

## ORIGINAL ARTICLE

# Effectiveness of Video Observation of Procedural Skills in Surgical Performance of Ophthalmology Residents

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## ABSTRACT

**Aim:** To determine effectiveness of video observation of procedural skills in surgical performance of ophthalmology residents.

**Methods:** This experimental study was done at the department of Ophthalmology, Lahore General Hospital Lahore from 1<sup>st</sup> July to 31<sup>st</sup> Dec. 2018. Sample was collected using non-probability purposive sampling technique. One surgical procedure was done four times by each resident that included chalazion surgery, pterygium surgery, extracapsular cataract extraction and phacoemulsification surgery. Surgery of each resident was recorded; later procedural skills were assessed by two independent supervisors using Likert scale for each mini-skill. The difference in score of 1<sup>st</sup> VOPS till 4<sup>th</sup> VOPS of each resident was documented. Each procedure was evaluated through a validated proforma.

**Results:** A total of twenty residents, five residents from each year of the four years residency program, age between 25 to 35 years, both gender male and female, who meet the inclusion criteria were included. Video observation of procedural skills (VOPS) scores of each resident demonstrated improved procedural skills in subsequent VOPS and mean scores of first VOPS versus fourth VOPS showed statistical improvement ( $p$ -value < 0.001). Mean VOPS score values of first year residents improved statistically from  $6.60 \pm 0.55$  to  $26.80 \pm 1.10$ , for second year residents from  $5.80 \pm 0.84$  to  $22.60 \pm 1.82$ , similarly for third and fourth year residents mean VOPS score values also improved statistically from  $12.00 \pm 1.87$  to  $41.60 \pm 3.29$  and  $17.20 \pm 4.38$  to  $39.40 \pm 4.28$  respectively.

**Conclusion:** Video Observation of Procedural Skills (VOPS) is effective in improving surgical skills of ophthalmology residents.

**Key words:** Effectiveness, Ophthalmology Resident, Procedural Skills, Performance, Video Observation of Procedural Skills.

## INTRODUCTION

Teaching and training of the postgraduate medical students in healthcare system is a dynamic field. Evolution in the field of medicine is constant and ongoing with rapid advances in the field. In order to ensure that training is contemporary with the continuous evolution of the profession, changes to postgraduate medical education is taking place worldwide<sup>1</sup>.

There are different assessment methods to evaluate the procedural skills of residents. Direct observation of procedural skills (DOPS) and video observation of procedural skills (VOPS) are two most commonly used methods to assess such abilities. In DOPS, a resident performs a procedure and the supervisor observes his performance directly. In a DOPS assessment on independent practitioners of aspirant colonoscopists it was concluded that the practitioners performs well, with good levels of reliability and validity, and is sufficient to be used in a high-stakes assessment<sup>2</sup>.

Similarly the DOPS method was used to assess the practical skills on midwifery students and similar approaches should be considered for assessment of competence in other areas of clinical practice for relicensing or re credentialing. It has high face validity and setting closely resembles clinical settings. However, the most important shortcoming of DOPS is that large number of residents cannot be accurately assessed at the same time.<sup>3, 4</sup> The performance of residents may be suboptimal if they know that they are being observed. Similarly the results of research show the effectiveness of role-playing method, this method can help the teachers to plan for the modification of educational programs in their respective course of apprenticeship and internship and improve the management skills of students<sup>5</sup>.

The other assessment methodology is VOPS in which the resident's performance is recorded and assessed later by the supervisor. This method provides adequate time for the observer to assess precisely each step of procedure and give feedback<sup>6,7</sup>.

In our setting supervisor has to supervise more than fifteen postgraduate residents in Ophthalmology and it is not possible to directly observe all of them in four different operation theatres. Video recording of the surgical procedure is an alternative to direct observation in our situation.

The objective of the study was to evaluate the effectiveness of the VOPS in ophthalmology training.

## METHODOLOGY

The study was conducted at the Department of Ophthalmology, PGMI/ Ameer-Ud-Din Medical College, Lahore, from 1<sup>st</sup> July to 31<sup>st</sup> December 2018 after approval of Ethical Review Board. It was a weak experimental study design as we only had the intervention group and there was no randomization. Sampling was done by non-probability purposive sampling technique. The residents of 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> year residency purposely sought out predetermined surgical procedures without randomization. A total of 20 residents, five residents from each year of residency i.e. 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> year were included in the study while cases were equally divided in each year residents. G-power statistical software version 3.1 was used for sample size determination. Sample size was calculated taken expected mean VOPS score as  $8.4 \pm 1.08$ . The calculated effective size and power ( $1-\beta$ ) were 0.83 and 0.95 respectively. A total of 18 were required to justify the effectiveness of the VOPS. However, we considered ( $n=20$ ) residents to have a margin of 10% in cases of dropouts.

