

The North Carolina State University College of Veterinary Medicine Turtle Rescue Team: A Model for a Successful Wild-Reptile Clinic

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ABSTRACT

The North Carolina State University College of Veterinary Medicine (NCSU-CVM) Turtle Rescue Team (TRT) is a veterinary student-run organization that treats native, sick and injured, wild chelonians. First-, second-, and third-year students are responsible for case management, consultation coordination, diagnostic testing within the hospital, and placing of recuperating animals with local wildlife rehabilitators. Several clinical research publications have resulted from the opportunity to work with these wild reptiles. Active student participants can also gain a course credit by attending eight hours of lecture/seminar related to reptile medicine. With regards to outcome assessment, 86% of survey respondents found the program to be valuable or extremely valuable to their veterinary medical education. The logistics of organizing, supporting, and running this service are discussed, and its value as a clinical learning tool is supported by the results of a survey.

INTRODUCTION

When an incoming class of veterinary students is asked what they see themselves doing in four years, many indicate they would like to treat wildlife. While not all students with a passion for wild-animal medicine end up in this field on a full-time basis, a good number are able to incorporate wildlife medicine into their companion-animal practice setting. Running a full-service wildlife clinic (amphibians, reptiles, birds, and mammals) is demanding of both time and financial resources. Injured and sick mammals present a significant zoonotic risk, especially for rabies, in some parts of the country. Birds frequently require several treatments and/or multiple feedings within a 24-hour period. Turtles are excellent patients for the following reasons: (1) They tend to be hardy and resilient, (2) they are easy to handle and work with, (3) they generally don't require a lot of hospital space, (4) they are not noisy, (5) they are portable (students can transport them easily and care for them at home when necessary), (6) most require feeding just three to four times weekly, and (7) most chemotherapeutic treatments are given no more frequently than every 24 hours.

At the North Carolina State University College of Veterinary Medicine (NCSU-CVM), approximately 40 first-, second-, and third-year students, plus about 10 staff and visiting volunteers, participate in a clinical program called the Turtle Rescue Team (TRT). Currently in its eighth full year, the TRT has treated over 1,200 turtles, belonging to nine different species (several frogs, lizards, and snakes have also been treated). Most cases present for vehicular trauma. Dogs, lawnmowers, fishing gear, and even horses have also caused injury requiring medical treatment.

The three major goals of the TRT are to (1) provide first-, second-, and third-year veterinary students an opportunity to work with and manage clinical wild-turtle cases, (2) provide competent and state-of-the-science veterinary care to sick and injured wild turtles, and (3) provide clinical case material for the generation of new knowledge in

the form of case reports and hypothesis-driven, peer-reviewed publications.

The NCSU-CVM TRT has been featured in both the *Journal of the American Veterinary Medical Association* and *Reptiles Magazine*,^{1,2} and many students know of the TRT before entering veterinary school.

FINANCIAL SUPPORT

The NCSU-CVM TRT is a volunteer organization that relies primarily on donations. The project began in 1997, when a local wildlife rehabilitator, who worked closely with the NCSU-CVM on sporadic turtle cases, moved to another state. Shortly after leaving, she made a large donation in her father's name, and the funds were used to begin stocking and outfitting a wild-turtle clinic. A core group of students and a faculty mentor began structuring the TRT and developing fund-raising ideas to sustain the program. Donations from Good Samaritans (those bringing the sick and injured turtles to the NCSU-CVM) make up the bulk of our funding. Each person who brings a turtle to the NCSU-CVM is asked to fill out a contact and history form, where they are also encouraged, but not required, to leave a donation. The Merck-Merial Summer Research Program has helped fund a full-time student director during the summer months on several occasions. Other sources of funding include donations received at the annual NCSU-CVM open house, bake sales, "mock" turtle-soup sales, T-shirt sales, generous allotments from the Student Chapter of the American Veterinary Medical Association (SCAVMA), and a collection jar that is set up at the annual North Carolina State Fair.

The average annual TRT budget is approximately \$7,000.00. These funds are used to pay for some student salary support, clinical supplies, husbandry materials including food, and clinical services (radiology, clinical pathology, microbiology, etc.) within the NCSU-CVM teaching hospital.

