

## Technology Fee Full Proposal

**Title:** Simulation-Based Education of Cardiac Arrhythmias and Cardiac Arrest Response for Veterinary Students, Interns and Residents.

**Proposer:**

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**Purpose:**

The purpose of this project is to enhance the learning experience of veterinary students as well as interns and residents of the UF-College of Veterinary Medicine, Small Animal Hospital, on the identification of life threatening cardiac arrhythmias and cardiopulmonary resuscitation response (CPR) by the use of simulation-base education.

The use of simulation technology is well established in many industries outside of medicine as part of training programs for high-risk situations. In the fields of aviation and aeronautics simulators have been demonstrated to improve pilot skills; similarly, simulation exercises are used to train personnel in nuclear plant and military operations. The major advantage to this approach is the ability to place a trainee in a graphic scenario and provide real-time feedback and discussion of actions and consequences without risk for harm.

In the medical field, simulation-based education has demonstrated its effectiveness to achieve, measure, and maintain trainee skills in the performance of a variety of clinical procedures in human medicine including laparoscopic surgery, endoscopy, advanced cardiac life support (ACLS), emergency airway management, trauma resuscitation, bronchoscopy, and carotid angiography. Simulation-based education has decreased the controversial use of live animals for medical training processes in human hospitals. Although this technology has been widely used in human medical education, its use in veterinary medicine is still in its infancy.

Both human and veterinary medical education share the same challenge; maximizing the availability of instructive patient encounters, or “good teaching cases.” While all veterinary students hope to see enough patients of sufficient scope and variety, exposure to good teaching cases has been traditionally limited by time and chance. Students may graduate from veterinary school without having seen a number of specific cases, each of which may represent a knowledge gap they will carry forward into their future veterinary careers. Upon graduation they may lack the psychomotor skills necessary to perform a number of emergency procedures that they may encounter in practice.

Recently, however, the advent of high-fidelity medical simulators has enabled instructors to recreate realistic patient scenarios in a standardized fashion. Using the cardiac arrhythmia simulator, our goal is to improve the medical training of veterinary students, interns and residents with this significantly improve the quality of patient care. There is a growing body of evidence indicating that simulation can be a useful adjunct to traditional methods of procedural

training.

After extensive research and discussions with other Veterinary Medical College faculty about the optimal simulator for our purposes, we decided that the portable MPS450 by Fluke Biomedical is the ideal simulator to teach cardiac arrhythmias and cardiac arrest responses to veterinary students, interns and residents. The MPS450 is an excellent training tool that teaches techniques for recognizing normal and abnormal conditions in the heart, lungs, and circulatory system, as well as techniques for CPR, defibrillation, and cardioversion.

The MPS450 features multiple simulations for ECG, blood pressure, respiration, temperature, pacemaker, artifact, and arrhythmia conditions. Several departments within the veterinary medical center (i.e. Emergency and Critical Care, Cardiology, Anesthesiology, and Surgery) may benefit from this training device, which can also be used to train 3<sup>rd</sup> and 4<sup>th</sup> year veterinary students before starting their clinical rotation.

### **Impact/Benefit:**

Veterinary students, interns and residents will benefit from this training modality. The University of Florida, College of Veterinary Medicine has an average of 110 students per class in a four year course program. We believe that 3<sup>rd</sup> and 4<sup>th</sup> year veterinary students will benefit the most which total a number of 220 students per year. The UF-Veterinary Medical Center employs a total of 4 veterinary rotating interns per year and more than 20 residents in several areas of clinical education.

The introduction of the MPS450 simulator will leverage the existing CPR simulator owned and operated by the Small Animal Emergency and Critical Care Service. The CPR simulator is an animal manikin with a special electronic adaptor to be used in conjunction with a real defibrillator to train students how to perform basic and advanced life support and practice defibrillation. Both simulators in conjunction will enable the instructor to create numerous high-quality case scenarios in cardiopulmonary arrest, thereby improving the student's learning experience.

In order to certify the Impact/Benefit level of the simulation-based education of cardiac arrhythmias and cardiac arrest response we will conduct a three-phased study involving 3<sup>rd</sup> and 4<sup>th</sup> year volunteer veterinary students.

### **Sustainability**

This project does not require recurring resources. This is a paperless system based module and is, therefore environmentally friendly.

