Article published online: 2020-12-18

Integrating Mental Practice into a COVID-19 Appropriate Virtual Reality Cataract Surgery Course for Ophthalmology Residents

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J Acad Ophthalmol 2020;12:e298–e300.

Abstract

To present a revised, publicly available virtual reality cataract surgery course for ophthalmology residents that integrates a novel mental practice program into the curriculum, fulfills the six core competencies of the Accreditation Council for Graduate Medical Education, and adheres to the Centers for Disease Control and Prevention educational recommendations for the coronavirus disease 2019 pandemic.

Keywords
- mental practice
- cataract surgery
- virtual reality
- ophthalmology residency training
- surgical education

Mental practice (MP) is the cognitive rehearsal of a task and is grounded in symbolic learning theory and neurophysiological research.[1] MP has been shown to improve operating performance and is becoming an important part of surgical residency curricula.[2] We developed an MP cataract surgery training program and integrated it into a publicly available, virtual reality (VR) cataract surgery course for ophthalmology residents.[3] The revised VR cataract surgery course fulfills the six core competencies of the Accreditation Council for Graduate Medical Education (ACGME)[4] and the Centers for Disease Control and Prevention (CDC) educational recommendations for the coronavirus disease 2019 (COVID-19) pandemic.[5]

The VR course curriculum has three sections: MP, didactics, and VR training. A key component of MP is the use of mental imagery to visualize and practice a procedure, and MP scripts can greatly facilitate this goal. To this end, the methodology (►**Fig. 1**) described by Saab et al[6] was used to develop an MP script for cataract surgery instruction. Employing modified verbal protocol analysis, a cognitive walkthrough of cataract surgery was developed by interviewing three attending cataract surgeons, all of whom have several decades of experience teaching and mentoring resident surgeons. The surgeons were instructed to mentally perform cataract surgery and recall the visual, audial, kinesthetic, and cognitive sensations they experienced; when necessary, they were prompted for further detail about the mental imagery. The interviews were transcribed and coded by cue type using emergent theme analysis. Cues were then organized according to hierarchical task analysis of the key procedural steps of cataract surgery based on the American Academy of Ophthalmology's "Cataract in the Adult Eye: Preferred Practice Patterns."[7] The resulting nine-step MP script was then reviewed by the three surgeons, revised based on their feedback, and integrated into the VR course. The MP section can be conducted in-person or virtually in

received
July 27, 2020
accepted after revision
September 8, 2020

DOI https://doi.org/10.1055/s-0040-1721068.
ISSN 2475-4757.

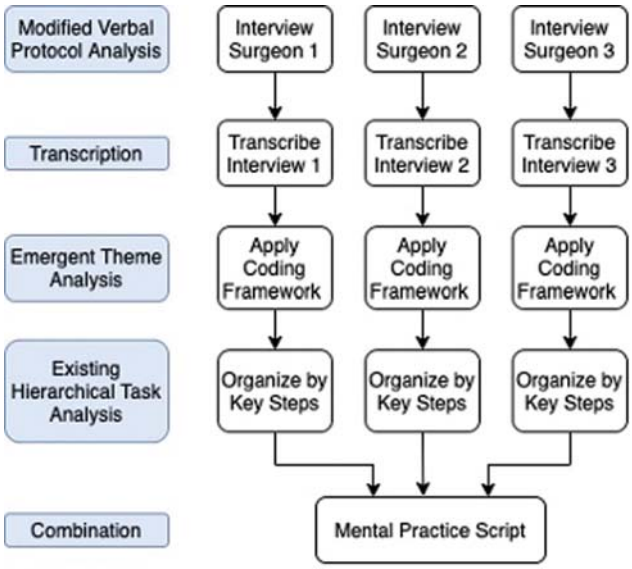

Fig. 1 Flow chart for developing the mental practice script.

Table 1 Accreditation Council for Graduate Medical Education competencies

Core competencies	Course content	Course section
Patient care	Perioperative patient care for cataract surgery	Didactics
Medical knowledge	Medical knowledge about cataracts and cataract surgery, including the key steps of cataract surgery	Didactics and mental skills
Professionalism	Care for patients with developmental disabilities, trauma, and psychosocial considerations	Didactics
Communication and interpersonal skills	Communication with patients regarding their surgical care	Didactics
Practice-based learning	Cognitive rehearsal of cataract surgery Virtual cataract surgery	Mental skills virtual reality
Systems-based practice	Communicating preoperatively with the patient's primary care provider	Didactics

one-on-one video conference or phone call sessions between the resident and attending ophthalmologist.

The didactics section is based on the 2020 to 2021 AAO Basic and Clinical Science Course "lens and cataract" section. There are short pre- and post-tests on the didactics that residents can complete online each year.

The VR section consists of training modules from the EyeSi Simulator (VRmagic, Mannheim, Germany; courseware version 2.5, software version 3.4). The VR training can be supervised remotely by an attending ophthalmologist reviewing videos of the resident's simulator performance. A validated practical test on their VR training[8] is administered at the end of the second year of residency; the test also can be evaluated remotely by a supervising ophthalmologist.

The course provides a table detailing pertinent course sections that meet the six-core ACGME competencies (►**Table 1**): patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism, and systems-based practice.[4] It also includes a section outlining cleaning and handling of the VR simulator that is in alignment with CDC guidelines for the COVID-19 pandemic. Additionally, the MP and didactic training can be conducted remotely for social distancing.

In summary, this revised VR cataract surgery course uses MP to augment a more traditional curriculum composed of didactics and simulation training. It meets the ACGME core competencies, and at a time when the COVID-19 pandemic has reduced opportunities for hands-on surgical training, it promotes social distancing and safe, flexible surgical training in accordance with CDC recommendations.

The VR course is available at no cost in the Brown Digital Repository: https://doi.org/10.26300/ygj1-xc17. We hope other ophthalmology residency programs will find the course useful to integrate MP into their cataract surgery educational curricula.

Note
The views expressed here are those of the authors and do not necessarily reflect the position or policy of the U.S. Department of Veterans Affairs or the U.S. government.

Funding
This material is the result of work supported with resources and the use of facilities at the Providence VA Medical Center, Providence, Rhode Island, United States; JCL was supported by a Summer Research Assistantship grant from the Brown University Program in Liberal Medical Education.

Conflict of Interest
None declared.

Acknowledgments
The authors thank David R. Rivera, MD; Ezra L. Galler, MD; and Jorge J. Rivera, MD for their contributions to the mental practice script.

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