Teaching Surgery to the Veterinary Novice: The Ohio State University Experience

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ABSTRACT

Surgical training in veterinary medicine has evolved rapidly over the past several decades. Catalysts for change include pressure from concerned students and the public to reduce the use of live animals in teaching; less-than-effective preparation of students for live surgery experience; an overall reduction in faculty time and effort devoted to skills training; college budgetary reallocations mandating reductions in expensive group laboratory experiences; and more specialized case-load patterns in clinical rotations, which have reduced students' exposure to common surgical conditions. In response to these trends, methods for surgery educators to reduce, refine, and replace live animals in surgery training courses at veterinary schools have received broad attention. When these methods are used effectively in a curriculum, it is no longer necessary to sacrifice animals for adequate student training. This article describes a successful and ethical surgical training program used at the Ohio State University College of Veterinary Medicine (OSU-CVM). This program provides early exposure to skills training using surgical simulators and auto-tutorials, ensures that basic skills are mastered before students are exposed to cadaver practice, and requires application of model-based skills to cadavers, with final matriculation to intensive exposure to multiple live-animal procedures via a collaborative surgery program with a local shelter.

Key words: ethical; surgery; skills; training; simulators

INTRODUCTION

Surgery is a combination of science and technical skill, and few would deny that education in both areas is critical to the proper development of a novice surgeon. The pedagogical structure in the majority of veterinary schools has students devoting much of their early professional education to developing a firm foundation of anatomy, physiology, pathology, and the fundamental principles of surgery. When they approach their clinical years, faculty coach students to apply this knowledge as the basis for clinical problem solving, to form appropriate differential diagnoses, and to make proper management decisions about their surgical patients.

Although the pedagogical approach to teaching the science of surgery to veterinary students has not changed appreciably, the approach to technical skills training has evolved dramatically over the past several decades.[1] Serious questions about traditional training methods that sacrifice large numbers of animals have emerged, and alternatives have been developed to reduce, replace, and refine the use of animals in surgical instruction.

This article explains how technical skills training has evolved in medical and veterinary schools and how surgery faculty at the Ohio State University College of Veterinary Medicine (OSU-CVM) have successfully instituted several ethically acceptable alternatives in our model training program. We realize that OSU-CVM is not the only school active in the alternatives movement; many other schools have similar initiatives. The author hopes, by presenting information about our ethically responsible program, to represent innovative surgical skills training programs available at many veterinary schools and to encourage other schools with more traditional programs to consider this opportunity for change.

ADVANTAGES OF THE VETERINARY MEDICAL PROFESSION

Like other entry-level health professionals, veterinary graduates have a wide range of career opportunities. Our profession has a direct and positive impact on animal health and welfare, and this is very important, since we cannot depend on other arms of the health professions for this task. While the work of many human health professionals directly influences their patients, they exercise their skills in an ever-specializing world that often limits their care to specific disciplines or tasks. Many, if not most, students enter our profession because they know they will be trained to offer comprehensive medical and surgical care in practice. Essentially, they know that veterinary graduates "can do it all." Providing adequate training for our students is a daunting task for educators, especially today, with the rapid growth of information to integrate during the short four-year education of a veterinary student. An alarming trend in veterinary education today is the erosion of time and effort devoted to training our students in techniques and skills, in an attempt to free more time for this ever-expanding information base. If we continue to limit the scope of training for our students, we lose the wonderful advantages our profession provides. How will veterinary medicine continue to attract the best students if this trend continues?

PUBLIC EXPECTATIONS OF ENTRY-LEVEL VETERINARIANS AND HUMAN DOCTORS

Most medical students are, to varying degrees, exposed to basic surgical techniques and skills. Graduating human doctors, however, do not expect to be able to do anything more complicated than giving injections and suturing a skin wound, because they have ample avenues for further training in well-established post-graduate programs. If they choose to enter the surgical discipline, they can continue their education through abundant post-graduate internship and residency opportunities. Specialization is offered in only a very limited manner in veterinary medicine. The public and veterinary employers still expect our graduates to be competent in surgery, but there are few avenues for our students to obtain more training after graduation. Therefore, veterinary schools must continue to look at options within our core surgery curricula to adequately train our students as competent entry-level veterinary surgeons.

