

Veterinary Education through Immersive Anesthesia Simulation: A Comprehensive Approach

By: Noah Meyers, LVT & Tara Groves, LVT, CPEP, FFCP (Veterinary)

Through the development of this presentation, the INACSL Standards of Best Practice: SimulationSM was heavily referenced and quoted within this document and the accompanying PowerPoint presentation.

Outline

I. Introduction

- Welcome and introductions by Noah Meyers and Tara Groves.
- Overview of presentation structure and objectives.
- Survey: Audience “Needs Assessment”

II. Current Landscape of Veterinary Education

- Traditional Methods
 - Lecture-based Learning: Attend lectures and note-taking.
 - Hands-on Labs: Skills demonstration and practice on models, followed by live animals.
- Challenges in Veterinary Training
 - Limited availability and high cost of realistic models (e.g., K9 Diesel by TacMed Solutions).
 - Lack of specific models for feline models, reliance on generic stuffed models from Amazon.

III. The Power of Simulation in Learning

- Simulation- Serves as a bridge between theoretical learning and practical application, enhancing educational outcomes by providing students with a realistic, engaging, and effective way to learn and practice skills.
 - Aims for realism
 - Includes interactivity and live feedback
 - Meets educational objectives
 - Considers safety and ethics
 - Integrates technology of varying modalities
 - Allows to evaluate knowledge, skills, and attitudes in a practical, real-world context.

- Benefits of Simulation-Based Experiences (SBE):
 - a. Improved knowledge retention, critical thinking, and clinical confidence, supported by findings from nursing studies (Solheim and Flo¹).
 - b. Numerous other studies exist in human medicine, cited through the Best Practices: Simulation.

IV. Developing Effective Simulations

Steps taken to develop and implement simulations:

1. Create a needs assessment, by surveying students and stakeholders, to provide evidence for the need for a SBE for learners. Should be conducted before developing and creating any simulation based education activity. It should be systematic and purposeful, focusing on identifying the gaps in knowledge, skills, or attitudes of a group or individual.
 - a. Needs Assessments
 - i. Surveys
 1. Prelab survey, post lab survey, survey to stakeholders pre/post on skill assessment.
 - ii. Consensus panels
 - iii. Focus groups
 1. Feedback from advisory board members, in clinical practice.
 - b. Results: Use the results of the needs assessment to create relevant, innovative, and interactive simulation-based experiences that aim to:
 - i. Enhance curriculum in the classroom and/or clinical areas.
 - ii. Provide just-in time training in the clinical practice setting.
 - iii. Provide opportunities for standardized clinical experiences.
 - iv. Address relevant and identified competencies.
 - v. Improve the quality of care and patient safety.
 - vi. Promote readiness for clinical practice.

2. Allow the simulation to be facilitated around the learner, supporting their current knowledge, experience, and understanding within the field/topic.
 - a. Includes reviewing “needs assessments”
 - b. Keep it simple! Don’t overcomplicate the scenario or case. The learners need a clear understanding to succeed.
 - c. Be flexible! (i.e. interpersonal learner conflict, learners who require additional support, breakdowns within the simulation)
 - d. Be willing to make mistakes, trial and error.
3. Develop measurable objectives and expected outcomes.
 - a. Setting broad objectives aligned with organizational goals, and specific *measurable* objectives for learner performance. Some to be shared with the learner, and some not to be shared.

Examples from TCC’s Immersive Anesthesia Simulation Program:

i. Broad Objectives:

1. Oversee and manage an anesthetized patient at varying points of anesthesia.
2. Demonstrate the ability to accurately place physiological monitoring equipment on a sedated/anesthetized patient.
3. Verify vital information being provided by monitor and other means.
4. Respond promptly and appropriately to vital parameters being monitored throughout the entire peri-operative period.
5. Efficiently and directly communicate with members of the team within the surgical suite.

ii. Specific Objectives:

1. Correctly attached ECG leads to obtain correct tracing.
2. Accurately positioned pulse oximetry probe for a reading.

3. Properly selected the correct NIBP cuff size and applied.
 4. Ensured accurate placement of temperature probe.
 5. Properly attached the capnography unit to the breathing circuit and ET tube.
 6. Established and ensured connections for IV fluids.
 7. Responsively addressed changes in patient physiology during surgery and anesthesia.
 8. Identified and troubleshoot any monitor-related issues.
 9. Recognized and resolved any errors with the anesthesia machine in use.
 10. Communicated with DVM and assistant as needed throughout the procedure.
- b. Expected outcomes = change in knowledge, skills, and/or attitudes as a result of SBE. Essential to learning, “measurable result of the learners progress toward meeting a set of objectives.”

