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Use of Mannequins in Veterinary Education and Training

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Abstract:

A veterinary mannequin is a life-sized or sectional animal model that accurately represents anatomy and is designed to support clinical skills training and simulation-based learning. Ethical and animal welfare concerns have an important role in modern veterinary education. Mannequins can replicate real life situations. The use of mannequins can help the students in gaining practical experience and improving the skills without harming the welfare of animals. It can support ethical teaching practices in line with the 3R principles (Replacement, Reduction, Refinement). But still the use of mannequins cannot replace the teaching with live animals. In this article we are briefing the importance, use and disadvantages of using mannequins.

Keywords: Animal Welfare, Ethical, Mannequins, Skill, Teaching, Veterinary,

Introduction:

A mannequin (manikin) in veterinary education refers to a full-scale or partial animal replica used to simulate real clinical scenarios and facilitate hands-on learning. Veterinary education is changing with new scientific and clinical developments while ensuring that students are trained to become competent veterinarians (Dilly *et al.* 2017). Veterinary education requires a balance between theoretical understanding and practical skill development. The use of mannequins allows veterinary students to gain practical experience without involving living animals, reducing the risk of harm while improving skills (Filho *et al.*, 2023). Compared to earlier decades, ethical and animal welfare considerations now play a much more important role in modern veterinary education; therefore, certain learning practices involving

in vivo animal studies now less commonly carried out.

Fig. Dummy model

The use of mannequins has developed as an interactive and immersive learning approach that replicates real-life situations. In skills laboratories, dummy models (Fig) are used to teach a range of clinical skills (Decloedt, 2023). This creates an environment that allows for repeated practice under supervision and control (Anderson *et al.*, 2023). An important development is the use of alternative learning tools to reduce the use of live animals in practical classes (Anciuti, 2021). Protecting animals has become a fundamental principle in veterinary practice. Many animals used in demonstration experiments, terminal procedures, or in veterinary laboratories for teaching clinical skills can experience significant welfare harms, including stress from sourcing and transportation, forced disruption of social bonds, confinement, fear, and pain (Knight, 2011; Knight and Zemanova, 2022). Promoting animal welfare and safeguarding their well-being is a key role of veterinarians (Pashudhan Praharee *et al*., 2022).

Role of Mannequins in Veterinary Skill Development:

The use of mannequins for training in clinical skills supports the 3R principle (Replacement, Reduction, Refinement) and ensures students still gain necessary professional abilities (Tvarijonaviciute *et al*., 2022). Veterinary trainees need to learn different injection methods and intravenous procedures, which can largely be practiced using mannequins and simulators in the skills lab (Decloedt, 2023). The eye models included the eyelids and eyes with interchangeable corneas, allowing students to practice on different clinical conditions such as corneal edema, stromal hemorrhage with neovascularization, and anterior chamber hemorrhage. For dermatology training, skin models were used to teach techniques like skin biopsies and scrapings (Marcos *et al*., 2023).

Modern educational methods provide students with the abilities and understanding required for veterinary practice and supports the use of alternative resources to limit the use of live animals in practical sessions (Anciuti *et al*., 2021). Protecting animals has become a key principle in veterinary practice. Veterinary training includes preparing animals for surgery, assisting with examinations and treatments, bandaging, and use of syringes, taking blood samples, administering medication, and more. In the clinic, models and mannequins are used to practice skills such as intubation, resuscitation, heart-rate monitoring, and pulse checks, with simulated pulses provided in the hind limbs (Training on mannequins and dummies).

In anesthesia and airway management training, students perform intubation, monitor attachment, radiograph positioning, Cardiopulmonary resuscitation (CPR), and electrocardiogram (EKG or ECG) setup

using specialized training mannequins (Anzccart, 2016). Also anatomical and clinical skill models allow veterinary students and technicians to practice essential procedures safely, thoracocentesis, splinting and auscultation (Knight and Zemanova, 2022). Animal mannequins consist of models of various animals, including dogs and cats, as well as body parts like artificial skin and veins. Since the clinic is designed to replicate a real veterinary setting, students are required to follow all health and safety regulations applicable to professional veterinary clinics.