EVOLUTION OF SURGERY TRAINING

The Apprentice Method

In the early twentieth century, experienced surgeons taught their trade by mentoring apprentice surgeons one on one.[2] Novices were expected to observe what was done, then do the procedure while supervised, and quickly become mentors to train other surgeons. The types of procedures taught were restricted to the cases seen by the mentoring surgeons. Faculty devoted most of their academic life to ensuring that their students were adequately educated and skilled. Training was inefficient, since one surgeon could effectively train only a few students at a time, and only one individual at a time was able to actually perform their technique under supervision. In many cases, complications were encountered, but they were considered part of the training process. This apprentice technique is a tried-and-true training method, and it is essentially the way we still train our select group of veterinary surgery residents for specialization today.

The Group Training Method

The effective but inefficient one-on-one apprentice method of training could not keep up with the demand for qualified surgeons.[3] The number and complexity of the procedures increased as anesthesia and infection issues were understood and resolved. A different, more efficient, training method was necessary to offer enough hands-on experience for students to develop adequate skill levels. Surgeons began to train groups of students extensively using animal laboratories. Only a few surgeons supervised these live-animal training laboratories, and, unfortunately, poorly prepared students learned many of their skills by trial and error. Novice students, still working to perfect proper instrument handling, frequently wasted the benefits of the live experience.[3] While the complications that arose were still considered part of the learning process, the brunt of suffering shifted from the patient to the laboratory animal. Unlike the ''apprentice method,'' which was limited by the type of case load, the group learning method was thought to be better, since it provided a variety of surgical experiences. However, because the procedures were often performed only once and were shared between students in the group, students did not readily develop either confidence or a sense of continuity in the whole surgical experience.

Training by the Procedure-Oriented Method

Most of these live-animal experiences were taught using a *procedure-oriented* approach. It was the prevailing sentiment among academic surgeons that students would learn their basic skills (largely by trial and error) while they performed common surgical procedures: both the procedure and the skills required for surgery could be taught at the same time.

Because some students lacked appropriate basic surgical skills and supervision was limited, mistakes were made, animals suffered during survival laboratories, and, under these circumstances, the end result was a negative learning experience. Contrary to popular belief, allowing students the opportunity to share a wide variety of surgical procedures in the laboratory did not strengthen their confidence in surgery. On the contrary, this approach fostered students' opinion that if they did not actually perform the procedure under supervision, it was unlikely they could repeat the procedure competently on their own. Thus, the procedure-oriented method often failed to prepare students adequately for entry-level surgery practice.[3]

The Skills-Oriented Method and Current Surgery Teaching Trends

Because of the inadequacy of the procedure-oriented method, academic veterinary educators began searching for new ways to teach surgery skills. Drs. Roger Fingland,[4] Ann Johnson,[5] and others[6] were discouraged by the results of the traditional procedure-oriented method. Could we instead focus on teaching the basic surgical skills necessary to perform *any* surgery and practice these skills repeatedly, using a common procedure performed every day in practice? Ovariohysterectomy, probably the procedure performed most often by small-animal practitioners, was felt to be an excellent exercise for students to hone their basic surgery skills.[4] This *skills-oriented* method focuses on fundamental skills—such as gentle tissue handling, instrument and suture handling, hemostasis and ligation, and tissue retraction—rather than on the procedure itself. Ovariohysterectomy is particularly suitable for this purpose because live animals can be sterilized and adopted without sacrifice and because each student can perform the procedure several times, thus improving their overall confidence and their sense of continuity in the operating room.

