Abstract

In ophthalmology, surgical skills training is challenging for both teachers and residents. Teaching in an operating room is complicated by the fact that the attending faculty member is primarily an observer with limited ability to prevent surgical complications. With the recent modifications in residency curricula which include virtual reality surgical simulation and wet labs, the technical skills and clinical judgment can be taught and assessed without exposing the patient to extra risk. In this review, guidelines are suggested to improve the process of training during residency and they can be applied to all ophthalmic surgical training.

Keywords: Ophthalmology education, Residency, Training, Surgical training

Introduction

Ophthalmology is a medical and surgical specialty that requires one to have good exposure in both fields to achieve competency. However, in most of the residency programs, surgical skills training is challenging because of multiple factors. First, residents in training are exposed to different surgical cases with variable numbers. Let us take the example of phacoemulsification, which is one of the most common surgical procedures done during residency training. The number of phacoemulsification surgeries done varies widely among the residency training programs and even within the same program. In the United States, the residents perform an average of 113 phacoemulsification cases during residency training, and most of them perform from 80 to 140 cases. However, there is a significant variability in this surgery among programs, with up to 25% of residents performing fewer than 80 cases. Moreover, these numbers are different in the United Kingdom, Canada, and Jordan with 500–600, 200–400, and 0–30 cases per resident, respectively.

Second, residents are also required to achieve variable surgical competencies during training which indicates a need for a more structured and intensive surgical training. Although it is complex and time-consuming, sufficient surgical exposure must be of a high priority in any successful residency program.

Third, modifications in the surgical training curriculum, caused by limitations to resident work hours, concerns over patient safety and restrictions in the operating room (OR), have obligated the residency educators to keep searching for more ways of teaching surgical skills.

With the advancement in competency-based training, it becomes important to consider residency outcome and continuously improve the transfer of surgical skills. Residency training is a team effort aiming to achieve a superior outcome. In ophthalmology, there are three main factors that can affect the success of surgical training: administrators (hospital administration and program administration), teachers and trainees. This review addresses the challenges in surgical training of residents with respect to all the three components of training.
For administrators

In this study, the term “administrators” includes hospital managers, head of departments and program directors. The role of administration is crucial to the success of surgical training. Understanding the importance of training and receiving support from administrators will help to overcome any difficulty and ensure achievement of training objectives. The hospital administrators may face different challenges with respect to resident’s training, such as:

(a) **Lack of space** (mostly operating rooms and, to a lesser extent, clinics): In most countries, there is a huge demand for medical services. Incorporating residents training in hospital systems may cause some delay and underutilization of hospital resources when considering the number of cases seen or managed for a given ancillary. Residents, especially in their junior level, need more time in clinics and OR to provide patient management similar to that of the senior staff in the system. To overcome these challenges, hospital administrators may improve utilization by making clinic and OR undergoing expansion if possible. Also, providing compensation to the OR staff for doing residents’ cases after working hours and in weekends, or after finishing the main OR lists can be helpful in this regard. Another solution will be using outreach programs by sending residents with their mentors to less crowded centers for training. Lastly, affiliation with another community hospital where they typically have a huge number of patients, and sufficient clinic, and OR can be helpful. These can be done either under the supervision of the faculty staff of that center or by sending staff from the main training center to supervise the training of the residents. One should stress on close supervision to avoid any variability in training. This can happen through explaining the objectives of the program and the ways of assessment as well as through monitoring the staff of affiliated centers.

(b) **Lack of interested supervisors:** The ability to teach surgery is a difficult task. The best surgical teachers must be recruited to teach residents the surgical competencies. These teachers must be rewarded, compensated and encouraged. The act of motivating interested staff varies among different institutes. It may include time compensation, letters of appreciation and priority in attending conferences and leave application. Putting “interest in teaching” as one of the advantages during recruitment can also help in getting interested teachers. Moreover, including residents/fellows teaching as one mission in hospital/department policies and staff contracts can be helpful in this regard. Finally, financial incentives for such teachers will even encourage others to share in teaching.