Residents of age between 25 to 35 years, both genders male and female were included. Residents of 1<sup>st</sup> year who had assisted chalazion surgery 10 times and were performing surgery independently, residents of 2<sup>nd</sup> year who had assisted pterygium surgery 10 times and were performing surgery independently, Residents of 3<sup>rd</sup> year who had assisted extra capsular cataract surgery at least for 50 times at the time of participation in this study and were performing surgery independently and residents of 4<sup>th</sup> year who had assisted phacoemulsification 100 times and were performing surgery independently were included in study.

Doctors meeting the above criteria but not a part of any training program and those residents who met the above criteria

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but they need more observation before performing surgery independently were excluded from the study. Residents who fulfilled the inclusion criteria performed the surgical procedures that were recorded. All of these four surgeries were assessed using mini skills, which were graded through Likert Scale (Table 1).

Two independent supervisors using Likert scale for each mini skill assessed procedural skills of the residents. After assessment feedback was given to the residents about their performance. After feedback residents were asked to perform surgery again and were recorded again for VOPS. Each resident underwent VOPS for 4 times. Assessment scores of 1<sup>st</sup> VOPS till 4<sup>th</sup> VOPS of each resident were documented.

**RESULTS**

Residents from each year of residency went through four VOPS. Resident's surgical performance in each VOPS was assessed and two independent supervisors gave feedback. Study results demonstrated that each resident showed improved procedural skill in subsequent VOPS and scores improved from first VOPS to fourth VOPS (Table 2). A total of 16(80%) male residents and 4(20%) female residents participated in the study having age range from 25 to 33 years and mean age of residents was 28.9 years. In the first year resident group of five residents, 3(60%) male and 2(40%) female were included, age range was 25 to 28 years, mean age 26.4 years, results demonstrated an overall average

improvement in procedural skills in subsequent VOPS that improved from 26.7% in the first VOPS to 90% in the fourth VOPS. The scores showed statistical improvement with a p-value < 0.001. In the second year resident group of five residents, 4 (80%) males and 1 (20%) female were included, age range was 27 to 29 years and mean age of second year residents was 28 years. Results demonstrated overall improvement of 84% from 20% at the start of VOPS and scores showed statistical improvement with a p-value < 0.001 (Table 2 &3).

The third year residents group again had 5 residents, all 5 (100%) were males, age range was 29 to 31 years, mean age 29.6 years. Results demonstrate statistical improvement in fourth VOPS scores, p-value <0.001 and overall score improved to 76% in the last VOPS. Similarly among the fourth year residents, 4(80%) males and 1(20%) female, age ranged between 30 to 32 years, with a mean age of 31.6 years, results demonstrated improved procedural skills in subsequent to 82.2% in the last VOPS compared to 22.2% in the first VOPS with a p-value 0.002 (Table 2&3).

Our results show that performance of almost all residents increased in each surgical step after every VOPS. There were few exceptions in which resident's performance declined in subsequent VOPS. Rapid improvement in simple and easy surgical steps was observed while technically difficult steps were difficult to learn and needed more discussion after each VOPS.

Table 1: Distribution of mini-skills of each surgical procedure according to the Residency Year.

Year 1	Year 2	Year 3	Year 4
Chalazion Surgery Steps	Pterygium Surgery Steps	Extra Capsular Cataract Surgery Steps	Phacoemulsification Steps
Draping of the patient	Anesthesia	Limbal incision	Incision
Local Anesthesia	Separation from cornea	Cystotome formation	Capsulorrhexis formation
Lid Eversion	Excision of body	Capsulotomy	Hydro-dissection
Incision	Stem cell graft excision	Nucleus delivery	Nucleus fragmentation technique
Curettage	Graft suturing	Injection of viscoelastic	aspiration of nuclear fragments
Bandage		Irrigation & aspiration	Irrigation & aspiration of cortical material
-	-	IOL implantation	IOL implantation
-	-	Limbal suturing	Anterior chamber formation
-	-	Anterior chamber formation	Wound closure

Table 2: Pilot study results in mean and percentage values

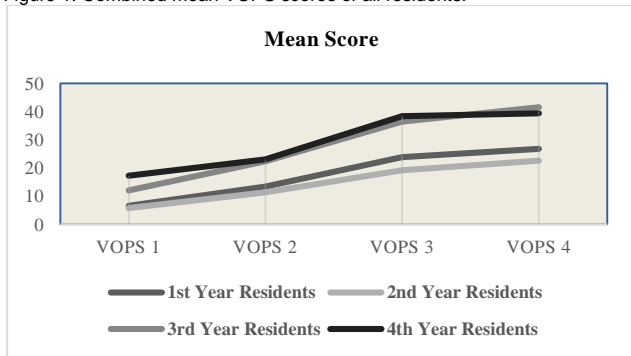
	Resident of First Year		Resident of Second Year		Resident Of Third Year		Resident Of Fourth Year	
	Mean	Percentage	Mean	Percentage	Mean	Percentage	Mean	Percentage
1 <sup>st</sup> VOPS	1.33	26.7%	1.00	20%	1.00	20%	2.11	22.2%
2 <sup>nd</sup> VOPS	2.33	46.7%	1.80	36%	1.80	36%	2.78	55.5%
3 <sup>rd</sup> VOPS	4.00	80%	3.40	68%	2.80	58%	4.22	84.4%
4 <sup>th</sup> VOPS	4.50	90%	4.20	84%	3.60	76%	4.11	82.2%

