ORIGINAL ARTICLE

Implementation and Methodology of a Pilot, Localized Video Library of Cataract Surgeries for Residency Training in a Tertiary Philippine Eye Institute

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ABSTRACT

Objectives. Video-based learning of surgical skills is a useful complement in training programs. This is more evident where direct patient exposure is limited due to multiple factors. In ophthalmic surgery, access to high quality ocular surgery videos such as for cataract operations, can provide significant learning points for trainees in an institutional program. Creation therefore of a local, curated, and indexed library of cataract surgery would support alternative means to maximize training of new ophthalmic surgeons. The objective of the project was to develop a local library of cataract surgery videos as an adjunct teaching tool for resident trainees in a Philippine tertiary eye care center.

Methods. A collection of cataract surgery videos from 2013-2020 were compiled into a single workstation. Videos were reviewed and catalogued using set keywords for easy searchability and labelling.

Results. 256 videos of cataract surgeries were compiled into the library. 6 main headings for the keywords, with 159 total subheadings were established to provide robust tagging and search options to index the video.

Conclusion. Particularly in Ophthalmic surgery, refinement of surgical technique is essential in ensuring better post-operative visual outcomes. This is achieved through repetition and careful dissection of operative technique. The use of a library with multiple videos of a similar procedure allows trainees more exposure to certain cases. This ultimately affords trainees, better experience and confidence in their own surgeries.

Keywords: cataract, library, surgery

INTRODUCTION

In any surgical training program, it is most ideal to offer as much hands-on experience to surgeon trainees at the operating table. However, this might not be the most practical way to maximize learning. Increasing concerns for patient safety and staff well-being have forced multiple surgical specialties to rethink their curriculums and find alternative ways of teaching surgical skills.[1] Video recording of operations has therefore increased in popularity, as it affords surgeons to teach a wider audience, than just those trainees scrubbed in at the operating table during a given procedure.[2] In other specialties, such as laparoscopic surgery, procedures there have relied on video assisted devices with recording capabilities. This makes such a teaching method easier to carry out and allows teaching with more precise focus on certain aspects of the surgery, than you could previously do if you were performing the surgery live, on the table.[3] Use of instruments with video recording capabilities is also readily available in Ophthalmic surgeries. Recording also allows more flexibility

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in terms of the time constraints as to when a trainee can watch and learn from a particular procedure. And as we are currently facing the COVID-19 pandemic, academic training has shifted towards less exposure and contact among patients and healthcare workers. This means that teaching methods especially surgical training, has had to look for alternative ways to provide competent surgical training.[4] A survey of multiple Ophthalmic training institutions worldwide note a drop in the amount of didactic hands-on training available. Majority also still lack a simulation or video-based training program in their curriculum.[5] Addition of video surgical libraries can help address this learning gap.

More particular for Ophthalmic surgery, surgeons and their assistants are limited to the narrow surgical field of the eye, and the number of microscope eyepieces available. While studies have shown that increased hands-on surgeon experience results in decreased post-operative complications and better visual outcomes, high volume operative training might not be achievable for all training institutions. Institutions where there are more trainees, but surgical cases remain limited, or where interesting Ophthalmic cases are rare, will have trainees that graduate with less volume of cases and type of cases encountered.[6] Hence, the Ophthalmic field has historically relied on video terminals or recording of operative procedures, to better reach a wider number of trainees to watch or learn from a particular operation. Prior to performing a particular surgery on a complicated or rare case, trainees also usually brush up on their knowledge pre-operatively by watching videos of these cases being done by more experienced surgeons.[7] Ophthalmic surgical video presentations in conferences, or online, have therefore increased in popularity over the years. These presentations have proven to be an invaluable teaching tool for enhancing the skills of surgeon trainees. Video recordings by Ophthalmic surgeons has allowed them to highlight pertinent parts to trainees, or steps during the operation that they would not have initially noticed while performing the procedure. Watching videos on repeat also provides more detail on their insight and decision-making process, which are crucial skills for ophthalmologists-in-training.[6]

Cataract surgery is an integral part of any Ophthalmic residency training program. As the leading cause of reversible blindness worldwide, it is one of the conditions which any ophthalmologist must be proficient in, especially its surgery. Training programs worldwide have different requirements as to the minimum number of cataract surgeries a trainee must perform during their residency period.[8] For a skilled surgeon, cataract operation is normally accomplished in just a few minutes. Therefore, for trainees, reviewing this surgery as a video recording, becomes much more useful, as crucial parts of the surgery can be reviewed in slow-motion or in repeat. This viewing repetition often leads to refinement of the surgeon's operative technique. This is vital in cataract surgery, which is most of the time "routine" or consists of repeated and predictable steps. And so, creation of a video library, wherein multiple videos of cataract surgeries are stored and indexed, made easily available to residents of a training program, will help achieve this goal of producing more competent Ophthalmic surgeons.

