with about 6-10 inches draped over your hands toward your body. If there are higher perches or any obstacles in the way, these can be removed before you start. Move slowly toward the bird, creating a wall with your towel to corner them in their cage. Avoid sharp, sudden movements, as these will be more startling to the bird and may cause a more reactive fight-or-flight response. You should also avoid throwing the towel over the bird, losing contact with the towel - this will usually result in the bird getting out from under your towel, and you will no longer have a sense of where the bird's body is located under the towel.

The towel will ideally be placed longways across the back of the bird, allowing you to in one movement cover the bird's eyes and pin the wings to the bird's side. Obstructing the bird's vision should be the first goal, as this will decrease stress and prevent the animal from visualizing an escape route or your arms or gloves to easily talon them. The wings are then pinned to the body and the bird is pushed down toward the ground and rolled gently to one side, with the back of the bird facing your body.

Once the bird is securely wrapped in the towel and lying on one side, with your non-dominant hand pinning the bird to the ground or floor of the cage, carefully move the towel with your dominant gloved hand to locate the talons. Once the talons are visualized, slide your dominant free hand just under the underside of the tail feathers, toward the vent, and toward the legs. Keeping your hand at the tail feathers and very close to the bird's body will help prevent the animal from being able to grab your hand or glove with its talons. Raptors can strike forward and out with the talons, but not back toward their vent or tail feathers.

Initially gain control of the legs proximally, very close to the body, with your index finger between the two legs and your other fingers grasping around both legs. Again, this is to make it less likely the bird will be able to grab your glove or hands. Once you have the legs secured, slide your hand distally along the leg until you are holding the legs immediately proximal to (above) the feet. This will give you the most control over the talons and help prevent you from allowing the bird to talon anyone else.

Once the talons are secure, with the bird still securely wrapped in the towel with the face and eyes covered, lift the bird up toward your body, with its back against your chest and your arms being used to help keep its wings secured to its sides.

To allow an examiner access to the wings or one side of the bird's body, hold the legs in your hand opposite the side that the examiner wishes to access, and allow your free hand to keep the bird's head covered with the towel and secure the head to prevent the bird from biting the examiner.

If catching up a bird from a larger flight pen or mew, use a fine net: holes in the net should not be larger than 0.5 cm to prevent feather breakage or toes/talons/legs being tangled in the net. Ideally, the bird is caught in the net as it is sitting on a perch or on the ground or just as it is jumping off the perch. Catching a bird mid-flight in a net can be risky, as they can impact the solid parts of the net, leading to injury. The outside of the net can be padded with a pool noodle, plumbing insulation, or other foam padding to help prevent injury. Once the bird is netted and on the ground, repeat a procedure similar to that described above. I usually start with the net still between the bird and the towel, and once the legs are secured, move the towel under the net and directly over the bird before moving the bird out of the net.

If at any point the bird becomes loose from the towel and starts flapping its wings, maintain the grip on the legs and swiftly but carefully bring the bird down to the ground or a table onto its back, and get a towel to rewrap the bird and regain control. Avoid allowing the bird to hang too long by its

legs, as this can lead to leg fractures or luxations. Move away from any solid objects if the bird is flapping frantically to avoid causing any wing fractures.

It is recommended to avoid grabbing or restraining a bird by just its legs alone without restraining the wings or body. This can (and has) led to iatrogenic trauma to the legs as well as self-injury to the wings if they flap them against a cage wall, door, or other solid barrier. Furthermore, by not decreasing the visual stimuli to the bird, this method also tends to appear more stressful to the animal.

## **Diet**

Raptor feeding is fairly simple, as these animals should always be fed a whole prey diet, typically rats or mice for mammal-eating birds and quail and chicks for bird-eating raptors. Pigeons are sometimes fed but are usually not recommended due to the risk of transmission of trichomoniasis and other infectious diseases. Chicks and pinkie mice should always be supplemented with calcium, particularly if fed to young growing birds, and neither should be exclusively used to feed young birds. If an animal is getting fed thawed frozen fish, thiamine (vit B1) should be supplemented (typically at least 30 mg per kg of fish) due to the thaminase produced by the frozen fish.

