

Animal Rites

Some Patients are Wilder than Others

By Stanley Perkins, M.D.

Stanley Perkins, a CSA member, is an anesthesiologist at the Sharp Memorial Hospital in San Diego, where he cares for a variety of humans. When he's not putting people—or animals—to sleep, he's flying his Turbo Commander with his dog, Amy, in the co-pilot's seat.

It had all the elements of a horror flick: a gurney, two unsuspecting doctors, and a violent yet sedated patient. In dim light the gurney glides onto a freight elevator, a dull clang reverberating as the wheels bump across the threshold. Slack-faced, with gazes riveted upward, the men watch the lighted arrow make its slow arc. Suddenly, a huge hairy hand springs up, seizing one of the men by the wrist. His eyes wide with panic, the doctor struggles to free himself while the elevator lumbers on, slowly carrying the men and their charge out of sight. As every fan of horror knows, such a scene never bodes well for the doctor. This time, though, the scene was real; I was the doctor and my patient was one ornery orangutan. In the two decades I've volunteered at the San Diego Zoo and Wild Animal Park as a veterinary anesthesiologist, that tussle with Otis was the closest I've come to being the guy who, when the elevator door opens, is sprawled lifeless on the floor.

Otis was one of two male orangutans at the zoo. The other, Ken Allen, had earned acclaim as an escape artist. Whenever he grew bored, he would set about loosening the bolts of his cage. A quick slip through the door, a scamper up an incline, and a swing over a wall, and Ken Allen would be out, strolling amid a crowd of people, as if he were just another zoo patron. Each time his keepers discovered one of his escape routes, they closed it off, but he would devise a new one. He never seemed to mind being led back into his enclosure, though; he simply relished the challenge of finding new flight paths.

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Otis had none of Ken Allen's geniality. He was a bundle of hirsute hostility, and he detested veterinarians—and anyone associated with them—most of all. With the highest strength-to-weight ratio of any primate, orangutans are not to be trifled with, especially when they have Otis's disposition. Whenever I received a call from the zoo about an animal in distress, I would jump into my

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car and head right over. If that call was about Otis, though, I had to fight the urge to jump into my car and head home instead.

On the day he grabbed me, Otis was scheduled for cosmetic surgery: He needed a wart removed from his nose. But at the zoo even the simplest examinations require sedation. Jeff Zuba, the veterinary intern, tranquilized Otis with a dart so we could transport him to the veterinary hospital. I administered the anesthetic while the veterinarians removed the wart, conducted a physical exam, and untangled his long locks.

During the return trip, I administered the last of the anesthetic. Since we were only minutes from Otis's enclosure, I figured we'd be fine. Unfortunately, I had forgotten the sluggishness of the freight elevator that led down to his cage.

Jeff and I were cramped into the tiny elevator with our bodies pressed against the gurney. I was holding the oxygen mask over Otis's face when suddenly I felt his prehensile grip. Now gasping for breath myself, I peeled his leathery digits one by one from my wrist and struggled to reinstate his oxygen mask. When the elevator door finally banged open, Jeff and I sprinted, with the gurney in tow, back to Otis's cage. By the time we had settled the orangutan in his bedroom, he was fully awake and spitting mad. Jeff later confessed the escape plan he had formulated as soon as Otis grabbed my wrist: He would dive under the gurney—and leave me to my own devices.

The Wild Bunch

It was one of my human anesthesia patients who introduced me to the San Diego Zoo. During the preoperative visit, she mentioned her work as a zookeeper. I told her I had always loved animals, and she offered to take me on a behind-the-scenes tour of the Zoo. After her recovery she made good on that offer and introduced me not only to her favorite animals, but also to one of the veterinarians. When I asked how anesthetic practices differed for animals, he suggested I visit the Zoo's hospital.

