Embracing technology in cataract surgical training – The way forward

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While ophthalmology as a surgical branch itself has evolved technologically with newer instruments, techniques and procedures; ophthalmic surgical training appears to have stagnated in terms of how it is delivered and how trainees' learning and performance are assessed. This collaborative editorial attempts to identify the lacunae in ophthalmic residency training and highlight how technological tools such as surgical simulators can be incorporated into ophthalmic training even in limited-resource settings with good results.

Key words: Blindness, MSICS, residency, SICS, training

"Under pressure, we don't rise to the level of our expectations. We fall to the level of our training."

- Greek poet Archilochus

The past 2 years have changed not only the way medicine is practiced but also the way medicine is taught. Learning the art of practicing medicine is a constant process that continues throughout one's career. However, one typically learns the basic surgical skills early on during training under the watchful eyes of a mentor, which serves them well throughout their career. Since 2020, because of the coronavirus disease 2019 (COVID-19) pandemic, trainees in surgical training programs have had fewer surgical opportunities. This is especially true for a branch such as ophthalmology, where most surgeries are elective. A survey conducted in India reported that 81% of the 716 ophthalmology trainees who were surveyed felt that COVID-19 had negatively impacted their surgical training.[1] Additionally, most of the respondents felt that there was at least 50% reduction in their surgical training volume, when compared to the training prior to the pandemic. This was not limited to India alone, but a global phenomenon.[2] Surgical logs of trainees in the United States also showed a significant dip in the number of surgeries performed or assisted in 2020–2021 as compared to the previous years.[3]

Lacunae in Indian Ophthalmology Residency Training

Even prior to the pandemic, surgical training across ophthalmic residency programs in India was found to be lacking in terms of independently performed surgeries by residents and fellows. A survey conducted by the Academic and Research Committee of the All India Ophthalmology Society (AIOS) showed that residents performed a median of 55 independent manual small-incision cataract surgeries (MSICS), the most commonly performed surgical procedure that Indian ophthalmology residents are trained in.[4] The mean was 74.9, but there were programs in which the numbers performed were in single digits, in some cases none. The ophthalmology residency trainers in India recommended on an average at least 50 MSICS

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and 50 phaco-emulsification surgeries, a tall order for most programs considering their trainee intake, supervising trainers, and patient workload.[4] Although there is no minimum mandated number of surgeries for ophthalmology residents in India, this figure falls well short of the requirements of the UK ophthalmology training program, which specifies at least 350 full cataract operations and US residency programs that require residents to have performed at least 86 cataract surgeries independently.[5,6] There is a significant mismatch between the number of surgeries needed to be performed to master them and the actual numbers being performed by trainees.[7] However, this does not mean that all training programs in India are sub-standard; although some world-class ophthalmic training programs do exist in India, unfortunately, 'one swallow does not make a summer'.[4] Poorly trained trainees would mean that even though the number of qualified ophthalmologists increases every year on paper, there are not enough skilled surgeons to tackle the backlog of cataract, which remains the leading cause of preventable blindness.[8,9] Additionally the skillsets required for complicated cataracts and complications arising from cataract surgery also need to be dealt with, which current training programs do not necessarily prepare trainees for. As the old army adage goes, 'Those who sweat more in peace, bleed less in war.' This holds true for surgery too.

So how do we augment the surgical training of our ophthalmology trainees and also improve the skills of the newly graduated ophthalmologists, without compromising on patient safety? One of the possible solutions for this complex problem could be integration of simulation-based surgical training into our training programs. A surgical simulator allows the trainee to learn skills in a safe environment where he/she can familiarize himself/herself with the human eye and its anatomy and at the same time, they can practice surgical tasks multiple times over, without worrying about the impact of errors or complications. Studies have shown that trainees tend to have higher complication rates in surgeries: ranging from 3.8% to 10.2%.[10,11] Simulation provides an environment where a trainee can not only learn the right technique to perform a particular surgical step but also intentionally make mistakes over and over again. This would teach them how to avoid surgical complications as well as how to manage them, depending on the fidelity and complexity of the simulator. Even very rare complications, which a surgeon may encounter perhaps once during a working lifetime, can be faced and managed appropriately. A study by Staropoli et al.[12] showed that the addition of surgical simulation training was associated with a significantly reduced rate of complications among novice residents. However, most virtual-reality simulators for cataract surgery have been developed for phaco-emulsification such as the EyeSi, MicroVisTouch, PhacoVision, and the Phantom Phaco simulator, among others[13-17] However, phaco-emulsification is not taught to most residents in the developing world.