Occasionally, some birds that typically eat mammals will refuse rodents and prefer to eat quail, or vice versa! Different prey items can be tried to encourage a bird reluctant to eat on its own. (The author once had a barred owl patient who would only eat fish!) Other tactics, such as elevating the food, making the food contrast sharply with the colored background it's placed on (e.g., dark mouse on a white cloth), or providing a freshly dispatched rodent can help encourage a patient to eat. Some veterinarians have also had good success using midazolam as an appetite stimulant, at 0.2-0.5 mg/kg intramuscularly, subcutaneously, or intranasally.

How much do you need to feed? A good starting point for adults in good body condition:

$$1 \text{ MEC} = (\text{body weight in kg})^{0.75} \times 78$$

= The weight of whole prey to feed per day in grams

$$\text{I.e., for a 600 g bird } 1 \text{ MEC} = (0.6)^{0.75} \times 78 = 53 \text{ grams}$$

Multiply this by 1.5-2 for underweight or sick birds or by 2-3 for young, growing birds.

This should always be adjusted based on body weight, body weight, and activity level. Smaller, very active birds, like Cooper's hawks, sharp-shinned hawks, and kestrels, should be fed, in most cases, as much as they want.

Feeding stations in outdoor enclosures should be elevated off the ground and not located directly under perches where they can be contaminated with feces and urates.

## **Avoiding Malimprinting**

For any rehabilitator caring for hatchling, nestling, and fledgling birds, avoiding imprinting and habituation of young birds is essential for the successful release of those birds. The younger the bird, the higher the risk of imprinting on their human caregivers, and some species are more easily imprinted or habituated than others. For instance, great horned owl nestlings are much more easily habituated/imprinted than barn owls. Barn owls actually need to be raised from a very young age and take quite a bit of work to successfully imprint on humans!

As we all know, the best thing for healthy young birds is to remain with their families, if at all possible. Keep in mind that some species, like great horned owls and barred owls, are excellent climbers, even on bare tree trunks, well before they can fly and may normally be spending some time on the ground. These birds can use their beaks and talons to climb back up the tree into their nest or branches and should be left alone. (If anyone doesn't believe you, tell them to search "baby owl climbing tree" on YouTube!)

Renesting is an option for uninjured young hatchlings and nestlings that have fallen out of the nest. They can be replaced back into their own nest and monitored to ensure that parental care is still present. They can also be placed into a nest belonging to different parents of the same species as long as the young present are approximately the same age/size.

If renesting is not an option, centers that maintain non-releasable birds can sometimes use these birds as surrogate parents. They need to be monitored closely, barn owls in particular, to ensure they will not attack the young. Some surrogates will care for the young, but often they just "keep them company" and provide a member of the same species to imprint on and from whom they can learn correct behaviors. Enclosures for adult birds can be fitted with a weather-protected rearing chamber for the young.

If young birds need to be hand-raised, there are several things that must be done to avoid malimprinting on human caretakers. Avoid talking, cover your face and body (usually with a ghillie suit), group young of the same species together, and use a puppet to feed. Real taxidermied carcasses are the best and most realistic option. Taxidermied birds should be held in front of the young birds in their line of vision while they are being tong-fed.

## **Young Raptor Care**

Hatchling raptors are fed 3-4 times per day and housed in an incubator set to 85-90 degrees F. Just as in mammals, NEVER feed a cold bird. Hatchlings can overeat, so they are typically fed up to 3x MEC (see calculation above) daily, and the crop or ventriculus is monitored to see when they are full. They should be empty prior to the next feed. Remember, owls do not have crops, so their bellies are palpated to see if they are full or need to cast. When full, the ventriculus is a large, firm, muscular organ that will extend past the caudal boundary of the sternum, slightly left of midline. If they need help expelling a cast, warm water can be gavage into the ventriculus at 30 ml/kg; this usually helps lubricate the GI tract, and the bird will often cast on its own shortly after. Hatchlings



will need the GI tract and fur removed from their food, as well as any very large bones (small bones are okay and necessary!).

All young birds should be weighed daily first thing in the morning to ensure continued weight gain, as well as have their body conditions evaluated. Feeding amounts and frequency can be adjusted if weight gain is insufficient. Only force-feed carefully if absolutely necessary - give them time to figure out tong feeding. **As quickly as you can, transition young raptors to self-feeding. Even very young nestlings will quickly learn to eat cut-up food from a plate.** Leave them cut-up food pieces in their cages immediately for all young birds, aside from hatchlings, so they get a chance to self-feed. This decreases stress and risk of human habituation/imprinting. Older nestlings and fledglings can eat as much as they want; they are better at self-regulating than younger nestlings and hatchlings. Continue to monitor weight, body condition, and casting.