Subjective outcomes assessment of students taught using a skills-oriented approach was encouraging. Students seemed better able to perform ovariohysterectomies because they were equipped with good fundamental skills. Even more surprisingly, many showed that they could handle a variety of procedures, even those they had never been exposed to during their training laboratories.[4] But students still needed some way to learn the fundamental surgical skills *before* they practiced on live animals slated for adoption.[6]

This skills-oriented approach made sense, and training could be provided that was ethical and less expensive. The use of basic skills simulators began to be explored by Drs. Johnson,[7] Smeak,[6,8] Greenfield,[9] DeYoung,[10] Holmberg,[11] and Griffon.[12] In some cases, these practice models were shown to be as effective as live-animal or cadaver practice in

teaching basic skills, if not more. When they understood the purpose of the not-so-lifelike models, and that the models were tools to train them better for the live experience rather than a substitute for live training, students accepted the use of simulators.

By virtue of their transportability, especially when coupled with video auto-tutorials, models also offered students the option to learn basic techniques on their own time, with less faculty supervision. Students could perform each technique as many times as necessary to reach an acceptable level based on their prior experience and level of coordination.[6] In addition, models allowed students to focus on the skill rather than dealing with the anxiety of possibly harming an animal during their practice. Instructors could now assess students' skill level more objectively, since each surgical skill could be isolated and demonstrated on identical models.[3] Although these surgeon pioneers were encouraged by their results, live-animal experience was still ultimately necessary to promote synthesis of skills and associated surgical confidence.

TEACHING NOVICE SURGEONS AT OSU

What are our goals for teaching novice surgeons at OSU-CVM, and how have we adopted this skills-oriented approach into our surgery curriculum? Surgery faculty developed several goals for our training program (listed in Table 1) to help guide curriculum planning.

Our graduating veterinary students are expected to be competent in the basic surgical skills listed in Table 2. The only surgical procedures students must be able to complete competently are dog castration and ovariohysterectomy; students must demonstrate that they possess acceptable basic skills, including appropriate ligation technique and wound closure, when performing these procedures solo. These skills must be performed appropriately to complete the Introduction to Surgery and Operative Practice courses. Students are ultimately evaluated for surgical competence during the core shelter rotation in their fourth year (see Table 3). The faculty supervisor works one on one with students during this rotation. Students must demonstrate competence or repeat the rotation until they can.

Provide Early Exposure to Skills Training

Why do most veterinary schools wait until after the first year to begin teaching basic surgery principles and skills to students? Most first-year anatomy courses provide some form of cadaver-dissection laboratories to help students understand the spatial relationships of important structures discussed in lectures; these laboratories could provide an excellent opportunity for students to practice basic instrument handling and surgical dissection. Students at this stage in their veterinary training are eager for the opportunity to develop "real-life" veterinary skills. Rather than allowing students to muddle their way through these laboratories using improper technique and crude instruments, educators could also use them to focus on developing basic surgical skills. To accomplish our goal of introducing skills training in the early part of the curriculum, OSU faculty surgeons have just begun demonstrating basic instrument handling, instrument use and identification, and basic dissection skills in early anatomy cadaver-dissection laboratories. Currently, we are planning to create an auto-tutorial DVD that will help introduce these skills and principles to first-year students. Students can then practice appropriate skills right from the beginning of their education, rather than learning inappropriate techniques that will be more difficult to modify in their introductory surgery courses.

If we can begin our skills training early, students should be more prepared for their basic skills laboratories in their second year. Perhaps more advanced skills could then be developed earlier. In the future, first-year surgery residents may help provide ongoing assistance in these anatomy laboratories, which should improve their anatomy knowledge while providing vital student supervision.

Ensure That Basic Skills Are Mastered before Any Animal Exposure in Surgery Courses

During our second-year Introduction to Surgery course, students learn a variety of basic skills before they receive any animal practice exposure (see Table 3). These skills are self-taught, largely via auto-tutorials and models. Hand-tie simulators supplied by suture manufacturers are used, along with auto-tutorial presentations, to teach suture handling and knotting. Suture and instrument handling and instrument knot tying are practiced using the Skin and

Table 1: Goals of the OSU training program

- Provide early exposure to basic skills training
- Ensure that basic skills are mastered before any animal exposure
- Apply the basic skills garnered from models to the practice of surgery on cadavers
- Expand hands-on clinical experience
- Increase exposure to common surgical diseases and procedures while maintaining our specialized caseload
- Provide the most ethical training possible without sacrificing animals for student teaching