On the appointed day I brought with me a "new" anesthetic we had begun using at my hospital. It was isoflurane, relatively commonly used in humans by that time, but not officially approved for veterinary use—although it was approved a few years later. The veterinarians watched as I anesthetized one of the many stray chickens that stroll the zoo grounds. The experiment was a success: The chicken quickly dozed off, and then just as quickly awakened after a predictable deep sleep. The chicken showed no sign of having been anesthetized. One of the nice things about isoflurane at that time was that it had somewhat similar physical properties to halothane, so it could be used in

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a halothane vaporizer, thus saving money, an important consideration at that time in the history of veterinary medicine.

It may be of note that smaller birds with a very high resting heart rate, such as hummingbirds, are very susceptible to fatal cardiac arrhythmias, and these were potentiated by halothane, the only inhalational anesthetic that veterinarians had at their disposal at that time.

The veterinarians had all received training in anesthesia, but they now realized how much more advanced the field had become in human medicine. They began asking me to consult on their more unusual or difficult cases, or in cases involving rare or valuable animals. Each time I would bring specialized monitoring equipment to supplement the veterinarians' basic instrumentation. The veterinarians immediately adopted the anesthetic agents and techniques I showed them, and the Zoological Society of San Diego raised money to provide them with advanced monitoring equipment. The zoo's patient mortality rate plummeted.

Since that beginning, I've treated lions, tigers, and bears, as well as elephants, rhinos, zebras, and many other exotic species. Cheetahs are among my favorites. These beautiful felines are like oversized, slightly psychotic house cats. It's as if you had a 100-pound Siamese cozying up to you, purring, licking your hand—and delivering an occasional swat.

Each species and each procedure offers its own challenges. Ungulates, for example, are exquisitely sensitive to such narcotics as morphine and fentanyl. The animals simply lose their stimulation to breathe. That vulnerability did, in fact, contribute to one loss: A giraffe's surgery proceeded smoothly, but later, when extubated, the animal stopped breathing.

Giraffes pose difficulties for other reasons. When we administer anesthesia, the giraffe's elongated neck becomes floppy, so we have to strap it to a board or risk injuring vertebrae. The giraffe's long and narrow jaw makes it impossible to intubate using a laryngoscope, so we do the intubations blind, with an ear at one end of the tube monitoring the breath sounds as we advance the tube toward the larynx.

Sleeping Giants

The most technically complex animal I've anesthetized, though, is the elephant. The sheer weight of an anesthetized elephant lying on its side can cut blood flow to the muscles, and compromise the animal's breathing, so we have to enrich the air supply with oxygen—and the surgeons have to be quick.

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But elephant breaths are like small windstorms. Having them depend on too small a ventilator tube would be like asking a human to breathe through a straw all day long.

Raised in captivity, the elephant—Jean—likely did not realize she was pregnant. Since an elephant in labor can stop her contractions at will, we assume Jean,



confused by the pains, stopped the labor and never restarted it. The fetus died in utero, and the decaying tissue was making Jean ill. We had to perform a complicated Cesarean to remove the fetus.

We do not use inhalational anesthetics on elephants. Because of the high flow rates of respiratory air movement involved, and because we basically use an open circuit, the vaporizer would be emptied in just a few minutes. Elephants are anesthetized with IV narcotics (etorphine, and later, carfentanyl). There is some respiratory depression associated with this, but because there is no way to mechanically ventilate with the volumes that would be required, it becomes a fine

balancing act to keep the animal down and comfortable, but still breathing.

To allow the elephant to breathe as naturally as possible while enriching the air with as much oxygen as we can, we constructed a rebreathing apparatus from an ordinary dryer exhaust hose, some large plastic bags, and a couple of oxygen tanks. Using this contraption, we inserted the elephant's trunk into the end of the dryer hose and performed what we believe was the first successful Cesarean section on an elephant.

Anesthetizing an elephant is definitely a team sport. There are probably 15 to 20 people directly in contact with the elephant at one time or another during each procedure, including an extremely skilled crew of handlers and keepers. They have a sling arrangement with a skyhook for lowering the elephant to the ground, and a lot of hay bales and tractor inner tubes for cushioning the

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downed animal for surgery. During the interval that the elephant was sedated but not yet unconscious, she still would respond to verbal commands of the handlers and could assist with her own positioning to some extent.