Even prior to being flighted, branchers are moved outdoors to large mews as soon as they are active and perching, have enough feathers to thermoregulate, and have no other underlying health conditions. They are provided with plenty of staged perches and branches to practice climbing, perching, and making short flights and hops.

**As soon as birds are fully flighted, they are placed in large flight pens and provided with live prey several times each week.** Typically, groups of young birds are given 75% live prey to 25% dead. The sooner they are introduced to live prey, the better. Young birds that are not introduced to live prey until an older age (e.g., if our center is transferred a young bird raised at another facility that does not provide live prey training) sometimes take longer to start hunting live prey. Check weights and body conditions frequently to ensure that all birds are getting enough food and successfully hunting live prey. Hawks are usually fairly simple to evaluate for successful live prey training: After providing 100% live prey in the morning, simply check the birds several hours later and note which birds have blood on their feet and big crops - they are successful! Note that live prey training is not a one-and-done deal - birds become more skilled and efficient hunters with more practice, so they should be provided as much practice as is feasible. Ojai Raptor Center breeds and raises rats and mice on-site for this purpose, and patients often get live prey several times per week (sometimes daily) for many weeks.

### **Special Species Considerations**

Falcons, such as peregrine falcons, and golden eagles require time with an appropriately licensed falconer if they arrive at a rehabilitation center prior to gaining any hunting experience in the wild. There is no flight cage in the world large enough to allow us to come even close to providing these species practice with their hunting strategies. The falconer will provide the necessary training to evaluate the birds' free flight and ensure they can successfully pursue and catch prey before being released. It is a good idea to maintain good working relationships with several local falconers, and any centers rehabilitating golden eagles are encouraged to reach out to the Committee for Eagle Rehabilitation Excellences for resources.

Keep in mind that some of the young raptors you are raising may need to migrate in the fall! Become familiar with which species in your area are migratory, as the timing and location of release for these animals can be crucial for their success. Birds that miss migration may have to be held until the following year. Young Swainson's hawks, for instance, need to be released with an existing kettle during the fall migration only.

## **Pododermatitis**

Pododermatitis, or bumblefoot, is any injury, lesion, infectious, or inflammatory process on the plantar aspects of the feet. Typically, pododermatitis is referring to pressure necrosis, and the bacteria associated is most often *Staphylococcus* spp., but *E. coli* and other bacteria can be associated with pododermatitis lesions as well.

Methods to prevent pododermatitis should always be part of the treatment process, and in most cases of minor pododermatitis lesions, may be the only treatment necessary to resolve the lesions.

Appropriately sized perches should be provided for each species. If pressure lesions are concentrated centrally, the perches provided are too small; if the lesions are on the toes, the perches are too wide. Keep in mind that falcons and vultures are flat-footed, so they should be provided with flat perches.

Providing a variety of perching is essential. Variety in perch size and texture (natural, astroturf, Daisy mat, fleece, sheets, neoprene, soft rubber "tire" material, sisal or hemp rope) is important. Foam can be placed underneath any of these substrates to give the perch more padding and give. Having irregular perches is better than having perfectly smooth, uniform perches. Your goal is for the pressures on the feet to be slightly different with each step the bird takes on the perch.

Movement around the enclosure should be encouraged, so providing multiple perching options is necessary. Perches that swing gently are great, as this requires that the bird shift its weight from foot to foot, which encourages blood flow to the feet and improves balance and coordination.

Even weight-bearing is important, particularly in large birds. Even weight-bearing can be achieved for birds with leg injuries by providing strong surgical fixations for leg fractures and appropriate analgesic medications. If there are concerns for long-term uneven weight-bearing, extra care should be taken in that patient's perch design, and/or the weight-bearing foot can be provided with a padded bandage prophylactically.

For resident birds or birds in long-term care, avoiding obesity can be helpful in preventing pododermatitis lesions.

Hospitalized falcons will sometimes receive talon trims - peregrine falcons are known to sometimes grip their own feet so tightly while they are being handled that they can actually puncture the skin of their feet with their own talons.

