



## Usage of a Non-animal Surrogate model in Veterinary Surgical Education and Training

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**DOI:** 10.31080/ASVS.2022.04.0474

**Received:** July 07, 2022

**Published:** July 25, 2022

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### Abstract

Presently offering veterinary surgical and clinical skill training is becoming increasingly challenging for veterinary institutions and profession as a whole. The increasing pressure from public and welfare domain to reduce live animal usage for teaching purposes has further complicated the process. Hence, it is imperative to explore various non-animal alternatives to employ in veterinary education and training. Although numerous models are available there has been dearth for indigenous low-cost non-animal models. Therefore, a non-animal surrogate was developed with locally available materials and evaluated for its efficiency as an educational aid. The results showed that it improved the student's surgical skills and confidence level. The surgical skill gained using surrogates was adaptable to live animal surgery. It reduced student's apprehension when doing surgery for the first time and decreased the use of cadaver or live animal. It is economical and simple to make and costs approximately one tenth the purchase price of an animal from facility. In conclusion this non-animal surrogate is an effective and less stressful aid for teaching basic surgical techniques to novice surgeons and concurrently favouring animal welfare.

**Keywords:** Non-Animal Surgical Alternatives; Veterinary Surgical Education and Training; Animal Welfare

### Introduction

Veterinary Surgical education and training has evolved rapidly over the past several decades [1]. Due to the growing concern from public and welfare domain to reduce live animal usage for teaching purposes has made animal purchase quite expensive and tedious [2]. Further high student to staff ratio; overall reduction in faculty time and effort devoted to skills training, reduction in colleges budget has minimized the student's exposure to expensive laboratory practices [3]. In response to these trends, refining, surgery training courses at veterinary schools have received broad attention [4]. At present, in most veterinary institutions, surgical training and clinical skills development in veterinary profession is performed on live animals or cadaver.

Currently, educational institutes are using either cadavers; or client-owned animals which are presented for recovery surgery. Cadavers are often used successfully as an alternative to live animal for surgical training [5]. However, reliable supply of fresh cadavers is not always readily available making it necessary to often store them in freezers for varying periods of time making it expensive. Moreover, the thawed tissues are quite abnormal and also aesthetically unpleasant. Apart from it, the integration of students into clinical surgery on client-owned animals brought to teaching hospital may be an ideal method of instruction but it requires considerably higher number of clinical cases, more student contact time and larger faculty numbers than are available at most institutions and at times may turn out to be inappropriate for training the novice surgeons [6].

Therefore, a non-live animal teaching model is the best option and it becomes imperative to explore non-animal alternatives for veterinary surgical education and training. When this method is used effectively in a curriculum, it is no longer necessary to sacrifice animals for adequate student training. There are number of alternative models available in the market ranging from simple physical models to sophisticated computer-enhanced simulators, but most of them are costly to be used abundantly. A number of surgical models have been developed specifically for veterinary training. These include the Dog Abdominal Surrogate for Instructional Exercises (DASIE), meant for practicing handling surgical instruments, suturing and placing ligatures [7]. A hollow organ simulator made from laminated polyurethane is used for performing gastrotomies and hollow organ closure, [8]. Other surgery simulators include one developed for canine ovariohysterectomy [9] and another for practising various surgical procedures on the spleen, liver and kidney [10]. There are also canine plastic bones, which have been used for teaching orthopaedic surgery for many years [11]. Hence an effort was made to devise a low-cost indigenous Non- Animal Surrogate - prototype for teaching basic surgical skills to novice students and to evaluate its suitability and acceptance for teaching.

### Materials and Methods

The prototype model was developed out of locally available materials like laminated foam rubber, rexin, suade and velcron. A three-layered cylindrical structures of 12 cm length and 4cm diameter was designed out of laminated foam rubber, rexin and suade materials in such a way as to facilitate incision, handling and suturing individual layers similar to body tissues (Figure 1). The foamy tube structure was used to mimic abdominal visceral organs and the fluid filled thin tubes were inserted in between the layers to mimic blood vessels in order to facilitate the practice of ligature to stop bleeding. The total cost involved to make per unit was estimated to be Rs. 35.