The TRT is housed in a laboratory area that is separate from the teaching hospital. This provides autonomy and bio-security and eliminates the need for patient-hospitalization fees.

STUDENT TRAINING

All veterinary students are eligible to participate in the TRT. Since the caseload is already in decline by the time first-year students begin the fall semester, this student group normally has minimal involvement until the spring semester. Second- and third-year students are the most involved and carry the bulk of the clinical responsibility. They also train the first-year students (and other new TRT members) in the day-to-day operation of the TRT.

Each spring there is a TRT workshop, where interested students are introduced to the project and have the opportunity to gain hands-on experience with some actual turtle patients. During this workshop, students learn how to identify the most common chelonian species, perform a physical examination, obtain diagnostic samples, administer fluids and medications, and are exposed to the basics of anesthesia and surgery. Teaching rounds are held at least once a month during the school year, where the cases in the clinic are discussed and general questions about the service are addressed. The faculty mentor is available on a daily basis (when on campus) to answer questions and consult on clinical cases.

The faculty mentor is ultimately responsible for the TRT program and is the clinician of record for communications with the veterinary teaching hospital, the Institutional Animal Care and Use Committee (IACUC), and the North Carolina Wildlife Commission. The faculty mentor spends approximately 5% of his time working with TRT-related issues (the week-to-week percent effort varies with the time of year).

Student participation varies widely. Some students, who are simply team members, may spend only one or two hours a month on the TRT. More interested or motivated team members may commit two or three times this amount of time to the program. Team captains, who carry a pager for weekly on-call duty, may spend 5 to 10 hours a week on the TRT during the busy summer months. The TRT president, who is usually paid during the summer, spends between 25 and 40 hours a week on the TRT. Finally, in recent years, a student has been designated as the rehabilitation coordinator. This person acts as a liaison between the TRT and 60 rehabilitators (many of whom have affiliations with the NCSU-CVM). During the summer, this person spends between 15 and 20 paid hours per week on the TRT.

ADMITTING A PATIENT

The group of students and veterinary school staff members is divided into four teams, each of which has one or two student captains. Teams alternate on-call weeks so that each team is responsible for turtle emergencies and hospitalized cases one week out of each month. The on-call group captain also carries the "TRT pager," which alerts her or him to an incoming case or telephone question about an existing patient. There are also an overall student director (president) and a veterinary technician who coordinates

schedules, orders supplies, and acts as a liaison between students, faculty, and rehabilitators. The experienced veterinary technician is available every day to answer student questions, and his office space is in the same room as the TRT clinic, facilitating close monitoring of the program. The technician's salary is state-supported, and during the peak case season (June–September), TRT-related work requires about 25% of his time.

Most patients are received at the main NCSU-CVM hospital admissions desk, where the person delivering the turtle is asked to fill out the proper paperwork, while the receptionist pages the on-call student. For urgent cases (since first-, second-, and third-year students are frequently attending lectures or laboratory sessions), the veterinary technician can receive the case and begin emergency treatment if necessary. Each patient is assigned a number (chronologically based on the year), which is applied to the animal's carapace (when possible and appropriate) with white surgical tape. This number also appears on the animal's medical record.

INITIAL PATIENT EVALUATION AND TREATMENT

Working with the history provided, the student identifies and weighs the turtle, then assesses the animal's condition. The majority of our patients (approximately 65%) are the victims of vehicular trauma. Many have lost a significant amount of blood, and many have open wounds that are portals for microbial infection. These patients usually receive parenteral fluids, empirical antibiotics, and an analgesic. Once the patient is stabilized, a plan is developed, which frequently involves surgical repair of the fractured shell and soft-tissue lacerations.

PATIENT CARE AND MONITORING

Most of the turtles spend between three days and three weeks in the clinic. During this time period, they are examined and evaluated at least every 24 hours. A treatment order form is used to track medications and treatments, and each animal has a medical progress sheet where the student's daily "Subjective Objective Assessment Plans" are entered. The students responsible for a particular case make decisions on the plan for treatment and rehabilitator placement, with the help of the faculty mentor and a student rehabilitation coordinator. Approximately 95% of discharged turtles spend some time with one of our 60 rehabilitators. The remaining discharged turtles are released directly to the wild; these turtles typically have very minor clinical problems. Approximately 65% of TRT turtles survive to be released.