TCC: Executive Summary for each simulation case to present to instructors to concisely tell the story of what will occur, what the learners should recognize, and how the story will unfold in a few simple sentences, along with outcomes.

1. *Summary Example*: “Students should recognize that the tachycardia that the patient is experiencing is due to pain, therefore additional analgesics should be given and tachycardia should resolve completely.”
4. Invent simulation cases and scenarios, aligning with the above-created objectives and outcomes.
- a. Case #1- Pain-induced tachycardia
 - i. Tx: Analgesics
 - b. Information given to students:
 - i. Patient Name: “Echo”, 7yr, K9, NM, Hound Mix.
 - ii. Pre-op Vitals: Wt- 43.6lbs (19.8kgs), T-101.4, HR-100, RR-24, NIBP- 185/142/ (165), MM-pk, CRT-<2.
 - iii. Procedure: Dental prophylaxis, no planned extractions

- iv. Premedications: Gabapentin 300mg/Trazodone 200mg PO at home, Cerenia (10mg/ml) 2mls - 1mg/kg SQ at intake, Butorphanol (10mg/ml) 0.4mls – 0.2mg/kg IM at 9:30 am
 - v. Induction agents: Propofol (10mg/ml) 4mls- 3mg/kg IV, Midazolam (5mg/ml) 2mls- 0.5mg/kg IV at 10:45 am
 - vi. Fluids: 5mls/kg/hr- 100mls/hr
 - vii. Maintenance Gas: Isoflurane to affect- 1.5%
 - c. Create a “script” for the instructor to use.
 - i. Must be flexible with the “script”, as simulation should always be student-led.
 - ii. Create Roles-
 - 1. Main Actor (DVM/LVT)
 - 2. Control Manager
 - 3. 2nd actor/Evaluator
 - 4. 3rd actor/Evaluator.
 - iii. Create Action Items/Quick Picks-
 - 1. “Induction and Apnea”
 - 2. “Let’s Start Off”
 - 3. “Initiation of Tachycardia”
 - 4. “Normal sinus rhythm/HR- Temp. Resolution”
5. Utilize varying levels of fidelity in SBE to generate the required perception of realism.
- a. Levels of Fidelity in Simulations:
 - i. Low Fidelity (LF): Using pipe insulation foam and silicone, simple venipuncture practice legs.
 - ii. Medium Fidelity (MF): Modified stethoscopes for heart and lung sounds.
 - iii. High Fidelity (HF): Multi-parameter monitor simulators on iPads, K9 Diesel model with real-time feedback capabilities.
6. Pilot Testing
- a. Once finished with design and implementation, the program was test piloted with recent vet tech graduates.
 - i. Helpful in identifying confusing or missing information.
 - ii. Graduates were walked through what was to occur, shown the pre-lab assignment, and student document for the simulation.
7. Generate a pre-briefing plan to ensure student success in varying ways.

- a. Pre-lab assignment, in addition to pre-lab survey.
 - i. Reading assignments (example; Today's Veterinary Nurse Surgical Anesthesia Article)
 - ii. Case information sheets with calculators and/or fill-in-the-blanks.
 - iii. Explain roles that will exist during the active simulation.
- b. Guide for instructors to follow to be systematic and standardized for each group that goes through.
 - i. Welcome document.
 - ii. Ground rules:
 - 1. Engage Your Imagination!
 - 2. Patient Safety is Assured.
 - 3. Pause When Needed.
 - 4. Embrace the Learning
- c. Prior to the simulation-based experience, the simulationist conveys important information to learners regarding expectations, the agenda, and the logistics of the experience.
 - i. Define expectations and roles
 - ii. Discuss logistics- length of scenario
 - iii. Establish ground rules

8. Debriefing and Evaluation

- a. Debriefing: all simulation-based evaluations must include a planned debriefing process.
 - i. Feedback
 - ii. Debriefing
 - iii. Guided reflection
- b. Evaluation
 - i. Formative: learner is meant to foster develop and assist in progression towards achieving objectives or outcomes.
 - ii. Summative: focuses on the measurement of outcomes or achievement of objectives at a discrete moment in time (end of a program of study).

- iii. High-stakes evaluation refers to an assessment that has major implications or consequences based on the result or the outcome (grades).
- c. The learners were given live and post-simulation feedback to reflect upon what occurred in the SBE.