Table 2: Entry-level basic skills/procedure competence for graduating OSU students

- Proper preparation of the surgeon and patient for aseptic surgery
- Aseptic surgical principles, techniques
- Hemostasis and ligation techniques
- Proper skin incision using scalpel blade
- Blunt and sharp dissection technique
- Ventral midline approach in male and female dogs
- Proper retraction and organ-isolation techniques
- Abdominal exploration
- Basic wound-closure and reconstruction techniques
- Ovariohysterectomy and castration in dogs and cats
- Dental cleaning and tooth extraction

Table 3: Chronological outline of the OSU Surgical Training Program for Professional Students

First Year

Anatomy Laboratories

- Basic instrument handling, dissection methods (cadavers)

Second Year

Introduction to Surgery Core Course

- Surgeon and patient skin preparation
- Gowning
- Aseptic technique
- Open and closed gloving techniques
- Instrument and hand knot tying (commercial knot-tying boards)
- Basic suturing technique (Skin and Suture Pattern Simulator)
- Beginning and ending a continuous line (Skin and Suture Pattern Simulator)
- Suture patterns (Skin and Suture Pattern Simulator)
- Wound closure techniques—subcutaneous and skin closure methods (cadavers)

Third Year

Operative Practice Core Course

- Re-examination of basic skills from second year course (models, boards)
- Ligation technique (Hemostasis Simulator)
- Wound closure techniques—intradermal closure technique (cadavers)
- Abdominal exploration and closure techniques (male and female cadavers)
- Ovariohysterectomy and castration techniques (male and female cadavers)
- Internal fixation techniques (plastic bones, cadavers)
- Tibial fracture repair (cadavers)
- Lateral stabilization of cranial cruciate ligament rupture (cadavers)
- Femoral head and neck excision (cadavers)
- Microsurgical techniques: lid repair, conjunctival flaps (cadavers)
- Dental techniques: inspection, cleaning, extraction, mucosal flaps (cadavers)
- Ovariohysterectomy, castration (live animals from local humane organizations)
- Umbilical and inguinal hernia repair (live pigs)

Elective General Surgical Training Course

- Hollow organ repair (cadavers, Hollow Organ Simulator)
- Cystotomy, bladder closure, scrotal urethrostomy (cadavers)
- Intestinal anastomosis, enterotomy, biopsy (cadavers)
- Pinna and ear surgery (cadavers)
- Mandibular and sublingual salivary gland removal (cadavers)
- Forelimb amputation (cadavers)
- Splenectomy (cadavers)
- Gastrotomy (cadavers)
- Gastropexy (cadavers)
- Skin-reconstruction techniques (cadavers)

Fourth Year

Senior Clinical Rotation

- General surgery core rotation (2 weeks)
- Orthopedic/neurological surgery core rotation (2 weeks)
- Elective surgery rotation (2 weeks)

Shelter Medicine and Surgery Training Core Rotation (2 weeks)

Suture Pattern Simulator[a] (see Figure 1). This model is housed in a plastic shell for protection and has a laminated urethane polymer ''dermis,'' or top layer, and a closed-cell foam ''subcutaneous'' layer. The surface layer ''sutures'' similar to skin and other soft tissue, and the results of the suture pattern (e.g., inversion, eversion, apposition) are well demonstrated on the surface layer. Students practice instrument and suture handling skills while completing a total of eight suture-pattern take-home assignments. Two different suture patterns are performed each week on the skin model, and technicians evaluate these suture pattern lines before students begin their next assignment. We have two well-trained, dedicated surgical technicians who instruct and assess basic surgical skills on models used in this course. These individuals help reduce faculty teaching commitment during the early skills training of our students. Later, in the third-year curriculum, students use this simulator to practice intradermal suture patterns and learn how to bury the final knot. It is not unusual to see students practicing their patterns and instrument handling on these simulators again before their fourth-year clinical rotation in surgery.