CONSULTATIONS

Because the TRT is run by a veterinary college, students have the benefit of advice from faculty and staff specialists. They regularly consult with ophthalmologists, neurologists, surgeons, radiologists, pathologists, and pharmacologists. These specialists have been an invaluable resource and are considered part of the overall "team" that works hard to help sick and injured wild turtles, even though they don't regularly attend rounds or training sessions.

Table 1: NCSU-CVM TRT publications (student names in bold)

Scientific Abstracts

Henson H, Lewbart GA, Marcellin-Little DJ, Roe S, Stoskopf MK. A new approach to fracture fixation in chelonians. *Proceedings of the International Association for Aquatic Animal Medicine* 28:59, 1997.

Henson HL, Lewbart GA. Preliminary evaluation of ketorolac as a postoperative analgesic in injured wild turtles. *Proceedings of the International Association for Aquatic Animal Medicine* 29:11–12, 1998.

Bakal RS, Lewbart GA, Cullen JM. Penile prolapse and amputation in an eastern box turtle (*Terrapene carolina*). *Proceedings of the International Association for Aquatic Animal Medicine* 30:141–142, 1999.

Willer CJ, Lewbart GA. Retrospective analysis of eastern box turtles (*Terrapene carolina carolina*) in North Carolina with aural abscesses. *Proceedings of the International Association for Aquatic Animal Medicine* 32:15–16, 2001.

DeBolt RK, Eads C, Levine JF, Lewbart GA. North Carolina eastern box turtles with aural abscesses and upper respiratory disease. CVM Research Forum Proceedings abstract, 2003.

Peer-Reviewed Publications

Kishimori J, Lewbart GA, Marcellin-Little DJ, Roe S, Trogdon M, **Henson H**, Stoskopf MK. 2001. Chelonian shell-fracture repair techniques. *Exotic DVM Veterinary Magazine* 3.5:35–41.

Thomas HL, **Willer CJ**, Wosar MA, Spaulding KA, Lewbart GA. Egg-retention in the urinary bladder of a Florida cooter turtle, *Pseudemys floridana floridana*. *J Herpetol Med Surg* 11(4):4–6, 2002.

Willer CJ, Lewbart GA, Lemons C. Aural abscesses in wild eastern box turtles, *Terrapene Carolina carolina* from North Carolina: Aerobic bacterial isolates and distribution of lesions. *J Herpetol Med Surg* 13(2):4–9, 2003.

Souza M, Hall K, Wilson J, Lewbart GA. Surgical removal of an artificial chicken egg from the gastrointestinal tract of a black rat snake, *Elaphe obsoleta*. *J Herpetol Med Surg*, 14(4):4–5, 2004.

Case E, Lewbart GA, Doerr PD. The physiological and behavioural impacts of and preference for an enriched environment in the Eastern box turtle (*Terrapene carolina carolina*). *Appl Anim Behav Sci*, 92:353–365, 2005.

LAWS AND REGULATIONS

Before beginning medical/rehabilitation work with any wildlife, including turtles, it is necessary to be familiar with local, state, and federal laws regarding these animals. Every state has different laws and regulations when it comes to maintaining reptiles in captivity, and there is a good general reference on the subject.³ Certain species of turtles are also federally protected. Many states also require a wildlife rehabilitator’s license when wild animals are held in captivity for prolonged periods of time. The TRT has a valid rehabilitator’s license from the North Carolina Wildlife Commission. In North Carolina, anyone (including rehabilitators) can keep up to five native reptiles that are not considered endangered, threatened, or of special concern (less than 1% of our patients fit into any of the three previously mentioned categories).

CONTROLLED SUBSTANCES

Certain substances, such as ketamine and butorphanol, are controlled and need to be handled accordingly. The pharmacy staff at most veterinary colleges can be of assistance in answering questions and explaining the regulations on drug storage and record keeping. The TRT keeps a double-lock box in the clinic space for the storage of controlled substances, including euthanasia solution. Over the past couple years, ketamine has been largely replaced by non-controlled propofol for induction, and butorphanol is being replaced by the non-steroidal drugs ketoprofen and meloxicam. A detailed controlled-substance logbook is maintained and available for inspection.