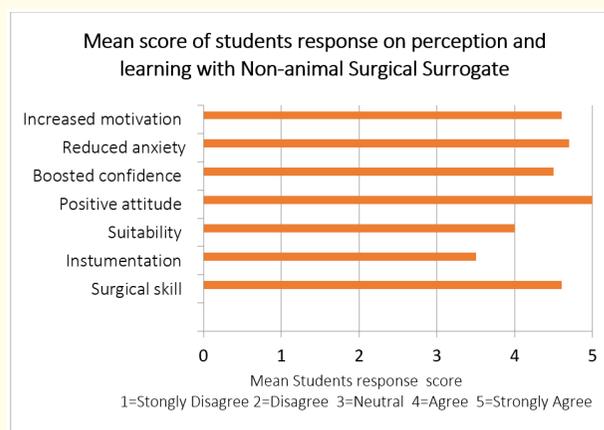


**Figure 1:** Non animal surrogate model and its utility in veterinary surgical practice.

The Non animal surrogate model thus developed were distributed to 120 beginners' level veterinary surgery students. Under the supervision of 20 surgical instructors, students were given training on basic surgical practices like asepsis and antisepsis, suture material selection, surgical instrumentation, suture patterns and hemostasis. In addition, subsequent to post surrogate training exposure, the students were subsequently made to perform surgical procedures on live animals and were observed by the instructor during the surgery. The perception, attitude, acceptance, confidence level, motor and cognitive skills in using this model for surgical practices were evaluated via questionnaires survey scored on a 5-point scale with scores ranging from 1 (lowest/poor learning experience) to 5 (highest/best learning experience). The descriptive statistics was made using Microsoft EXCEL software.

### Results and Discussion

The results showed that the non-animal surgical surrogate model served as an analogous surrogate for translating surgical skill from laboratory to live animal. The analysis of the results of the survey on students' perception and learning on use of non-animal surgical surrogate models are summarized in figure 2.



**Figure 2:** Students' response on use of non-animal surrogate models.

The results indicate that all the students (100 per cent) showed positive response towards the practice of basic surgical techniques on the non-animal surgical surrogate model. It was also noted that the students exposed initially to non-animal surgical surrogate training showed better psychomotor and basic surgical skills during actual surgery. More than 90 per cent students perceived that

it increased the confidence level during surgical procedure due to freedom from worry of consequences of surgical errors and improved their surgical skills. The students had the opportunity to do the practice at will as it was economical. The skills that could be learnt through the non-animal surgical surrogate are draping and aseptic techniques, use of surgical instruments, incision, tissue handling, skin suture, muscle suture, hollow organ suture and blood vessel ligation. However, this model may not be suitable to practice advanced surgical techniques or other procedures like anesthesia, fluid therapy, patient monitoring and post operative care. This surrogate as a teaching aid shows a relative advantage to live animal or cadaver practice by being economical, humane, reusable, readily available, aesthetical and improves the motor and cognitive skill of the trainee. The comparative advantage of non-animal surrogate model over other teaching aids is summarized in table 1 given below.

Teaching model	Non animal surrogate	Cadaver	Live animal
Advantages			
Motor skill	++	++	++
Cognitive skill	++	++	++
Price	++	+	+
Humane	+	-	-
Availability	++	-	-
Reusability	++	-	-
Aesthetic	+	-	-

**Table 1:** Comparative advantage of Non animal surrogate models to other teaching aids (What is the number of this table?).

++ (very good); + (good); - (poor).

Though there are increasing difficulties associated with providing adequate opportunities for veterinary students to learn clinical skills, the veterinary profession is now developing their own skills laboratories and are adapting simulators as well as designing an increasing number of veterinary specific models. The high-quality care and safety of surgical patients can be offered only through better technical skills and attitude of the professionals. The early exposure of novice surgeons to skills training using surgical simulators or surrogate models ensures that basic skills were mastered before students were exposed to live animal and cadaver practice.

Practicing surgical skills on an inanimate model, rather than a live animal, helped reduce student apprehension by minimizing the consequences of faulty technique. Students can practice a skill repeatedly until mastered as well as use simulators strategically to address skill deficiencies or complement clinical cases. These alternative ways fulfill the aims and deliver a good scientific education that provides the student with the skills, knowledge, and understanding required for the veterinary profession but it is equally important to understand the differences between the simulator and a real live animal and strengthen these approaches.

## Conclusion

Therefore, it can be concluded that the skill gained with the non-animal surrogate model was adaptable to live animal surgery. This surrogate model was an effective and less stressful method of preparing students for live animal surgery. It is an aesthetically acceptable and economical alternative to live animals and when effectively used play a crucial role in the training of the veterinary graduates of the future.

## Acknowledgements

The author would like to thank the support rendered by the organizers of CCLAS training programme, Laboratory Animal Medicine Unit, Chennai, TANUVAS for utilizing the surrogates for the training programme.

## Conflict of Interest

The author declare that there is no conflict of interest.

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