Video Observation of Procedural Skills

Table 3: Combined mean scores and p-values of all residents

	Total Number of Residents	1 <sup>st</sup> VOPS		4 <sup>th</sup> VOPS		P Value
		Mean	Standard Deviation	Mean	Standard Deviation	
First Year Residents	5	6.60	± 0.55	26.80	± 1.10	< 0.001
Second Year Residents	5	5.80	± 0.84	22.60	± 1.82	< 0.001
Third Year Residents	5	12.00	± 1.87	41.60	± 3.29	< 0.001
Fourth Year Residents	5	17.20	± 4.38	39.40	± 4.28	0.002

Figure 1: Combined mean VOPS scores of all residents.



**DISCUSSION**

Video Observation of Procedural Skills (VOPS) is recently being introduced in our clinical teaching settings in which trainee's procedural performance is recorded and then evaluated by the supervisor and feedback is given. Before the introduction of this technique, clinicians had to focus on the individual performance of the students. It was practically not possible to give the due attention to all the students at one sitting.

This method provides flexibility to the supervisors to assess the procedures individually with detail at his convenience. After assessment a detailed analysis can be shared with the student deficiencies highlighted for improvement<sup>7, 8</sup>.

There's still a disagreement amongst residents and faculty across the spectrum on the best way of teaching and achieving educational goals.<sup>9</sup> A survey done by Johnson et al of residents and faculty surgical procedure showed a significant difference in

perceived learning needs of residents. There is a need to provide targeted information and feedback on surgical skills to the residents in order to identify the areas that need improvement.<sup>10</sup> A visual examination is an educational intervention that strengthens interactional training points in a stressful environment than the operating room.

Our study results are comparable to other studies conducted in this regard. A one-year trauma education program conducted using simulations scores were calculated at one and four months intervals for comparison. The study concluded improvement ( $P < 0.05$ ) in team performance using innovative video technology<sup>11</sup>.

In another study twenty-six surgical residents performed laparoscopic Nissen fundoplication in pigs. Their surgical performance was video recorded and rated afterwards. The study concluded that recorded video performance improved surgical performance similar to our study<sup>12</sup>.

The conventional method of surgical teaching requires improvement as demonstrated by different researches. There's a need for a targeted approach towards learning surgical skills with a performance based analysis of the surgical techniques that are video recorded and discussed for feedbacks and improvement<sup>13</sup>.

Video assessment of basic surgical tissue handling techniques is easy, authentic and an extremely sensitive method. It helped in improvement of surgical skills. However videos reviewed by trainees themselves does not improve performance, while review by an expert provides significant positive feedback and improves future performance<sup>14,15</sup>.

Ophthalmology residents can also benefit from this method since most of the procedures can be easily recorded and reviewed later. In a study on ophthalmology residents it was concluded that VOPS is a reliable, valid and feasible assessment method for postgraduate residents<sup>16,17</sup>.

In our study 20 post graduate Ophthalmology residents performed four different procedures. They were divided into four groups of 5 each according to their year of postgraduate training. Residents in each group performed same surgical procedure, which was recorded and assessed by supervisor. Video observation is relatively easy and convenient method of assessment for supervisor as it is almost impossible for a single supervisor to directly observe 20 residents in operation theatre. More-over recorded videos can be used for self-assessment for trainees as well.

The findings of our study have to be seen in light of some limitations. The performance of the residents during VOPS may be suboptimal, as they know that their surgical procedures are being recorded. There was variability in case complexity of the similar pathology among different residents, for example, fourth year residents who performed phacoemulsification surgery, among them some residents got early stage nuclear or sub-capsular cataracts that were easy to perform upon, while others performed surgery for mature and hyper mature cataracts that was surgically difficult to perform. This may have affected surgical performance of residents and VOPS score. Similarly patients were operated under local anesthesia and different patients may have different pain threshold and co-operation during surgery. These factors may affect the VOPS score. These and personal factors of the residents including wellness, tiredness, stress and anxiety were not included in the study parameters<sup>18,19</sup>.

Our study results serves as a basis for large scale future trials that should incorporate the limitations of this study in order to further facilitate and validate the importance of video observational skills in our clinical settings. The procedure provides a gradual learning curve that improves the clinical performance of the residents as shown by the results, it provides flexibility to both the residents and supervisors and this freedom helps in providing a focused approach towards the desired clinical outcomes. Since most of the ophthalmic setups in the tertiary care units are equipped with video recording devices this approach can be easily

incorporated into our system with minimal investment and minimal learning curve.

## CONCLUSION

Video Observation of Procedural Skills (VOPS) is effective in improving surgical skills of ophthalmology residents.

**Conflict of interest:** Nil

**Author's contribution:** HAK & UM designed this study HMB & MAH collected data, AR: statistical analysis, counselling of patients

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