### **Timeline**

A three-phased study will be implemented as part of this project. Phase 1 and 2 will require 4 weeks each to be completed and phase 3 will require 2 weeks or more depending on the 3<sup>rd</sup> and 4<sup>th</sup> year veterinary student's schedule. We estimate 4 to 5 months to complete the 3 phases and begin data analysis. After phase 3 statistical analysis will be performed and a manuscript will be written and submitted to the Journal of Veterinary Emergency and Critical Care (JVECC). In addition, the investigators intend to submit a scientific abstract for presentation at the 19<sup>th</sup> International Veterinary Emergency and Critical Care Symposium (IVECCS).

Phase 1: The investigators will learn how to operate the simulator and will become familiar with all of the options. The hands on portion will be enhanced by tutorials (online, phone, etc.) from the manufacturer. The MPS450 was created to simulate human cardiac arrhythmias, for that reason, during this phase, any human specific arrhythmia will be deleted from the system and substituted by arrhythmic patterns that better correlate to the veterinary medicine patient population.

Phase 2: After adapting the simulator settings to our patient population, the investigators will create thorough guidelines on how to use the simulator to teach student groups. The objective of these guideline is to offer the instructor (both familiarized and non-familiarized with the simulator) quality material to recreate realistic patient scenarios.

Phase 3: A total of sixty 3<sup>rd</sup> and 4<sup>th</sup> year veterinary students that volunteer will be divided into two groups. Group 1 (traditionally trained) and Group 2 (simulator trained). Both groups will be given a written questionnaire immediately before the training session to assess their baseline knowledge on the subject. After completing the training module, the students will be given a written questionnaire to assess how much they learned with each type of training modality. They will be also evaluated on their ability to identify, diagnose and respond to a cardiovascular arrest in small animal medicine (dogs and cats). Both groups will be compared regarding their written test score before and after training and their ability to perform successful CPR (cardio pulmonary resuscitation) in agreement with the veterinary guidelines for CPR (Reassessment Campaign on Veterinary Resuscitation - RECOVER). This study will be prepared for publication.

In order to assess the students ability to perform successful CPR, each group will be given a scenario and will be assessed on 5 primary end points:

- 1 – Time to intubation;
- 2 - Time to begin chest compressions;
- 3 - Time to begin defibrillation after seeing ventricular fibrillation wave form in the simulator screen;
- 4 – Rate of compressions;
- 5 – Rate of ventilations;
- 6 – Rationale use of CPR drugs, and
- 7 – Time to identify return of spontaneous circulation (ROSC) and stop chest compressions/ventilation.

## **Budget**

### **1. Personnel \$0.00**

No personnel costs are expected

### **2. Equipment \$2,369.00**

MPS450 Simulator is manufactured by Fluke Biomedical located in Cleveland, OH. A quote was obtained from Fluke Electronics Corporation on February 14<sup>th</sup> 2013. The MPS450 unit costs \$2,369.00 with the following features (features not related to this study were removed when possible to decrease the equipment cost): ECG Simulation/12-lead independent outputs, 43 arrhythmia selections, Four Invasive BP channels including Swan-Ganz, Respiration and Temperature simulations, Blood pressure synchronized with ECG, Physiological patient data, Large, bright 4-line by 20 character supertwist display, R-Wave detection test, 9 V battery operated, RS232 port for computer control, Front panel soft key user interface, Universal ECG connectors - High-level ECG output, and Expansion port. Features removed to reduce equipment cost include: Cardiac Output, Fetal/Maternal ECG Option w/ IUP Simulations, and Soft-sided carrying case.

### **3. Service and Support \$872.49**

Fluke Biomedical's Care Plan packages offer comprehensive priority service and support. The Care Plan package is warrant for this study because it includes priority bench service, extended warranties, technical support, expedited return shipping, productivity consultation services, and educational training which is extremely important for this study. This package is valid for three years from the time of purchase.

### **4. Accessories cost \$906.00**

Accessories include a carrying case to avoid accidents during transportation and specific cables and adaptors required in order to use this simulator with different types of multiparameter monitors available at our institution.

**5. Supplies \$100.00**

Supplies include batteries, replacement cables, ECG electrodes, etc.

<b><u>ITEM</u></b>	<b><u>Individual Price</u></b>	<b><u>Amount</u></b>	<b><u>Total Price</u></b>
1. MPS450 Simulator	\$4147.49	1	\$4147.49
2. Supplies	\$100	1	\$100
<b><i>Total projected budget</i></b>			<b><u>\$4247.49</u></b>