Limited open-door laboratory times are available for students in the second-year introductory course for any necessary remediation or skill review. Trained veterinary technicians supervise the open laboratories; faculty and resident contact time is kept to a minimum at this stage of student training. Open laboratories allow tailoring of instruction for students who require remediation or extra help. Most students perform a mock practical before the final practical examination to identify weak areas for improvement. Before being allowed to participate in a cadaver wound-closure laboratory, each student must successfully complete a 20-minute practical examination conducted by veterinary-technician supervisors. All students repeat this practical examination to ensure the skill is mastered before starting their third-year operative practice course. Instrument handling, suture patterns, and instrument knot-tying skills originally learned on skin models are

Figure 1: Skin and Suture Pattern Simulator. Left: Student practicing buried intradermal suturing on a laboratory simulator; portable simulator shown closed (above right) and open, exposing practice surface below.

then applied to wound-closure practice on cadavers. This cadaver laboratory is designed to teach subcutaneous tissue and skin closure and techniques for relieving wound tension.

At the beginning of the third year, during our main operative practice course (led by Dr. Mary McLoughlin), students are given another practical examination, as in their introductory course, and they learn a new skill: proper ligature placement. Students first watch an auto-tutorial that covers the steps taken by the surgeon and assistant to perform a vessel ligation, then practice these skills on an inexpensive model (see Figure 2). The hemostasis simulators shown in Figure 2 can be made easily by purchasing 2.5-cm-thick upholstery foam[b]; and cutting a V-shaped 2-cm channel in the middle; feeding fine 3-mm-wide red ribbon through the foam using long needles; and cutting the ribbon close to the surface of the channel to mimic an exposed blood vessel. Students are asked to clamp the ribbon ''vessel'' with fine hemostats without damaging peripheral tissue (foam), then effectively ligate the ribbon with silk. The model exposes poor technique (pulling too hard on the slick suture during knotting, for example, pulls the ribbon out of the foam, and poor knot-tying technique results in ligature avulsion).

With the same goal in mind, we continue to introduce more complex skills using cadavers before the third-year students begin their live-animal experience. These skills include blunt and sharp dissection techniques, identification of fascial planes during bone approaches, methods of visceral retraction and isolation, abdominal exploratory technique, and approaches to the abdomen in the male and female dog. One faculty member and two surgery residents supervise these cadaver exercises and evaluate students' performance.

In addition to the core operative practice course, to expand hands-on experience, we offer a variety of elective courses to third-year students in soft-tissue and, as of recently, orthopedic procedures; these elective-surgery laboratories have been expanded and are now offered to our interns. These limited-enrollment courses offer students the opportunity to perform a variety of techniques on cadavers, including, for example, limb amputation, intestinal anastomosis, gastrotomy, gastropexy, splenectomy, ear-canal ablation, and urethrostomy. The types of surgical procedures offered in this elective rotation depend on the interests of the students and instructor.

In an elective-surgery class, hollow organ closure is taught to selected students using an auto-tutorial and a hollow-organ model resembling a canine stomach[c] (see Figure 3). Students learn how to close a stomach incision using a leakproof two-layer closure. This hollow organ model is a laminated urethane polymer mold housed in a plastic hinged box. Like the skin simulator and the hemostasis