The idea of presenting surgical videos has been commonplace in international conventions, and online, for several years. However, there has been no standardized system for how these videos are presented, catalogued, and verified according to the objectives of a particular training institution.[9] For a surgeon trainee in a particular institution, this leads to a more tedious and disorganized approach in trying to find videos for a particular case. The learnings from those videos might also be inconsistent with what their institution has been teaching them, which could cause further confusion. The objective therefore of a localized video library of cataract surgeries in a single institution is to make available a curated, indexed, and readily accessible source for high-quality surgical videos to its trainees. As an adjunct teaching tool, it could result in a better quality of surgical training, despite needing fewer hands-on surgeries. It would also mean less contact with patients, leading to better safety and post-operative outcomes for new Ophthalmic surgeons.

MATERIALS AND METHODS

The initial database for the library were of videos done by a single surgeon from 2013-2019 at the American Eye Center in Metro Manila, Philippines. Patient written informed consents were all taken prior to recording of these procedures, which included a clear and explicit note that the videos would be recorded and stored for academic and legal purposes. Anonymity was and will be preserved throughout the existence of the video library, with patient information only available to the primary surgeon, and the committee members who created the library. A separate master list of the original video files, which contained identifiers only by video number, and no patient identifier, was then created in order to preserve patient anonymity for anyone outside the committee. No further patient intervention was performed during the creation of the library. The library project is a joint memorandum with the American Eye Center, and was approved by the University of the Philippines Manila and Philippine General Hospital, prior to its full setup.

The video library and study protocol were conducted in full accordance with the Declaration of Helsinki, Good Clinical Practice, and confined within the laws and regulations of the University of the Philippines Manila-Philippine General Hospital and American Eye Center. Ethics board approval and registration was also done. Patient identity and involvement will be kept confidential and anonymous throughout the study and existence of the library. There were no anticipated risks for patients enrolled in the study, as they do not need to be withheld on necessary treatment while the study is ongoing.

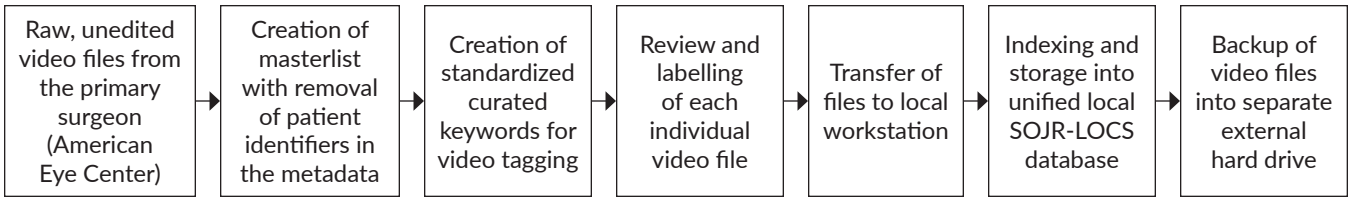

Figure 1. Workflow schematic for creation of the SOJR-LOCS database.

A local computer workstation was set-up at our institution, at the Department of Ophthalmology and Visual Sciences of the Philippine General Hospital. This library workstation is housed in its own separate room, identified as the Sentro Oftalmologico Jose Rizal – Library of Cataract Surgery (SOJR-LOCS), wherein the initial set of videos would be stored locally in the workstation's hard drive and serve as the only access point for resident trainees to review the videos for their knowledge. Online cloud storage or remote access was not considered at this point. This was to encourage trainees to maximize the actual workstation while at the hospital, and to prevent possible data breaches if the videos were hosted online. To further protect patient privacy, the master list files with patient information were not stored locally. The list was also password protected, known only to the committee members. Backup storage of these videos is in a portable password-protected, disk-based hard drive that is stored securely within our department in the hospital. A workflow of our setup is presented in Figure 1.