Final Tips and Takeaways:

- d. Research, assess, and evaluate simulations and how they could fit into the current curriculum. Converse with content experts, and those familiar with simulation education, pedagogy, and best practices.
- e. Limited availability of veterinary-specific simulationist present.
 - i. Having formal or informal training.
 - ii. Incorporating the Best Practices into how simulations are built.
 - iii. Literature survey and review.
 - iv. Networking with colleagues already performing simulations.

Resources:

- <https://www.inacsl.org/healthcare-simulation-standards-gl>
- <https://www.isimulate.com/>
- <https://syndaver.com/product-tag/veterinary/>
- <https://wholelogic.com/veterinary-continuing-education/stageiii-one-year-full-license/>
- <https://tacmedsolutions.com/products/k9-diesel?variant=39387735720135>
- <https://ojin.nursingworld.org/table-of-contents/volume-23-2018/number-2-may-2018/articles-on-previously-published-topics/simulation-based-learning-undergraduate-education/#effectiveness>

Citations:

1. Solheim E, Flo J. Nurses' experiences of simulation-based learning, 12–18 months after the simulation: A qualitative study. *Nordic Journal of Nursing Research*. 2023;43(1). doi:10.1177/20571585211032774
2. INACSL Standards Committee, Hallmark, B., Brown, M., Peterson, D., Fey, M., Decker, S., Wells-Beede, E., Britt, T., Hardie, L., Shum, C., Arantes, H., Charnetski, M., & Morse, C. (2021). Healthcare Simulation Standards of Best Practice™ Professional Development. *Clinical Simulation in Nursing*, <https://doi.org/10.1016/j.ecns.2021.08.007>.
3. INACSL Standards Committee, McDermott, D., Ludlow, J., Horsley, E., & Meakim, C. (2021). Healthcare Simulation Standards of Best Practice™ Prebriefing: Preparation and Briefing. *Clinical Simulation in Nursing*, <https://doi.org/10.1016/j.ecns.2021.08.008>.
4. INACSL Standards Committee, Watts, P.I, McDermott, D.S., Alinier, G., Charnetski, M., Ludlow, J., Horsley, E., Meakim, C., & Nawathe, P. (2021). Healthcare Simulation Standards of Best Practice™ Simulation Design. *Clinical Simulation in Nursing*, <https://doi.org/10.1016/j.ecns.2021.08.009>.
5. INACSL Standards Committee, Persico, L., Belle, A., DiGregorio, H., Wilson-Keates, B., & Shelton, C. (2021). Healthcare Simulation Standards of Best Practice™ Facilitation. *Clinical Simulation in Nursing*, <https://doi.org/10.1016/j.ecns.2021.08.010>.
6. INACSL Standards Committee, Decker, S., Alinier, G., Crawford, S. B., Gordon, R. M., Jenkins, D., & Wilson, C. (2021). Healthcare Simulation Standards of Best Practice™ The Debriefing Process. *Clinical Simulation in Nursing*, <https://doi.org/10.1016/j.ecns.2021.08.011>.

7. INACSL Standards Committee, Charnetski, M., & Jarvill, M. (2021). Healthcare Simulation Standards of Best Practice™ Operations. Clinical Simulation in Nursing, <https://doi.org/10.1016/j.ecns.2021.08.012>.
8. INACSL Standards Committee, Miller, C., Deckers, C., Jones, M., Wells-Beede, E., & McGee, E. (2021). Healthcare Simulation Standards of Best Practice™ Outcomes and Objectives. Clinical Simulation in Nursing, <https://doi.org/10.1016/j.ecns.2021.08.013>.
9. INACSL Standards Committee, Bowler, F., Klein, M., & Wilford, A. (2021). Healthcare Simulation Standards of Best Practice™ Professional Integrity. Clinical Simulation in Nursing, <https://doi.org/10.1016/j.ecns.2021.08.014>.
10. INACSL Standards Committee, Rossler, K., Molloy, M., Pastva, A., Brown, M., & Xavier, N. (2021). Healthcare Simulation Standards of Best Practice™ Simulation-Enhanced Interprofessional Education. Clinical Simulation in Nursing, <https://doi.org/10.1016/j.ecns.2021.08.015>.
11. INACSL Standards Committee, McMahon, E., Jimenez, F. A., Lawrence, K., & Victor, J. (2021). Healthcare Simulation Standards of Best Practice™ Evaluation of Learning and Performance. Clinical Simulation in Nursing, <https://doi.org/10.1016/j.ecns.2021.08.016>.