Ophthalmologists' perceptions of a low-cost strabismus surgical model – the lessons learnt

Aleena Thomas, Jessica McKeever, Dr Una O'Colmain , Dr Kevin McConville

University of Dundee

1 Introduction

Background

Simulation is a well-established concept within medical education[1]. There are several simulated options to practice surgical skills within ophthalmology but a lack of low-cost alternatives, especially within strabismus surgery. This is of concern as low-cost simulation has been shown to be beneficial to trainees via a strabismus simulation model[2].

The Royal College of Ophthalmologists[3] policy specifies that trainees require 20 strabismus surgeries before completion of training, 5 of which can be simulated. Even with this concession, trainees have been struggling to attain this number[4].

Currently, one of the commercially available strabismus models costs approximately £50 per eye[5]. The self-made model used in this project costs less than £2 *(Figure 1).*

We hope to increase the financial accessibility of simulation training for ophthalmologists while also helping trainees reach the target of 20 strabismus surgeries if this model proves to be as effective as other commercially available models.

Research Questions:

1) What are the perceptions of ophthalmologists using a low-cost strabismus surgical simulation model?
2) How can the model be modified to improve its purpose?
3) What are the perceptions of ophthalmologists about simulation in post-graduate training?

2 Methods

Research Design: This qualitative study used an action research model as the focus was on inquiry and application of knowledge.

Participant selection: Purposive sampling allowed for recruitment of those who were most knowledgeable in the field of strabismus in the local context. The inclusion criteria comprised of consultants, associate specialists and trainees working within Ninewells Ophthalmology department. Ethics was obtained via the University of Dundee School of Medicine Ethics Committee.

Data collection: Participants were invited to interview via email recruitment through an external gate-keeper. Semi-structured interviews were used to obtain a rich data-set. Participants practiced surgical skills on the model and were then interviewed. 20 participants completed interviews (7 consultants, 4 associate specialists and 9 trainees). Member-checking was used to ensure all information recorded was an accurate representation of their thoughts.

Data analysis: Interviews were transcribed by hand and then thematically analysed[6]. Three themes and 11 sub-themes were identified.



Figure 1: Image of low-cost strabismus surgical model

3 Findings



Theme 1: Opinions of the model

- Perceived function
- Benefits of the model
- Limitations of the model
- Perceived function

"I think it's a great model, particularly for beginners." Trainee 7

"I think one of its strengths is that it's hugely reusable and recyclable" Consultant 4

"The fact that it's cheaper creates more opportunities for practice." Trainee 8

"The muscles were not elastic." Trainee 4

"A table tennis ball is too big... The muscles are definitely longer than they are in real life." Consultant 8

"I would reduce the size of the muscular insertion." Consultant 1

"You could potentially use a thick elastic band and have that be under tension." Trainee 5



Themes 2: Simulation in post-graduate training

- Simulation experience
- Benefits of simulation
- Limitations of simulation
- Observation and feedback

"I think I trained at a time when you didn't have much simulation" Consultant 11

"I think simulation ran in parallel with theatre" Trainee 5

"Mistakes will be made so if they're made in a simulated environment that's better so they can be learnt from and not replicated in real life." Consultant 4

"It can be used as an excuse by the programmes to reduce surgical time... rather than putting emphasis on real surgery" Trainee 4

"You can easily get into bad habits with simulation if you don't have someone who is senior observing you." Trainee 4



Theme 3: Current state of ophthalmology training and practice

- Barriers to training
- Minimum competency assessment
- Transferrable skills from strabismus

"In this unit we've often struggled to get enough strab[ismus] numbers towards the end of ST6, ST7" Consultant 2

"I think simulation makes you run the risk of falling into the trap of equating number of doing something to being competent at it." Trainee 9

"I think it would be quite useful when thinking of practising how to do enucleations particularly for a retrieval environment" Consultant 1

4 Discussion

All participants thought the model was a good resource for learning the fundamental skills such as identifying the correct equipment and understanding the basic anatomy.

A key strength of the model was its accessibility, comparing its use to an expensive, commercial model. Participants highly valued the opportunity to practice the procedural steps of strabismus surgery in a low-stress and low-stakes environment.

The main weakness was the lack of muscle elasticity simulated by the felt material. Many suggested improving this by changing the felt to a rubber band.

All participants agreed that simulation was a very useful learning modality, attributing its increased implementation in training to greater confidence and better patient safety outcomes. Some hesitancy existed amongst the trainee participant group, where three participants voiced their concern that increased simulation may lead to less theatre opportunities. This is a finding uncommon in literature and requires further consideration.

Various barriers to surgical training were identified such as higher patient expectations and a lower number of strabismus surgeries. For this reason, most were happy with the RCOphth strabismus simulation guidelines as it was seen as an opportunity to increase surgical competence in a safe environment before implementing the skills on a real patient.

References

1. Ferrara, M., Romano, V., Steel, D. H., Gupta, R., Iovino, C., Van Dijk, E. H. C. & Romano, M. R. (2020). 'Reshaping ophthalmology training after COVID-19 pandemic'. *Eye* 34(11), pp 2089-2097 [Online]. doi:10.1038/s41433-020-1061-3 [Accessed 20 February 2022].
2. Malik, M., Shah, N., Kit, V. & Jain, S. (2021). 'Development of a low-cost strabismus surgery simulation model'. *Eye* 35(3), pp 805-810 [Online]. doi:10.1038/s41433-020-0966-1 [Accessed 22 February 2022].
3. Royal College of Ophthalmologists (n. d.). *Surgical Skills SS12 Muscle Surgery Learning Outcomes* [Online]. Available: https://www.rcophth.ac.uk/learningoutcomes/ss12/ [Accessed 22 November 2021].
4. Ezra, D. G., Chandra, A., Okhravi, N., Sullivan, P., Mcdonnell, P. & Lee, J. (2010). 'Higher surgical training in ophthalmology: trends in cumulative surgical experience 1993-2008'. *Eye* 24(9), pp 1466-1473 [Online]. doi:10.1038/eye.2010.54 [Accessed 20 February 2022].
5. Simulated Ocular Surgery (n. d). Available: http://simulatedocularsurgery.com/product/strabismus-eye-advanced/ [Accessed 14 November 2021].
6. Braun, V. & Clarke, V. (2022). *Thematic analysis: a practical guide,* Thousand Oak, California: SAGE Publications.

5 Conclusion

This study adds a new perspective to Malik *et al.'s*[2] paper by providing qualitative recommendations for implementation and improvements regarding a low-cost strabismus surgical simulation model.

The model was praised for its simplicity and low-cost with many saying the skills achieved with this model were comparable to its commercially available counterparts.

The use of simulation in post-graduate training was looked on favourably by most participants and many saw this as a way to address the paucity of strabismus theatre opportunities. However, trainee hesitancy with regards to its increasing place in ophthalmological training and what this means for their access to theatre opportunities warrants further exploration.

Recommendations for future research:

1. Completion of the action research cycle by implementing and further evaluating the changes suggested by the participants
2. Conducting the study in another training centre with a larger cohort of participants to elicit more nuanced views

Recommendations for future practice:

1. Protected time for both trainees and consultants to engage in simulation practice with real-time expert feedback and observation