A library committee was created consisting of the primary surgeon and investigator of this library, graduates of the same residency training program, and senior residents of the institute. The committee was tasked with the following duties, listed in Table 1. To ensure the maintenance and longevity of the library, the committee members will also be tasked to recruit future members, should there be a need for more manpower. The committee is also primarily responsible for maintaining the quality of the surgical video library. This responsibility includes ensuring the database is well-maintained, keywords are updated, and any new video added to the library is first curated and deliberated on its value or contribution to the library collection.

A keyword database was curated and established by the library committee to provide consistent tagging of each video and subsequent video entries into the database. The list was categorized, and color coded according to various pertinent surgical information. Once the official list of keywords was created, each raw surgical video was then reviewed and labelled by a single ophthalmic surgeon observer using only these pre-approved words. To check for consistency, a second observer, also an ophthalmic surgeon, then verified these labels for the particular video.

Table 1. List of Duties of the SOJR-LOCS Committee

- Maintenance and upkeep of the library
- Formulation of library policy on usage
- Ensuring data security and patient privacy
- Physical security of the library and hardware
- Quality maintenance of new videos, including curation of which videos to include
- Backup of the database
- Recruitment of future members, including of surgeons who will contribute their videos to the library collection

The computer (Mac Mini 2020, Apple Computers, California, USA) consisted of a main computer display where the library could be accessed and maintained. It is also linked to a larger display monitor where a larger audience in the room could view the surgeries in detail and in a larger view, which would not be possible in a normal operating room setting. Guest user rules are prominently displayed in the main window of the computer home screen. The built-in file explorer system (Finder, Mac OS Monterey, Apple Computers, California, USA) of the computer served as the database of the videos, rather than additional third-party software. This was done in order to better ensure adaptability, robustness, and longevity of the video library database over a number of years. Future endeavors to expand the surgical video library, to include more cataract surgeries, or even include videos of other ophthalmic procedures, would be easier due to the use of the built-in file explorer system. More people are also familiar with its use and navigation rather than a separate third-party software, which means easier accessibility and operability of the video library for both committee members, and trainees who will use the interface.

Once logged in the video library system, each video then becomes searchable through clicking on the list of standardized keywords in the explorer window (Figure 2), or by typing a particular keyword in the search bar, where the video results become filtered as more keywords are inputted (Figure 3). Trainees will then be able to see various meta-data ascribed to the video (Figure 4). These keywords will become more robust and informative as indexing is enhanced in the future. Lastly, the videos can then be controlled and displayed on the bigger monitor to allow more detail to be appreciated while going through the process of the surgery.

RESULTS

The library consisted of 265 videos of surgeries recorded from the Zeiss OPMI Lumera 700 operating microscope (Carl Zeiss AG, Oberkochen, Germany). The keywords used to tag each video for indexing in the library are listed in

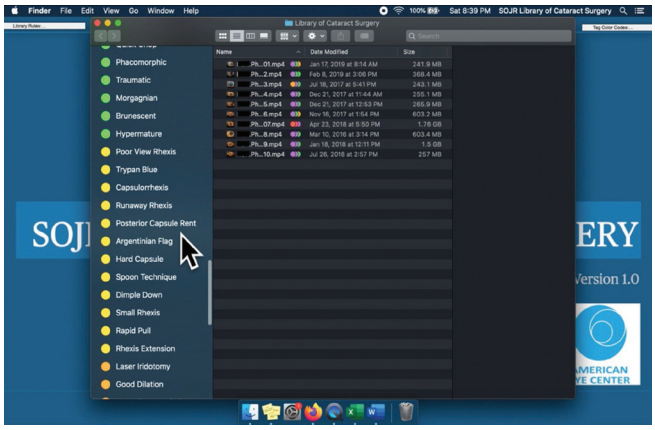

Figure 2. Screenshot of the SOJR LOCS database, showing color-coded keyword tags on the left-hand side of the display window.

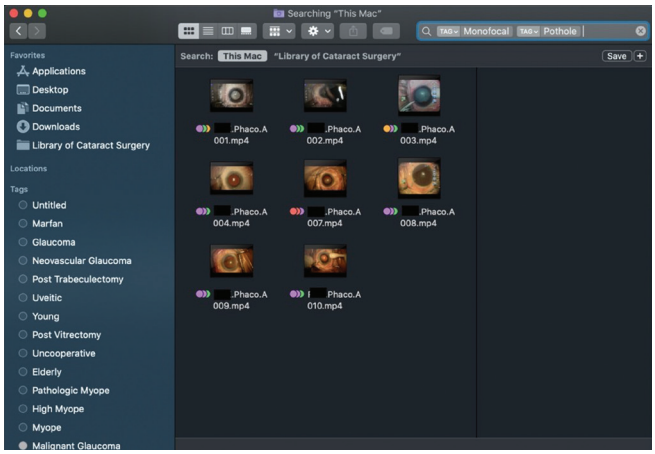

Figure 3. Screenshot of the SOJR LOCS database, showing videos filtered through input of keywords in the search bar.