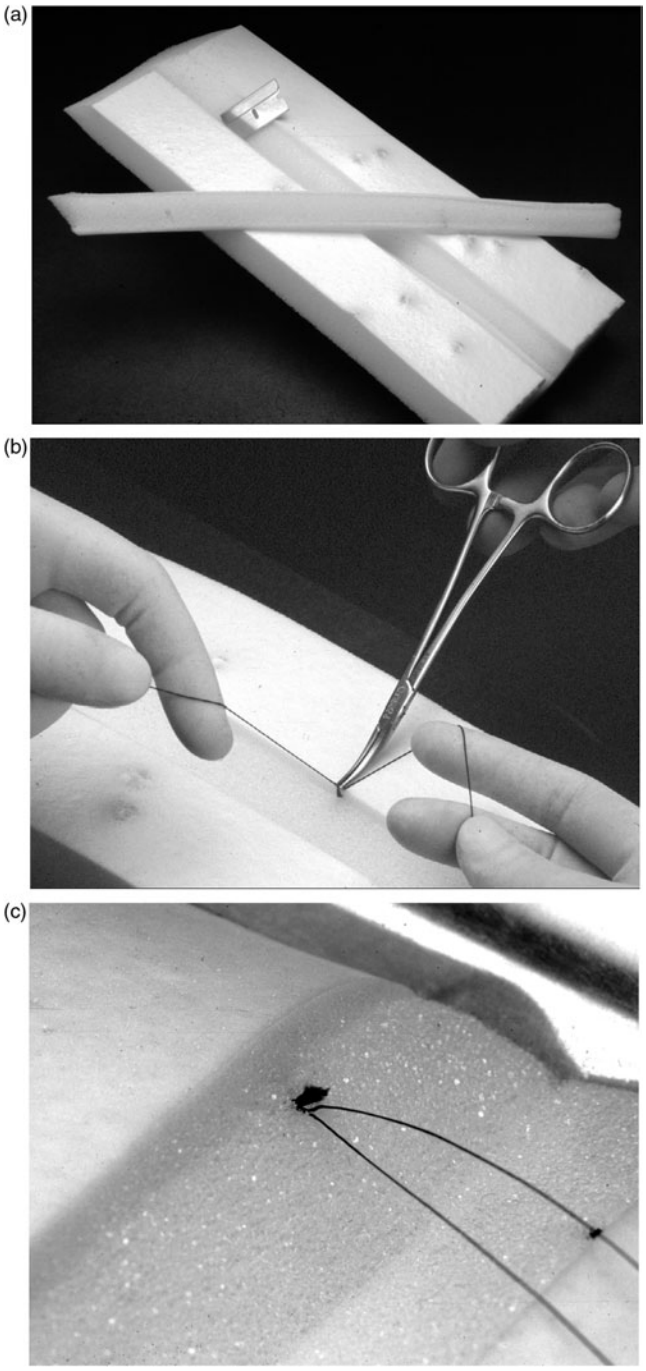

Figure 2: Hemostasis simulator. Left, polyurethane foam pad with blade-cut channel mimicking an open wound; middle, ligature around clamped exposed ribbon end; right, ligated ribbon end with knot ears pulled to the right.

simulator, these models can be used repeatedly, since the polymer is self-healing to some degree. Various incisions can be made and closed with different patterns (e.g., in Figure 3, right, a Cushings line is used to close a gastrotomy in the body of the stomach; the upper image shows a simple interrupted closure of an outflow approach).

Apply the Basic Skills Formed from Models to the Practice of Surgery on Cadavers

After third-year students have demonstrated an appropriate level of basic skill, they begin a series of practice exercises with dog cadavers in their main operative practice course (Table 3). They begin by opening and closing the abdominal wall on male and female cadavers and continue with wound closure and reconstruction techniques, dental procedures, microsurgery techniques, and approaches and basic orthopedic fixation skills. Students are supervised and evaluated by a faculty member and two surgery residents. Any student who does not exhibit an appropriate skill level is mentored individually and assigned as assistant first in the early live-animal surgery laboratories. Students move through the various stages of skill competence at the same rate, but more individual attention is given to students who do not ''catch on'' as quickly as others. We often find that these students are encouraged and taught by their ''tablemates'' during the late cadaver laboratories and early live-animal surgeries.

Once these preliminary cadaver skills labs are completed, students learn the principles of general anesthesia and perform, in pairs, a total of three spays and castrations on live dogs. In general, depending on the number of male or female dogs available for a laboratory session, each student is randomly assigned as primary surgeon for at least one of his or her three live-animal experiences. Most students participate in an ovariohysterectomy and a castration. The primary surgeon usually shares part of the surgical experience with the assistant. The transition from cadaver to live animal causes anxiety for some students, but most are ready for the challenge, since they are confident that their basic skills are at an appropriate level. These animals are recovered from surgery and sent back to their humane organization for adoption. Students are allowed to repair inguinal and umbilical hernias on affected pigs at the end of the operative practice course. Regional farms are the source for the pig laboratory; pigs are shipped back to the originating farms when recovered.