(c) **Surgical cases suitable for training:** Patient recruitment is one of the challenges that faces residency training program, especially in tertiary care centers. Cases in these centers are usually complicated and need expert intervention. This problem can be solved by modifying eligibility criteria to accommodate cases suitable for training. Another way to deal with this challenge is to consider affiliation with community hospital where common surgical cases can be operated by residents-in-training.

(d) **Patient willingness to be treated by trainee:** This could be included during opening file process keeping in mind that all residents’ cases should be done under the supervision of treating consultants. This should be explained during patient consenting to any surgical intervention. Also, the resident’s clinic can solve this problem since residents will recruit and manage their own patients.

(e) **The possibility of the high rate of complications in residents’ cases:** With proper supervision and patients’ selection, the risk of complications are not different from attending staff. Residents performing phacoemulsification surgery achieved a low overall rate of major complications (4.7%). Specific features of cataracts; such as, mature nuclei and zonular pathology, carried increased intraoperative risk. Anticipating risk may help to decrease surgical complications further. Also, surgical skills foundation, wet labs and surgical simulators can help to establish a good surgical foundation and to increase surgical safety. It is essential to include wet-laboratory experience early in all residency training programs. Nowadays, in ophthalmology, there are multiple simulation-based methods to improve trainee learning curve and increase patient safety. Residents who trained using the simulator had shorter phacoemulsification times, lower percentage powers, fewer intraoperative complications and a shorter learning curve.

For teachers

By teaching a trainee to perform a better operation, the physician may have an impact on thousands of individuals. The supervision of trainee is stressful but beneficial. It will give more confidence in managing difficult cases. Transfer of surgical skills from experienced surgeons to resident surgeons is difficult because the teaching surgeon primarily acts as an observer rather than directly performing the procedure.

The following points can help in efficiently teaching surgical competencies to residents and optimizing this learning process.

(a) **Patients’ selection:** It is well-known that not all cases of patients are teaching cases. Arranging the list ahead of time is important so that the trainee can effectively perform his/her role. The ability to identify those patients who can tolerate resident intervention is crucial. It is also important to avoid certain patients who are not suitable for beginner residents; e.g., patients with monocular visual impairment, small pupils, pseudoxfoliation, pediatric patients or patients with low corneal endothelium. Unfamiliar procedures or devices should be completely avoided during training.

(b) **Operation room time management:** To avoid a significant delay in your list, a good control of OR environment is needed. Patients list should not be overloaded with cases, especially when training novice surgeons. During list creation, it is important to include cases that can be treated by the trainees with their limited experience. If it is the first list, it would be better
for the experienced surgeon to manage the first case to show the surgical way to the trainees. The whole training period should be planned, starting with observation, then doing a few steps, followed by simple cases and then difficult cases. And if training time allows, residents may share in supervising their junior colleagues that will build their ability to teach in the future. This approach to teaching surgery allows the trainees to progress in a planned way and to avoid overwhelming them with cases that may lead to complications and poor confidence. The presence of fellow-in-training can help more in the process of training. With a proper arrangement of OR list, the fellows should not compete with residents in performing surgical cases. The presence of fellows at training institution, if utilized appropriately, often enhances the education of the residents.9

(c) Good positioning and microscope handling: Appropriate positioning at the operating microscope is important in teaching cases. Awkward positioning of the teacher will make the surgery more difficult and affect his/her ergonomics.10 The residents’ cases often take a longer time and need attention, so neglecting good positioning will lead to musculoskeletal strain and affect overall performance of teaching staff. At the beginning of the case, seat, table and microscope should be adjusted to accommodate a neutral posture. When supervising trainees with different statures, slight spine tilt should be avoided, and the assistant eyepieces should be adjusted to correct that difference. The cords of the microscope and machine pedals should be arranged such that they do not conflict with switching position. Moreover, it is important to stand and perform upper body and back stretches in between cases, whenever possible.11

(d) Building and reinforcing the resident’s confidence: In my opinion, the most crucial step to have a successful mission is to know when to intervene during surgical cases either with comments or action. At the beginning, the most classic way should be used along with aids (capsular staining, hooks, good amount of viscoelastic devices, etc.) to have a smooth case. Minor complications like small capsulorhexis should be managed at the beginning of the case. If not managed properly, they may lead to an increase in major complications and decrease in the success rate by residents.12

It may be necessary for the trainer to switch positions to evaluate the status or to take over. This should be done in the spirit of cooperation, without emphasizing the resident’s failure. Mistakes are better addressed and discussed after the procedure is completed.