SCHOLARLY WORK

While the NCSU-CVM TRT is primarily a clinical service, it has generated a number of clinical research papers and

Table 2a: Demographics of respondents to the survey of participants in the TRT program

Status	#
CVM Students	27
Internship	-
Small Animal	3
Exotic	3
Other (Aquatic, Zoo)	2
Residency	-
Exotic	1
Other (Pathology)	1
Private Practice	-
Small Animal/Exotic	2
Exotic Only	1
Industry	1
Academic	2
Wildlife Rehabilitation	2

Table 2b: Graduation year of respondents to the survey of participants in the TRT program

Graduation Year	
2001	2
2002	2
2003	3
2004	8
2005	8
2006	10
2007	4

case reports (Table 1). A retrospective study that addresses a number of clinical and case-related issues is underway and should be published in the near future.

The TRT is regulated by an IACUC protocol and all participating students are required to pass the university IACUC training-program examination. Although the turtles are not research animals, they are non-client-owned

vertebrates under the authority of the university. Any hypothesis-driven research involving TRT animals that includes procedures not deemed necessary for the clinical support of the animals requires a separate IACUC or IACUC addendum.

OUTCOME ASSESSMENT

A survey instrument was developed, drawing on the work of Gerwels, Price, and Swanson,⁴ to determine the effectiveness of the TRT with relation to clinical skills, technical skills, and overall value. Approximately 100 surveys were distributed (by e-mail or hard copy) to past and present TRT veterinary-student members (based on TRT records), and 37 TRT members completed the survey. Their demographics are tabulated in Tables 2a and 2b and their assessment of the program, both overall and as to the technical and clinical skills attained, are reported in Tables 3a, 3b, and 3c, respectively. The vast majority of students responding to the survey found the TRT to be either *extremely valuable* (75%) or *valuable* (22%) with regards to a number of different technical procedures. With regards to clinical skills, 81% found it *extremely valuable* and 16% *valuable*. In terms of overall value, 86% found it either *valuable* or *extremely valuable*, and 13% *somewhat valuable*.

Table 3a: Rating of the value of participation in the TRT

	Not Valuable	Somewhat Valuable	Valuable	Extremely Valuable
Preparation for Clinical Rotations	–	6	11	16
Career Choice	1	6	7	20
Preparation for Current Veterinary Role	–	4	9	17
Reptile Medicine	–	1	4	30
% of Responses (Value)	0.8%	12.9%	23.5%	62.9%

Table 3b: Report of routine technical procedures performed with the TRT and assessment of their respective learning values for a clinician/future clinician

	Not Valuable	Somewhat Valuable	Valuable	Extremely Valuable
Basic Husbandry	–	2	14	21
Rehabilitation	–	1	8	21
Wound Care (Flushing, Debriding)	–	–	12	25
IM Injections	–	1	10	26
SQ Injections	–	2	9	25
Intracoelomic Injections	–	–	9	28
IV Injections	1	–	3	20
Nutritional Support (Tube Feeding)	1	–	5	27
Blood Sample Collection	–	–	3	20
Radiography	–	1	2	19
Anesthesia	–	–	2	21
Other Procedures	–	–	–	4
% of Responses	0.6%	2.0%	22.4%	74.9%

Table 3c: Report of clinical skills obtained while working on the TRT and assessment of their respective learning values for a clinician/future clinician

	Not Valuable	Somewhat Valuable	Valuable	Extremely Valuable
Soft Tissue Surgery	1	-	3	18
Shell Repair	-	-	-	24
Other Surgical Procedures	1	-	2	12
Radiographic Interpretation	-	-	3	17
CBC/Chemistry Interpretation	-	1	6	7
Antimicrobial Therapy	-	1	5	20
Other Pharmacologic Therapy	-	1	5	20
Case Management	-	-	3	22
Analgesic Therapy	-	-	6	22
% of Responses (Clinical Procedures)	1.0%	1.5%	16.5%	81.0%

Based on the results of this survey, it can be concluded that the NCSU-CVM TRT is a valuable learning program that helps prepare veterinary students for future veterinary studies.

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