My experience in anesthetizing elephants was put to ecological use more recently when Jeff—my fellow Otis survivor and now a veterinarian at the Wild Animal Park—asked me to consult on an elephant population control project in southern Africa. Conservation efforts have been so effective in some of the region's national parks and land reserves that many have become over-



populated with elephants, threatening biodiversity, habitat, and the success of other species. One park alone has 7,000 more elephants than the land can support!

Dr. Perkins is above left

A team of veterinarians and conservationists has concluded that the most humane and effective approach for controlling the population is to reduce the birth rate by performing laparoscopic vasectomies on the older dominant males. We knew the anesthetic procedure had to be safe, reliable, and simple enough for the conservationists to do by themselves with minimal equipment. Earlier this year, Jeff and I designed a portable breathing system. The resultant apparatus—a modification of the system we used for Jean—is an enormous endotracheal tube attached to an assemblage of large tubes, one-way valves, and oxygen ports. This system has since been used on multiple elephants in the field without failure.

The Wild Zoo Yonder

As a research facility that works with so many exotic animals, the medical center at the San Diego Wild Animal Park receives requests for assistance from all over the world. One day, the call came from Anchorage: One of the elephants at the Alaska Zoo, Annabelle, needed a tooth extracted. The zoo had originally been built around Annabelle, when a local grocer won her in a national contest but had no place to house her. So when the veterinarian, veterinary dentist and I all flew north to care for her, we became instant heroes.

The most memorable of the many trips I've since made to the Alaska Zoo, though, involved another dental problem. Binky, one of two polar bears there

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at the time, needed a root canal. He had been taken to the zoo as an orphaned cub found wandering the Alaskan Arctic; and now as an adult, he was frustrated with his concrete-and-steel home. In his efforts to chew to freedom, he had broken three of his canine teeth. Binky was the first bear I had ever been asked to anesthetize, and I felt nervous. We tranquilized him, and then dragged all 850 pounds of bear from his bedroom to his exhibition area to ensure adequate workspace. I was using a lighted laryngoscope in my effort to insert a one-inch-wide endotracheal tube. But the day was bright, his trachea was deep, and his tongue was flopping all around, so I couldn't see well enough to guide the tube.

"Just reach in there," said Jim Oosterhuis, the head veterinarian from San Diego, "and feel for his larynx."

"You want me"—here I paused to stare at Jim—"to put my arm down the throat of a just slightly sedated polar bear?"

"Sure!" Jim said, "You'll have no problem at all." I had, until that moment, at least trusted Jim implicitly. Drawing on that now shaky trust, I took a deep breath and plunged a hand down Binky's throat, pressing deeper until I could feel the tip of his epiglottis. With my other arm, I guided the tube down his trachea. Just then, I noticed that polar teeth—the sharpest of all ursine teeth—were resting inches below my shoulder. If that tranquilizer suddenly wears off, I thought, they're going to start calling me Lefty.

But the maneuver worked, and Binky recovered well enough to gain international attention—even cult hero status—some years later for that very set of teeth. The catalyst was an Australian tourist who decided to scramble over two safety rails to get a good photo of him. Binky obligingly poked his head through the bars, but then wrapped his jaws around her leg. After a brief skirmish, he settled for her red-and-white sneaker. The tourist escaped with a broken leg, bite wounds, and a reputation for dimwittedness.

Animal Magnetism

When I describe my work at the San Diego Zoo and Wild Animal Park, people ask why I didn't go into veterinary medicine. I had considered doing so, but then realized I would find it emotionally draining to deal with suffering animals that couldn't understand what was happening to them. Now, by combining my vocation with my avocation, I'm able to enjoy the rewards of bringing the latest advances in human medicine to the veterinary world.

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My volunteer work with animals has given me perspective on my work with humans. Starting intravenous lines on people now seems easy after having started them on powerful and struggling gorillas. Similarly, after intubating four-ton elephants, I no longer feel as anxious when morbidly obese patients come to my operating room. I also appreciate being able to explain to my patients what I'm doing and to hear their thanks.

And, best of all, sharing elevators with human patients on gurneys has always been blessedly uneventful.

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