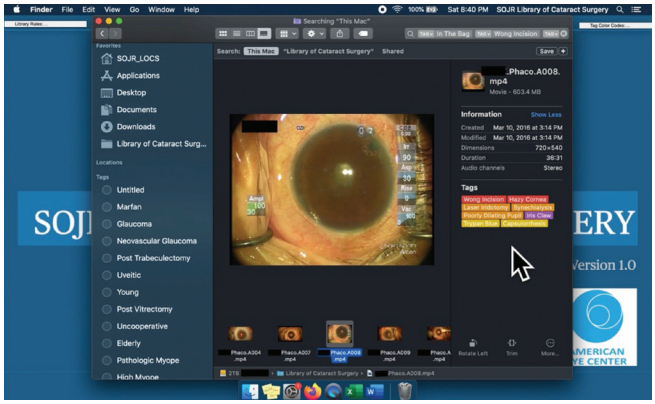

Figure 4. Screenshot of the SOJR LOCS database, showing keyword and metadata assigned to each video file.

Table 2. Eight main categories were identified, corresponding to patient demographics, or important anatomic considerations intraoperatively during cataract surgery. Furthermore, a total of 159 keywords were then established and used to tag each video. Majority of the keywords created were under the "Lens" heading.

DISCUSSION

As previously stated, multiple studies are in agreement that direct hands-on surgical experience is still the most invaluable tool in training. But in the presence of multiple unavoidable factors, the use of a video-based coaching method for teaching surgery provides a reliable alternative. Health pandemics forcing healthcare works to limit exposure to patients and surgeries, remote institutions in third-world countries having limited cases and quality of surgeries available for their trainees to perform, and many others, can all be addressed through development of curated surgical video libraries to enhance training.[4] There is still limited studies on how video-based coaching affects ophthalmic surgery training, but has been shown to be promising in other surgical fields.[7,10] One such study by Malik et al.[11] noted willingness of medical students to learn about ophthalmic surgery through educational videos. This shows promise that this can be an agreeable teaching method for ophthalmic surgeon trainees as well. Another study done in 2017, used wet lab training for cataract surgery using online instructional videos, and showed improvement in trainee competency scores after the course.[12] Such studies show that video-based learning is an acceptable tool to address limitations in surgical education at this time.

The creation of an in-house video library for our resident trainees affords multiple advantages. First, it affords more flexibility as to when a trainee can review a particular case, and not be limited to needing to be present at the operating room at the time of the surgery. Second, the videos being available locally in their home institution allows more convenience for trainees to review such surgeries, as well as being easier to search and navigate due to indexing and keyword tagging. Next, while there is increased availability of online surgical education videos in online video hosting platforms, the problem with these videos is that they are not curated or governed by the trainees' training institution. Specific learning points of a particular institution are therefore not emphasized in these random videos. This could influence how an inexperienced trainee would think that the procedure they are viewing is of good quality or not.[10,13] Discretion on the part of the viewer should therefore be emphasized when using such videos. The in-house library of cataract surgery however, addresses this aspect, as the videos are performed by consultants affiliated with their training institution, and have been curated to be presented in a standardized way, aligned with the training goals of their program. Trainees are also within easier communication with the surgeon in these