Simulation-based Training for MSICS

Because very few institutes in India such have ophthalmic surgical simulators available for trainees, there has been a dearth of evidence that demonstrated the positive impact of simulation-based cataract surgical training for MSICS. In fact, the only published study to do so has come from India, which studied the effectiveness of simulation-based training for MSICS. Nair et al.[18] conducted a randomized control trial and reported that trainees trained on a surgical simulator made fewer errors in their first 20 independent MSICS procedures when compared with surgeons who trained as per the conventional training curriculum. The trainees included in this study were from LV Prasad Eye Institute, Hyderabad and Vishakhapatnam; Mahatme Eye Hospital, Nagpur; and Sankara Nethralaya, Chennai. The trainees were trained on the HelpMeSee Eye Surgery Simulator, which combines high-fidelity computer graphics integrated with physics-based models and has the ability to provide tactile feedback to trainees. Based on this pivotal study, the initial steps to integrate the simulation-based training into the surgical training curricula were taken.[19] The initial experience with the HelpMeSee Eye Surgery simulator, which is currently installed at LV Prasad Eye Institute, Hyderabad, and Aravind Eye Hospital, Madurai, has been extremely encouraging, and we hope to scale this up and train many more trainees in cataract surgery. Close to 100 ophthalmologists have already trained on the HMS eye surgery simulator in 2022 alone, and the number continues to increase globally across locations such as Mexico, Madagascar, and China as the aim remains to bridge the gap between the limited training opportunities available and the required level of competency needed to perform safe cataract surgeries. The instructor-led training course for MSICS on the HelpMeSee Simulator is a comprehensive 6-day long program with a well-rounded, exhaustive curriculum comprising didactic classroom lectures, lab activities, interactive debrief sessions, and simulator sessions (which comprise 80% of the course time). At the end of the course, the trainee undergoes an assessment of the tasks on the simulator.

Why Simulation-Based Training?

Virtual reality simulated training on its own can teach vital surgical skills to surgeons before they actually operate on patients. It is a win–win situation for all with the improved outcomes being better surgical training and improved patient safety. Additionally, comparative studies have shown that a virtual reality simulation-based training curriculum is more effective than conventional training involving wet lab training and animal/cadaveric eyes.[20] This is being adopted the world over: the United Kingdom requires all ophthalmic trainees to clock a prerequisite number of hours of cataract surgical practice on a surgical simulator. This has yielded dividends with a reduction in surgical complications – directly attributable to the simulation training.[21] Simulators also have the ability to assess trainees' performances with various customizable performance parameters such as the size of the capsulorrhexis, the depth of the tunnel, the number of errors, and zonule damages among others. This helps in tracking the performance level of the trainees as the training progresses.

Although simulation is not without its drawbacks, simulated surgery has the inherent flaws of not always being able to completely re-create every real-life scenario that can occur. Furthermore, simulators have significant costs associated with development, updates, and maintenance. However, we believe that the time is right to embrace simulation-based training and integrate it into the ophthalmic surgical curriculum so that we help train better and safer ophthalmologists. This could be one of the first few steps in overhauling the current

training framework and to create a new system with a focus on skill-based assessments rather than knowledge-based assessments. Concurrently, organizations such as the International Society of Manual Small-Incision Cataract Surgery (ISMSICS) and the AIOS can help formulate preferred practice patterns, monitor structured residency training, and set parameters for standardization of the exit examination.[22] We owe it to the next generation of ophthalmologists and to their patients. The question remains – do we have the desire and the will to do this on a scale where we can truly make a difference?

The relevance of Manual SICS in India is undeniable; it is by far the most common technique of cataract surgery in the country; it forms the backbone of the National Program for the Control of Blindness and visual impairment; it is the most popular technique for teaching cataract surgery; it forms the base for learning phaco-emulsification and the technique of choice to fall back upon in case something goes wrong during phaco-emulsification. The Indian Journal of Ophthalmology needs to be thanked for providing a platform for this simple yet elegant technique of cataract surgery.

Cataract backlogs are not just because of a lower number of surgeries. Poor outcomes put off potential beneficiaries. Good quality and safe surgery, by an experienced surgeon, is the best way to motivate potential cataract surgery patients. The surgeon's experience need not be only on human eyes; simulation too allows the pilots the clock the necessary flying hours. Why not surgeons?

Conflicts of interest

There are no conflicts of interest.

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