Abstract

Background: Live anaesthetised animals are used in many countries for medical professionals to practice surgical techniques. This type of simulation – known as "live tissue training" – has been specifically used by military organisations to learn to manage complex traumatic injuries, and criticised by animal rights activists. There is a moral and ethical imperative to reduce live animal use in medical research and education, in accordance with the principles of the 3Rs (replacement, reduction and refinement) of humane animal experimentation. Yet, many advocates argue that there are currently no available simulation models that can replace all which can be achieved by using an anaesthetised pig. One significant component of the debate relates to the perceived realism or fidelity of using an animal in place of a human patient. Although the educational effectiveness of simulation is not in question, the benefit of this specific practice is unclear, in terms of educational outcomes for learners or improved health outcomes for patients.

Aim: This doctoral research project aimed to explore how "live tissue training" is being used as simulators to educate medical professionals in the context of trauma, with a specific focus on surgeons and surgical teams. By improving our understanding of this type of simulated practice, it may be possible to contribute to an argument for justification of animal use in certain situations or contexts, inform educators on the most optimal way to use live animals for learning, guide technological developments to produce open surgical simulators, and assist with the rational reduction of animals in unnecessary medical training.

Methods: A sociomaterial approach was adopted, focusing on how materials interact with social practices. Four sub-studies – a review of the literature and three empirical qualitative studies – were used to explore the research questions. Studies I(a) and I(b) reviewed the literature to understand how live animals are used as a simulation modality and what the associated ethical arguments are. Studies II–IV contributed to understanding how LTT is used in different contexts and for different learner populations. Study II used focus groups of UK military medical personnel to explore the use of LTT in a military environment. Study III involved focused ethnographic observations of seven international military and civilian surgical courses that use a live animal to train in the management of trauma. Study IV used fifteen qualitative semi-structured interviews of

the learners and educators involved with LTT to explore how this sort of training could be optimised to maximise educational benefit.

Findings: By concept, LTT is simulation, but the observed training is not delivered according to the established practices of simulation-based education, but is more akin to a traditional surgical apprenticeship. Training is typically orientated toward learning procedural skills with in-situ feedback delivered by expert educators; there is no formal debriefing. Military LTT tends to be more aligned to pre-hospital and surgical team training in an operational context, whereas civilian LTT is typically orientated toward educating surgeons. Most learners and educators apply a consequentialist ethical outlook aligned with 'the end justifies the means'.

The animals exist on an ontological spectrum, as a model for training and a patient that needs to be saved, which influences how learning is mediated. The tactile nature of the animal is important for all, but can be interpreted and valued differently. Survival of the animal is critical, at least until the learning objectives have been completed, when the animal is euthanised. During LTT, life and death are interpreted as success and failure. Premature death of the animal is problematic – superficially, as the perceived value for learning diminishes, and on a deeper level, as clear evidence that the actions of the learner truly matter in relation to patient outcomes.

The experience of participating in live animal training is highly valued because it is considered to be realistic. An authentic learning experience is more likely to be perceived when animals are framed as patients, with a focus on the technical and non-technical skills of surgical practice. This facilitates multimediation of learning and a wider range of both intended, and unintended, learning outcomes.

Conclusions: By considering the dual ontological nature of the animal alongside how this training is conceptualised – as simulation, a surrogate clinical experience or something in between – pedagogic knowledge could be used to optimise the learning that occurs through this educational event. It is also ethically and morally reasonable for each use of a live animal to be thoroughly considered as to whether the educational value, compared to alternative simulation models, outweighs the ethical cost. This approach would not only comply with the principles of the 3Rs, but ensure training in the context of trauma is the best available to improve patient care.