OSU surgeons are committed to providing excellent ethical preparation for our surgery students. All cadavers used in our laboratories come from sick, injured, or otherwise unadoptable dogs from the Franklin County Department of Animal Control, and a limited number are bodies donated for this purpose. The director of the shelter determines whether a dangerous behavioral or health issue warrants euthanasia of a homeless dog. All live experiences are conducted on animals that require surgery.

Students gain additional practice in surgical skills and assistant skills during their fourth-year clinical rotations. In groups of three or four, students rotate through two separate two-week clinical rotations: orthopedic and neurological surgery and soft-tissue surgery. Students perform most of the basic elective surgical procedures carried out in these clinical rotations under the supervision of residents and faculty members. To increase exposure to common surgical conditions, select patients from local humane organizations are referred to OSU-CVM for treatment through the Second Chance Program. Depending on the complexity of the treatment, students, interns, and residents assigned in core surgery rotations assume primary management of these patients, under direct supervision from faculty at the

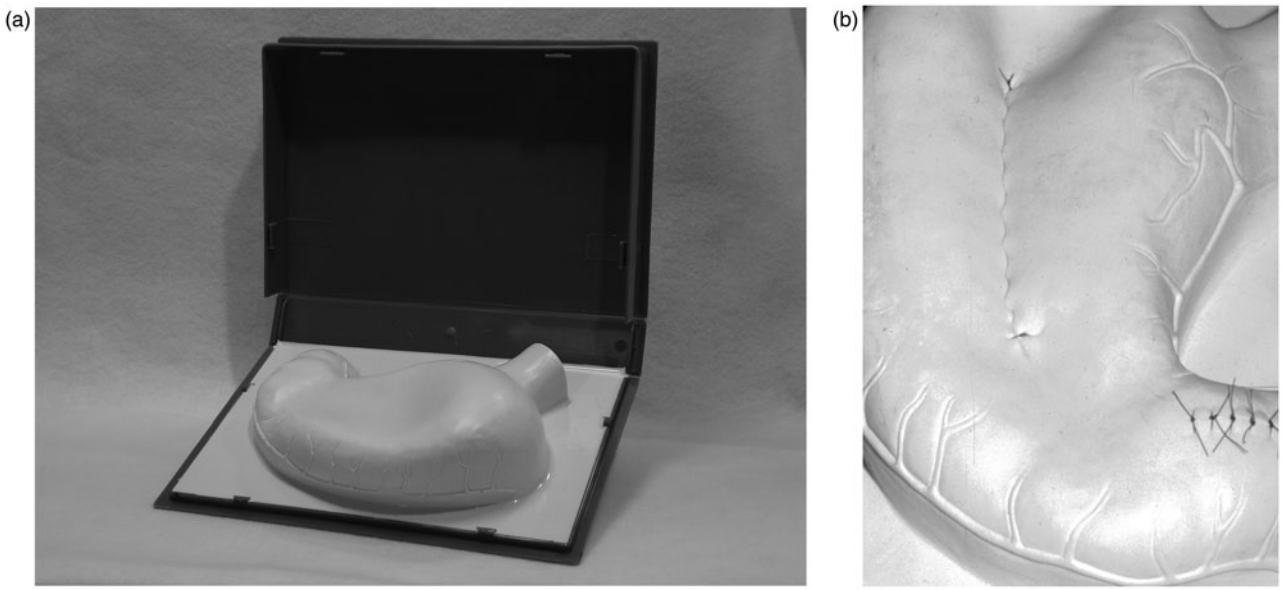

Figure 3: The Hollow Organ Simulator. Left, open simulator case showing working surface of the stomach cast; an incision (simulated gastrotomy) has been made in the body of the stomach cast. Right, suture closure of stomach-cast incisions.

veterinary teaching hospital. A fund has been established that helps cover the expenses of this program.

