

# In vivo Simulation-Based Learning for Undergraduate Medical Students: Teaching and Assessment [Response to Letter]

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## Dear editor

We read with interest the response to our article from Nicholls-Mindlin et al concluding that animal use should be eradicated from medical school curricula. The arguments around this conclusion are articulated around their own experience that several students find in vivo SBL demoralising and upsetting. An example given to support this statement is the investigation of the physiological effects of clinically relevant drugs like adrenaline in vivo during their pre-clinical years. Nicholls-Mindlin et al claim that although Oxford University follows 3R principles, still the additional educational value of animal use is negligible. In their letter, there is also mention of selection bias of the ESMSC course, as we selected the most motivated students and hence our experience would be obscured. They finally underline that each medical student has the right to follow the ethical pillars of autonomy and justice and therefore withdrawing participation from activities that include animals should not result in any assessment or progression failure in their studies.

The initial point raised describes a personal, single-centred experience which is perhaps as vulnerable to selection bias as the authors propose the ESMSC course is. We would suggest formalising these views, perhaps through a qualitative study, to capture and analyse the experiences of their colleagues – this could be meaningful, particularly as they have described an exercise in which we agree does not seem to mandate in vivo experimentation. Our study systematically reviews the literature and is informed by 5+ years of experience in delivering what we believe to be meaningful educational experiences, an aspect of which is in vivo SBL. Future reviews like ours would certainly be informed by formal characterisation of negative experiences, such as the one described, to allow appraisal of methods and quality of conclusions drawn.

The second point of surgically minded students preferring limited animal use, with what the authors quite rightly raised as a selectively biased cohort, is certainly not striking. It is well recognised that surgical educators are aiming to find valid alternatives that provide educational value. One only needs to observe the explosion of productivity in the simulation literature to see this. The ESMSC course itself evolved, with later iterations depending on fewer in vivo modules and more hyper-realistic simulations, mirroring this trend. However, the main thesis of the article is to highlight the place in vivo modules still have in surgical education. This position

is indeed waning; however, the review describes educational experiences outlining remaining value under specific circumstances.

We agree with the aspiration towards the admonishment of in vivo SBL from under and indeed post-graduate education. However, with documented benefits of their use for training, it is important that we have viable and cost-effective alternatives which maintain pre-clinical skill development but also motivate students to enter the operating theatre.

We would also like to clarify a couple of things regarding the ESMSC course, considering the issues raised in this letter:

ESMSC is a mixed fidelity course; the animal use is extremely limited and accounts for less than 10% of the educational time, which has reduced and is reducing in keeping with the ethical pillars of 3Rs. Further to this, students who sign up for the course are fully informed about the use of animals and must attend the induction talk, which provides a comprehensive overview of the

course and use of animals. Our students are fully consented and are able to withdraw at any time.

In conclusion, Nicholls-Mindlin et al raise important points in their letter. Our position is that animal tissue use should be limited to necessary applications and should be guided by field experts. The role in medical school curricula should account for freedom of choice in terms of participation, and we should continue towards reducing and ultimately eliminating in vivo SBL once cost-effective and efficacious alternatives are established.

## Disclosure

MS/AP are the leads of the ESMSC course; GT has extensive contribution in the eMERG project. The views expressed on this manuscript reflect the interpretation of the authors towards the topic and are based on previous work of the eMERG collaboration. The authors report no other conflicts of interest in this communication.

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