(e) Communicating well with your trainee: First, you need to explain to the trainees their roles and what they are supposed to do. It should not be assumed that the trainees know your ways and protocols. Especially for the beginners, the preoperative round is important for the medical aspect of cases, special preparation, and also for patient comfort. In OR, it is important to review the case, your approach and your goals with the resident before starting. I found it helpful to use videos or written formats to show the ways or protocols before touching the patient. There are many teaching videos that residents may review to help them in OR.

Note that ophthalmic patients are generally awake during surgery, so one must be careful about communicating in the OR for patient comfort. Postoperatively, the residents should be guided to be present in the first postoperative visit as teaching postoperative care is essential and as important as teaching in OR.13

For residents

Residents are the main factor for success. If anyone aspires to learn something, he/she will achieve it. Surgical techniques are important, but mastering ophthalmic surgeries requires much more than just techniques. One should be aware that the goals of any surgical training program include increasing the resident’s surgical confidence and skills, enhancing his/her surgical judgment and preserving the best possible outcome for the patient.1

Here are some suggested guidelines to give trainee the best outcome out of his/her training period.

(a) Evaluating patient preoperatively and surgical indications: Attending clinics and OR sessions but not paying attention to his/her patients will not qualify a trainee as a surgeon. The trainee is required to understand the patient’s complaint and evaluate him/her completely before the surgery. This would include surgical indications, proper clinical workups and patient’s expectations. It is essential to pay special attention to the patient’s anatomy to plan your surgery; for example, those with deep-seated eyes, pseudoexfoliation, high myopia, post-refractive eyes and poor pupil dilation. If the trainee knows his/her patients preoperatively, it will help him/her to work them up properly and thus eliminate most of the intraoperative surprises.

(b) Communicating with your attending physician: The patient’s case and the planned procedure should be discussed thoroughly with the treating consultant. Trainees should engage actively in surgical planning, biometry evaluation, and IOL selection. They should discuss phacoemulsification machine parameters, the reasons for modifications, the preferred surgical technique and instruments. It should be noted that being a good assistant, who can anticipate what is needed, is essential to become a competent surgeon. The OR list should be arranged ahead of time to save more time for your cases. Trainees should be familiar with the planned procedure by watching videos or other surgeons in action.

(c) Utilizing your time for learning surgical skills: Surgical training is complicated by the fact that the teaching surgeon primarily acts as an observer rather than directly performing the procedure. So, patient safety should be secured all the time. Therefore, simulator training and wet labs are utilized to reduce the learning curve of beginners, which establishes tissue awareness, dexterity and muscle memory.9

So, if the trainee does not have a chance to do a case in an OR list, he/she can still utilize his/her time in learning. One can practice microscope, suturing and instrumentations, which will help in future lists.
Being familiar with early signs of intraoperative complications and their management: Good knowledge about complications is needed for any surgical intervention. A good surgeon cannot prevent the occurrence of complications but will try to prevent them, and if complications happen, they will manage them in a proper way. Minor complications (e.g. limited capsular extension) can be reversed with no subsequent sequel if discovered early. Vitreous loss will happen in some of the cases, and the trainee needs to know how to handle it safely. Other major complications like drop nucleus, suprachoroidal hemorrhage can also occur. In such cases, it is extremely important to know the initial management to improve the final outcome.

Understanding and participating in postoperative care: The trainees should take time after each case to discuss every step of the surgery with the attending physician. Learning from postoperative care is as important as learning in OR. In the early stages of surgical training, the trainees should perform postoperative rounds with the attending physician. This step is very important in building up surgical experience.

In conclusion, there is a great need for improving surgical training during residency programs. With proper utilization of the current resources, one can expect improvement in achieving training objectives. Coordination among the three components of training (administrators, teachers and trainees) is crucial to have a successful mission.

Conflict of interest

The authors declared that there is no conflict of interest.

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