Increase Exposure to Common Surgical Diseases and Procedures While Maintaining Our Specialized Case Load

During their fourth year, in addition to their four-week surgery rotation, students rotate through a two-week collaborative outreach program, the OSU Shelter Medicine and Surgery program, led by Dr. Larry Hill. This is a designated core course to which all fourth-year students are assigned. Groups of five to six students enter the rotation; half are initially assigned to the surgery area while the rest work in the medicine receiving area. They switch areas during their second shelter week. Two OSU Shelter veterinarians, Dr. Hill and Dr. Jane Flores, supervise the two areas. During their surgery week, students perform and assist in numerous common surgical procedures, such as skin-mass excision, cherry-eye correction, and stifle stabilization. In addition, each student performs solo between 10 and 15 sterilization procedures. On the medical side, students examine an average of 85 patients per week, draw blood, implant identification microchips, and perform necessary laboratory tests.

OSU-CVM's methods of surgery training are not unique, and several other veterinary colleges offer similar opportunities. These innovative and ethical approaches to surgery training provide for phased development of the novice surgeon and increase hands-on learning without excessive expense or on-site faculty commitment. While OSU-CVM has a long way to go to fully accomplish our goals, we hope this model reveals ways that surgical training can be efficient, effective, and ethically responsible.

We are currently conducting an outcomes assessment of our surgical training program to determine whether we are meeting the goals listed in Table 1. The assessment instrument has been given to students and their employers and to faculty instructors over the past three years. Our current program has eliminated the use of survival and terminal surgical exercises on purpose-bred animals. Trained technician instructors have reduced faculty time commitment in traditional basic skills laboratories, but this model program has not dramatically reduced faculty time devoted to instruction in operative practice exercises. It remains to be determined whether our students and their employers feel they are more confident and better prepared for practice, as well as whether this program is more cost effective than our previous surgical instruction practices.

FUTURE CONSIDERATIONS

With the cooperation of Dr. Lara Rasmussen and Dr. Ben Kitchen, we hope to develop a more complete list of surgical skills and models for student self-directed study. We are currently working on auto-tutorial/model teaching sets covering intestinal anastomosis and suspensory ligament rupture techniques. These skills modules will be made available to other schools as they are completed.

In addition, we hope to expand our shelter experience to include third-year students. After fourth-year students complete their shelter surgery rotation, they could be called on to help the shelter instructor teach and demonstrate basic skills and sterilization procedures to third-year students (in lieu of the current live-animal surgical experience in operative practice). This change could free up valuable laboratory time for more cadaver practice in our core curriculum, now offered only to a select group of elective students. We would like to provide more exposure to cat surgery at our local humane society, and conduct other common surgical procedures, if funding for our Second Chance Program grows. Because of the popularity of the shelter surgery experience, opportunities for an

additional week of this live-animal surgical experience are also being considered.

WHAT DO WE NEED TO DO COLLECTIVELY TO ENCOURAGE FURTHER GROWTH OF ALTERNATIVES IN SURGERY TRAINING?

- Veterinary schools need to work together to develop meaningful and worthy alternatives. Many institutions are active in alternative training methods, but there is no coordinated plan to reduce redundancy and disseminate proven ideas and teaching approaches.
- Surgeons must begin to collaborate and share their successful teaching methods; they must develop a consensus on what skills and procedures are essential for entry-level veterinarians.
- Methods need to be developed for objective and accurate evaluation of students' competence in performing these targeted skills.
- Alternatives that are developed and proven to be good teaching tools must be made readily available among institutions.
- Surgery educators need carefully constructed outcomes assessment instruments to help guide our teaching efforts and determine whether these efforts are making a difference to our graduates and their employers.

NOTES

a Skin and Suture Pattern Simulator, Surgical Simulators, Chicago, IL <www.surgicalsimulators.com>.

b Polyurethane foam, Special Design Products, Columbus, OH 43228.

c Hollow Organ Simulator, Surgical Simulators, Chicago, IL <www.surgicalsimulators.com>.

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