Keep in mind that foot lesions are not always from perches! Raptors can get foot lacerations and other foot lesions from things like aviary netting or other structures on the walls, ceilings, or floors of their enclosures. Evaluate your enclosures carefully before always assuming that the problem is with the perch!

### **Captivity-related Trauma**

Carpal bumper wounds, or trauma to the leading edge of the wrist, can happen to any bird in captivity, no matter the size of their enclosure. The most common raptor species that develop lesions at this location are bald eagles and osprey, but any raptor can develop them. The lesion is most often located over the extensor process of the carpometacarpal bone. The leading edge of the wrists should always be examined carefully every time a bird is in hand to look for early lesions - they can be subtle and easy to miss. Treatment of these lesions involves typical wound care. Duoderm works very well to treat these lesions if there is no evidence of infection. Bone exposure can occur if these lesions are significant enough, and occasionally they require surgical closure.

“Carpal bumper pads” are an easy way to prevent these injuries. All osprey and bald eagles in care should get these placed automatically on intake, and typically are kept in place for the length of their rehabilitation. Our center also often places these pads on red-shouldered hawks, as this species seems prone to this injury as well. These pads are very easy to make. They involve two pieces of Tegaderm, with a pad in the middle (3M Reston foam works great, but simple gauze will do), centered over the proximal carpometacarpus. The key is to **hold the carpus in full extension during placement**. If these pads are placed with the carpus in flexion, they will soon fall off with wing motion. If correctly placed, these bandages will often stay in place for weeks, even in a large flight pen (unless it’s a great horned owl - they pull them off immediately!). Some centers that see a large number of bald eagles will use duct tape to hold these pads in place for extended periods.



*Carpal bumper pads being placed on a young bald eagle. Note that a helper is gently holding the carpus in extension during placement.*

## Tail Feather Damage

Damaged feathers are a common captivity-related problem for birds of prey and can result in the need for feather imping or even greatly extend their rehabilitation stay if a molt cycle needs to be completed. Flight feathers can be damaged by inappropriate housing; however, tail feathers are prone to breakage in any bird in a small enclosure or on perches close to the ground. All hawk, falcon, and eagle species should always receive tail guards when hospitalized. Most owls, due to their soft flight feathers, do not seem to experience as much feather damage while in rehabilitation as do the birds with stiffer feathers. The author does not routinely place tail guards on owls unless there is evidence of early feather damage and has found that some owl species (great horned owls and barred owls in particular) often bite at and/or pull off their tail guards, which can sometimes result in more tail feather damage than if there was no tail guard on at all!

Tail guards can be made from a number of materials: folders, x-ray film, autoclave pouches, the list goes on! If tape needs to be applied directly to the feathers, the author recommends using either 3M Micropore or 3M Durapore tape, as these tapes appear to be the least damaging to feathers. The tape can be wetted with alcohol to facilitate removal. If material is only used to cover one side of the tail, it should be placed on the ventral aspect of the tail. The author's preferred tail guard material, however, is box sealing tape (the paper kind), in particular Uline Economy Kraft Reinforced Tape ([https://www.uline.com/Grp\\_109/Kraft-Sealing-Tape](https://www.uline.com/Grp_109/Kraft-Sealing-Tape)). The tape is cut into appropriately sized pieces, usually just shorter than the length of the tail; you don't want the material to touch the bird's skin, as this would irritate the bird. The adhesive surface is wet with a moist sponge and then applied directly to the rectrices, both the dorsal and ventral surface. At the time of removal, warm water is poured directly into the tail guard, which will eventually slip right off without any adhesive residue. Neither baths nor large water dishes are provided for birds with tail guards in place, as this tends to result in tail guards falling off.



*Paper box sealing tape can be used to protect both the dorsal and ventral surface of the tail.*

## **A Note on Anxiolytics**

Anxiolytic drugs are becoming more commonly prescribed for wildlife patients by veterinarians. While there are little to no published reports regarding their use in most bird of prey species, the author finds them helpful to reduce stress, self-trauma, and inappetence in many bird species. Midazolam is a benzodiazepine typically available in a sterile injectable form. Doses in birds range from 0.5 to 2 mg/kg and can be administered intranasally, subcutaneously, intramuscularly, or intravenously. This drug has been reported to have an appetite stimulating effect at the lower end of the dose range in some animals.

