

A survey of the role of virtual surgery simulators in ophthalmic graduate medical education

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Received: 24 August 2010 / Revised: 16 September 2010 / Accepted: 20 September 2010 / Published online: 8 October 2010
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Dear Editor,

Virtual eye surgery (VES) simulators offer a safe and controlled environment to actively learn intraocular surgery. This includes gaining experience in the eye-hand-foot coordination required for intraocular surgery, the use of common microsurgical instruments, and the critical steps of key procedures such as capsulorhexis for cataract surgery and membrane peeling for vitreoretinal surgery [1–3]. However, the role of VES simulators in the education of ophthalmologists-in-training is unclear: they appear to improve surgical skills as measured by the simulator and wet-lab performance but there is a paucity of data showing improved operating room performance [1, 4]. To learn more about the current status of VES in ophthalmic graduate medical education, we surveyed United States (US) ophthalmology residency program directors on the role of VES simulators in their programs.

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After being granted an exemption from the Providence Veterans Affairs Medical Center Institutional Review Board, an anonymous survey consisting of multiple choice and Likert-style questions (Tables 1, 2) was created on www.surveymonkey.com. The survey link was sent to the 117 Accreditation Council for Graduate Medical Education Ophthalmology Residency Program Directors listed on the FREIDA online database (www.ama-assn.org/go/freida). Each survey question was analyzed independently with the denominator being the total number of responses to the question.

The results of the survey are summarized in Tables 1 and 2. The response rate was 47.9% (56/117). A VES simulator was used by 23% (13/56) of residency training programs. Among the programs without a VES simulator, cost was the main limiting factor (98%, 41/42) followed by inadequate simulator realism (26%, 11/42), and the unproven validity of VES (21%, 9/42). Among programs using VES simulators, (100%; 10/10) used the EyeSi simulator (VRmagic, Mannheim, Germany); (69%, 9/13) mandated its use in the educational curriculum and (50%, 6/12) used it to evaluate resident surgical skills quantitatively. A VES simulator had been personally used by 75% (38/51) of program directors; 21% (9/42) of program directors reported that department faculty used a VES simulator to help residents improve surgical skills. Most program directors agreed that VES is a useful tool for improving and measuring resident surgical skills and that it could be incorporated into the resident training model; however, they did not support VES evolving into a mandatory component of resident training.

This study has several limitations. The survey response rate of 47.9% may limit the generalizability of the results, though it exceeds the 32% response rate of a recent US program director survey [5] and the 34% mean response rate for e-mail surveys reported in a recent meta-analysis [6]. In addition, the survey may have been biased by the

Table 1 Utilization of virtual eye surgery simulators in residency programs

#	Question	<i>n</i> ^a				
1	Does your program use virtual eye surgery (VES) simulators for resident surgical training?	56	Yes [13 (23%)]			
1a	If N, why not? (Select all that apply)	42	Cost [41 (98%)]	Simulator realism fidelity [11 (26%)]	Current lack of evidence of simulator to surgery performance [9 (21%)]	Other [1 (2.4)%]
1b	If Y, the VES unit is ____.	10	EyeSi [10 (100%)]			
2	In what capacity is the VES simulator used by the residents at your program?	13	It is an optional part of the educational curriculum [4 (31%)]		It is a required part of the educational curriculum [9 (69%)]	
3	Resident surgical skills are quantitatively evaluated on the VES	12	Yes [6 (50%)]			
4	Have you personally used a VES simulator?	51	Yes [38 (75%)]			
5	Does the faculty at your program use a VES simulator to help residents improve their surgical skills?	42	Yes [9 (21%)]			

^a *n*=Number of responses for each question

multiple choice rather than open-ended nature of the questions and by the large number of responses from residency programs without VES simulators.

This study suggests that while many US program directors have previous experience with a VES simulator and view it as a useful educational tool, VES simulators are currently used in only a minority of US ophthalmology residency programs due primarily to their high cost. Further research is needed on the role of VES in ophthalmic graduate medical education, especially in demonstrating improved virtual reality-to-operating room outcomes compared to more traditional methods of surgical education [1, 2, 4, 7].

Financial Support This material is the result of work supported with resources and the use of facilities at the VA Medical Center, Providence, RI, USA.

Disclaimer The views expressed in this article are those of the authors and do not necessarily reflect the position or policy of the Department of Veterans Affairs or the United States government.

Conflicts of interest No authors have any financial/conflicting interests to disclose.

Table 2 Program director insights regarding virtual eye surgery simulators

#	Statement	Average rating ^a	SD	<i>n</i> ^b
1	The VES simulators are a useful tool in improving basic surgical skills	3.78	0.79	49
2	The current generation of VES simulators has the capability to provide a realistic simulation of cataract surgery	3.22	0.98	49
3	The VES simulators are a useful tool in improving resident proficiency with cataract surgeries	3.67	0.75	48
4	The VES simulators can be used to quantify resident proficiency with cataract surgery skills	3.41	0.76	49
5	VES simulators should be incorporated into a three-step teaching model that includes residents practicing management of various scenarios and complications in a safe virtual environment, practicing the procedure in wet-lab and assisting in a procedure	3.48	1.09	50
6	VES simulators should eventually become a mandatory component of cataract surgery training in ophthalmology residency programs	2.33	1.14	51

^a Average rating was calculated by assigning a numeric value to each response (Strongly disagree=1, Disagree=2, Neither agree nor disagree=3, Agree=4, Strongly agree=5), and obtaining a weighted average of all the responses

^b *n*=Number of responses for each question

References

1. Solverson D, Mazoli R, Raymond W, Nelson M, Hansen E, Torres M, Bhandari A, Hartranft C (2009) Virtual reality simulation in acquiring and differentiating basic ophthalmic microsurgical skills. *Simul Healthc* 4(2):98–103
2. Khalifa Y, Bogorad D, Gibson V, Peifer J, Nussbaum J (2006) Virtual reality in ophthalmology training. *Surv Ophthalmol* 55:259–273
3. Rossi JV, Verma D, Fujii GY, Lakhapal RR, Wu SL, Humayun MS, Juan ED (2004) Virtual vitreoretinal surgical simulator as a training tool. *Retina* 24:231–236
4. Feudner EM, Engel C, Neuhann IM, Petermeier K, Bartz-Schmidt KU, Szurman P (2009) Virtual reality training improves wet-lab performance of capsulorhexis: results of a randomized, controlled study. *Graefes Arch Clin Exp Ophthalmol* 247:955–963
5. Scott IU, Smalley AD, Kunselman AR (2009) Ophthalmology residency program leadership expectations of resident competency in retinal procedures and resident experience with retinal procedures. *Retina* 29:251–256
6. Shih T, Fan X (2008) Comparing response rates from web and mail surveys: a meta-analysis. *Field Methods* 20:249
7. Seymour NE (2008) VR to OR: a review of the evidence that virtual reality simulation improves operating room performance. *World J Surg* 32:182–188