Advantages of Using Mannequins:

1. Models and simulators mainly help reduce stress in animals and also improve students' motivation, confidence, and sense of competence while decreasing their anxiety (Filho *et al.*, 2023).
2. The use of mannequins reduces the number of animals needed for teaching and enables students to practice until they develop the skills and confidence required to work with live patients.
3. Accurate and detailed animal anatomy models allow veterinary students, veterinarians, researchers, farmers, and related professionals to acquire essential knowledge about the animals in their care or field of expertise (Pashudhan Praharee, 2022).
4. Training with mannequins prevents inexperienced students from performing procedures on stressed animals, lowering their anxiety and improving confidence and speed with real patients.
5. Students can use mannequins to safely practice abdominal and vaginal palpation on pregnant dogs, learn fetal development stages, static evaluation, assessing the maternal-fetal ratio and gain confidence before working with live animal (Anciuti *et al*., 2021).
6. Vaginal palpation practice on mannequins allowed students to safely perform examinations and recognize different stages of canine gestation, supporting prenatal diagnosis and follow-up. This method is early, safe, cost-effective, and enhances technical skills, though it requires professional precision.
7. The use of alternative teaching materials has increased veterinary students' interest and understanding of procedures, enhancing safety in future in vivo studies. Practical experience with living tissues is essential, and simulations or tactile tools like mannequins are more engaging than videos, helping students gain confidence and feel secure.
8. Plastic models are used to demonstrate internal structures and fracture types. Static mannequins offer a safe learning environment, reduce animal suffering, lower student stress, and prepare them for real procedures. The lack of emotions like anxiety or fear helps improve learning and memory.
9. Clinical skills can be taught in a calm, safe environment, reducing student anxiety and stress. In the skills lab, complex procedures can be broken down into smaller, manageable steps for practice.
10. A comprehensive bovine artificial insemination (AI) training program combines technical skills, like handling frozen semen, with knowledge of bovine reproductive anatomy, physiology, material

preparation, and the AI procedure, including breeding programs and genetic selection in veterinary education (Filho *et al*., 2023).

11. In recent years, research on non-animal models for education has grown significantly. Several universities worldwide, including Ankara University, the University of Hannover, and the University of California Davis, have a long-standing tradition of "Clinical Skill Labs," where students use plastic models and full-body mannequins to learn and practice various procedures (Marcos *et al*., 2023).
12. Using models and simulators in the early stages of bovine AI training clearly helps minimize the potential harm of practicing directly on live animals, promoting the welfare of cows used in education.
13. Veterinary anatomy models provide students with a precise understanding of organ functions and their interrelationships, which is often challenging to achieve through textbook images alone (Pashudhan Praharee *et al*., 2022).

Disadvantages of Using Mannequins:

1. Some of the models and mannequins are expensive, and clinical training on live animals is still necessary. Creating and maintaining homemade models is time-consuming, especially for large student groups (Decloedt, 2023).
2. Mannequins cannot fully replicate animal behavior or convey the pain and emotional responses that contribute to animal distress.
3. These models only represent basic movements and lack biological responses.
4. It is not possible to accurately simulate real-life situations involving difficult anatomical locations or inadequate physical support.
5. They cannot realistically simulate animal restraint or immobilization during procedures.
6. Overall, these models fall short of representing real-life scenarios and fail to capture the complexity of living animals (Tvarijonaviciute, 2022).
7. Although non-harmful teaching methods can produce learning outcomes comparable to harmful animals, veterinary educators still emphasize that practicing on live animals is necessary for comprehensive training (Marcos *et al.,* 2023).

Conclusions:

The use of mannequins, plastic models, and simulation tools in veterinary education has become an important method for teaching clinical skills while promoting animal welfare. These tools provide a safe and controlled environment for students to practice procedures, develop technical skills, and gain confidence before working with live animals. They reduce the risk of harm to animals and support ethical teaching practices in line with the 3R principles (Replacement, Reduction, Refinement). Although

limitations exist, such as cost and the inability to fully replicate live animal behavior, models and simulators are valuable for learning anatomy, physiology, and practical techniques. Overall, simulation-based training is an essential part of modern veterinary education, helping students become competent professionals while ensuring the well-being of animals.

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