Diazepam is another benzodiazepine and is commercially available in both injectable and oral forms. A 2 mg tablet is available from most veterinary distributors for very low cost (\$2-\$4/100-count bottle). Doses in birds range from 0.5 to 2 mg/kg and can be administered intranasally, subcutaneously, intramuscularly, intravenously, or orally (depending on the formulation). The author usually uses 2 mg/kg orally twice daily (tablets are easily hidden in food items) but has gone up to 4 mg/kg twice daily for particularly active and stressed animals without adverse effects. For both of these drugs, the dose should be titrated to effect for each patient; start low and gradually increase the dose to the desired effect.

***Note that both midazolam and diazepam are schedule IV controlled substances and can only be used under direction of a prescribing veterinarian with a DEA license in good standing.***

## **Aspergillosis**

Aspergillosis is an opportunistic fungal infection that commonly affects birds of prey. This genus of fungal organisms is ubiquitous in the environment, and spores are more prevalent when birds are housed indoors. Any bird can benefit from aspergillosis prophylaxis, but it is particularly important for any bird that is immunocompromised. Birds that are emaciated and/or suffering from other infectious diseases (such as West Nile virus) should always be placed on a prophylactic medication for fungal disease. Gyrfalcons, goshawks, golden eagles, falcons, and snowy owls are some species that should always receive prophylaxis while hospitalized. Arctic species are believed to be particularly susceptible because these fungal organisms are uncommon in their natural environment.

Prevention of aspergillosis includes keeping a well-ventilated hospital. The EPA has a helpful webpage regarding mold in homes (<https://www.epa.gov/mold/brief-guide-mold-moisture-and-your-home>). Providing adequate nutrition and treatment for concurrent infectious diseases is also important, as is minimizing stress.

All avian species are particularly susceptible to the immunosuppressive side effects of steroids (i.e., dexamethasone, prednisone, methylprednisolone), so steroids should be avoided in birds to avoid potential opportunistic fungal and/or bacterial infections.

Itraconazole (Sporanox) at 10-15 mg/kg orally once daily or Terbinafine at 22 mg/kg orally once daily can be administered as prophylactic antifungals during hospitalization while held indoors and immediately before and after transport to another facility. They are generally unnecessary if the bird is held in a well-ventilated outdoor mew or flight pen. Voriconazole is generally reserved to treat known or suspected fungal infections and is not recommended for use as a prophylactic. Keep in mind that there are documented antifungal-resistant strains of *Aspergillus*.

### **Key Takeaways**

Avoiding problems before they start can drastically shorten the rehabilitation process, but wildlife can be quite skilled at causing additional problems for themselves while in captivity. New issues and injuries can arise with birds in care, even for the most skilled rehabilitators, so don't despair if an accident happens! Critically assess the cause of the problem and learn from it so you can avoid similar situations for future patients.

Finally, it is very important to know your limits. If you do not have the proper caging, staffing, experience, equipment, etc. for a particular patient, please transfer the animal to a facility that does, **within a timely manner**. Sometimes waiting even a day can make a treatable condition no longer treatable. Even a few extra hours of inappropriate housing can drastically lengthen the recovery time, or render that patient non-releasable. Network with other facilities in your area and you are sure to find help!

### **Resources:**

Arnt, L. 2007. *Raptors in Captivity: Guidelines for Care and Management*. Hancock House Publishing: Surrey, BC, Canada.

Bechert, U., Christensen, J.M., Poppenga, R., et.al. 2010. Pharmacokinetics of terbinafine after single oral dose administration in red-tailed hawks (*Buteo jamaicensis*). *Journal of Avian Medicine and Surgery*;24(2):122-130.

Carpenter, J.W., Marion, C.J., editors. 2018. *Exotic Animal Formulary*, 5th ed. Elsevier: St. Louis, MO.

Miller, E. A., and J. Schlieps, editors. 2021. *Standards for Wildlife Rehabilitation*. National Wildlife Rehabilitators Association: Bloomington, MN.

Scott, D. E. 2016. *Raptor Medicine, Surgery, and Rehabilitation*, 2nd ed. CABI: Boston, MA.

Suarez, D.L. Appetite stimulation in raptors. In: Redig P.T., Cooper J.E., Temple D.J., et. al., eds. *Raptor Biomedicine*. University of Minnesota Press: Minneapolis, MN. 1993. 225-228.