Table 2. List of Keywords in the SOJR-LOCS Database

Main Keyword Categories	Cornea	Iris	Capsule	Lens
Subheading Keywords	• Hazy cornea • Corneal scar • Low endothelial cell count • Triplanar incision • Biplanar incision • Monoplanar incision • Fuchs' endothelial dystrophy • Supraincisional • Stromal pocket • Penetrating keratoplasty • Corneal marker • Arcuate keratotomy • Corneal suture • Peritomy • ECCE wound • Superior incision	• Poorly dilating pupil • Small pupil • IFIS • Iridodonesis • Iris hooks • Viscodilation • Malyugin ring • Sphincterotomy • LIDRS • Synechialysis • Pneumosynechialysis • Pupilloplasty • Hypopigmented iris • Good dilation • Laser iridotomy • Peripheral iridotomy • Pseudoexfoliation • Irregular pupil • Carbachol injection • Anterior segment bleeding • Correctopic pupil • Repeat I/A	• Rhexis extension • Rapid pull • Small rhexis • Dimple down • Spoon technique • Hard capsule • Argentinian flag • Capsulotomy • Runaway rhexis • Capsulorrhexis • Trypan blue • Posterior capsular rent • Poor view rhexis • Femtosecond laser posterior • Capsulorrhexis • Capsular hooks • Enlarging the rhexis • Cystotome	• Hypermature brunescent • Morgagnian • Traumatic • Phacomorphic • Quick chop • Phaco chop • Stop and chop • Divide and conquer • Anterior subcapsular • Posterior subcapsular • Difficult rotation • Phacodonesis • No hydrodissection • Viscodissection • Epinucleus rotation • Reverse chop • Anterior phaco • Pothole • Lens dislocation • Intumescent • Total white • Adherent cortex • Adherent epinucleus • Thick posterior plate • Dry chop • Posterior polar • Retained lens material • No hydrodelineation • Lateral separation • Inside out hydrodelineation • Good hydrodissection • Transformer I/A • Bimanual I/A • Good hydrodelineation • Golden ring • Attempted phacoemulsification • Dropped nucleus • Phacofragmentation • Polar precautions • Seibel Flip
Main Keyword Categories	**Zonules**	**Intraocular lens**	**Vitreous**	**Patient Profile**
Subheading Keywords	• Zonulysis • CTR • Sutured CTR • Z-suture technique • Capsular tension ring • Hand shake technique	• Monofocal • Trifocal • Multifocal • Toric • Sulcus • In the bag • TSS • Yamane • Scleral fixated • ACIOL • Aphakia • Accommodating lens • Iris claw • Iris fixated • Three piece IOL • Irrigation and aspiration under IOL • IOL injector problem • IOL injector mishap • IOL cutter • IOL explant • Optic capture • Broken haptic • Posteriorly dislocated IOL • IOL Loading • Cortical cleanup • Polish	• Anterior vitrectomy • PPAV • Triamcinolone injection • Manual vitrectomy • Vitreous loss • Malignant glaucoma • Vitreous tap • Pars plana vitrectomy • Fluid misdirection syndrome • Pars plana lensectomy	• Myope • High myope • Pathologic myope • Elderly • Uncooperative • Post vitrectomy • Young • Uveitic • Post trabeculectomy • Neovascular glaucoma • Marfan • Resident case • Consultant case • Trabeculectomy • Down Syndrome • GDD • Shallow chamber • AC maintainer

videos, and so can more easily inquire or learn additional insight into the surgeon's thought-process.

As a pilot study in our department, only cataract surgeries are included in the initial library catalog. The benefits of the existence of such a library in the department, on the skill enhancement of the resident trainees, has also yet to be investigated and could certainly be done in future studies. Metrics, such as the amount of time trainees spend watching the videos in the library, and how it translates into their surgical outcomes, and other factors, could be investigated in future studies to validate the benefits of such a video library existing. Its effectiveness in other ophthalmic surgeries could also be investigated by expanding the library catalog to include recordings of those other surgeries. Comparison between a video library versus the use of a hands-on surgical simulator could also be done in the future. Lastly, as different institutions have different goals in their training programs, this video library could be opened up in the future to other institutions in the country, or serve as a guideline for other libraries.

CONCLUSION

To our knowledge, a curated, indexed, video library for cataract surgery in a tertiary eye care center of this volume does not exist elsewhere. This video library opens up the potential to enhance the training and competency outcomes of our resident surgeons, resulting in safer surgeries and better post-operative outcome for our patients. It affords easier availability and access to quality and verified information on cataract surgery, in a time where hands-on opportunities are becoming limited, to ensure that new graduates are still developed to be knowledgeable and competent Ophthalmic surgeons.

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Disclaimer

The views expressed in the submitted article are the authors' own and not an official position of the institution or the funder.

Statement of Authorship

LMGA contributed in the conceptualization of work, acquisition and analysis of data, and drafting and revising of manuscript. RCK contributed in the conceptualization of work, acquisition and analysis of data, drafting and revising of manuscript, and final approval of the version to be published.

Author Disclosure

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