

The Royal College of Ophthalmologists' National Ophthalmology Database study of cataract surgery: Report 6, The impact of EyeSi virtual reality training on complication rates of cataract surgery performed by 1st and 2nd year trainees

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Introduction:

Posterior Capsule Rupture (PCR) with or without vitreous loss is the most frequently recorded intraoperative complication of cataract surgery, and can lead to higher risks of further surgery, infection and loss of vision.

Higher PCR rates have been reported for first year (ST1) and second year (ST2) trainee surgeons than for consultant surgeons; 5.1% compared to 1.9%.

Prior to the introduction of the EyeSi surgical simulator (VR Magic) to the UK from 2010 onwards, cataract surgery training had been a combination of microsurgical skills courses, wet-lab training using animal or model eyes and experiential learning in theatre.

Since 2010 there has been an increasing uptake of EyeSi simulation training in the UK. This analysis aimed to investigate the introduction of EyeSi training on the PCR rates of first and second year trainee surgeons.

Methods:

Using The Royal College of Ophthalmologists' National Ophthalmology Database (RCOPHth NOD), 29 centers were identified with cataract surgery records from 2009 onwards (at least one year prior to the introduction of EyeSi). These centers all had data for at least 50 cataract operations performed by ST1 and/or ST2 trainee surgeons.

The centers were contacted to determine when they introduced EyeSi training and which other hospitals/trainees in their Deanery had access to their EyeSi. Of these, 23 centers had either purchased or had access to an EyeSi and 6 centers had no access to an EyeSi.

An eligible cataract operation was defined according to the criteria used for eligibility in the National Cataract Audit (NOA) (www.nodaudit.org.uk). Only operations performed by an ST1 or ST2 trainee were included.

Centers were grouped into those with an EyeSi on site, those with access to an EyeSi off site and those with no access to an EyeSi. Statistical comparisons of PCR rates used Chi-squared tests and all analysis was performed using STATA 14.

Results:

17,831 cataract operations were performed by 265 ST1 and ST2 trainee surgeons.

A higher proportion of operations were performed by ST1 and ST2 trainee surgeons who had access to an EyeSi in the latter years of the study, Figure 1.

The case complexity according to the NOA PCR risk factors were almost identical between the Before EyeSi, After EyeSi and No EyeSi groups (Tables 1 and 2).

Over the study period, the unadjusted PCR rates decreased for the with access to an EyeSi group, Figure 2, and this applied when the access was either 'on site' or 'off site', Figure 3.

The overall ST1 and ST2 trainee PCR rates for before, after and no access to EyeSi were 3.5%, 2.6% and 3.8% respectively, Table 3.

Figure 1: The percentage of operations performed by ST1 + ST2 trainees.

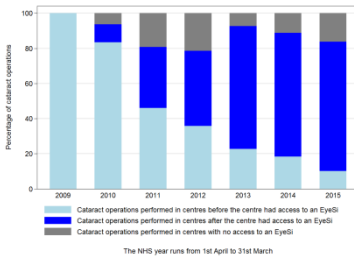


Figure 2: Unadjusted PCR rates for ST1 and ST2 trainees by NHS year.

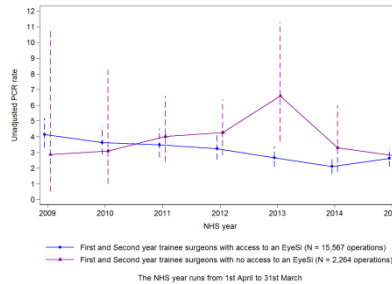


Figure 3: Unadjusted PCR rates for ST1 + ST2 trainees with access to an EyeSi by NHS year.

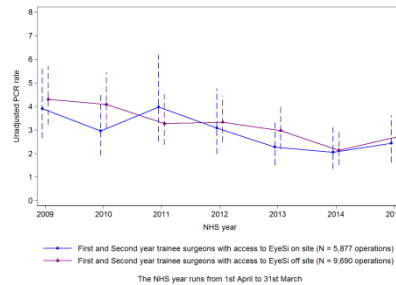


Image of an EyeSi surgical simulator (VR Magic).



Table 1: The percentage of operations performed by ST1 + ST2 trainee surgeons according to the NOA patient level PCR risk factors.

	Before access to EyeSi	After access to EyeSi	No access to EyeSi	Overall
Number of operations	6,919	8,648	2,264	17,831
Patients age at surgery (years)				
<70	21.4	23.2	23.9	22.6
70 - 74	16.7	16.6	15.8	16.5
75 - 79	22.9	23.4	22.6	23.1
80 - 84	22.1	21.4	21.8	21.7
85 - 89	13.6	12.2	11.9	12.7
≥90	3.4	3.3	4.0	3.4
Patients gender				
Female	60.5	60.5	61.3	60.6
Male	39.5	39.5	38.7	39.4
Patients ability to lie flat during surgery				
Yes	99.2	99.6	98.8	99.3
No	0.8	0.4	1.2	0.7

Table 2: The percentage of operations performed by ST1 + ST2 trainee surgeons according to the NOA eye level PCR risk factors.

	Before access to EyeSi	After access to EyeSi	No access to EyeSi	Overall
Number of operations	6,919	8,648	2,264	17,831
First eye surgery	55.7	54.2	56.3	55.0
Second eye surgery	44.3	45.8	43.7	45.0
Presence of ocular co-pathology / known PCR risk factor				
Amblyopia	1.6	2.3	1.8	2.0
Brunescient / white cataract	3.1	1.6	2.4	1.5
Diabetic retinopathy	5.3	6.0	6.9	5.9
High myopia	2.3	2.4	2.6	2.4
Pseudoexfoliation / phacodonesis	0.1	0.3	0.4	0.2
No fundal view / vitreous opacities	0.6	0.4	0.5	0.5
Previous trabeculectomy surgery	0.1	<0.1	0.3	0.1
Unspecified 'other'	2.5	2.4	2.7	2.5

Table 3: Overall PCR rates for ST1 + ST2 trainees, before, after and with no access to an EyeSi.

	Before access to EyeSi	After access to EyeSi	No access to EyeSi	Overall
Number of operations	6,919	8,648	2,264	17,831
Number of cases of PCR	244	225	86	555
Unadjusted PCR rate	3.5%	2.6%	3.8%	3.1%

Before vs. After access to EyeSi: 3.53% vs. 2.60% ($p = 0.001$)

Before vs. no access to EyeSi: 3.53% vs. 3.80% ($p = 0.546$)

After vs. no access to EyeSi: 2.60% vs. 3.80% ($p = 0.002$)

Conclusions:

- First and Second year trainee surgeons unadjusted PCR rates have been decreasing since 2009.
- Any decrease in complications of surgery have benefits for patients.
- The reduction in PCR rates aligns with the introduction of EyeSi simulator training.

Acknowledgments:

We would like to thank both the hospitals and the staff collecting the data for participating in the national ophthalmology audit.

All NOA participating centers are listed on the RCOPHth NOD website (www.nodaudit.org.uk).

It is with deep regret that we note the death of our friend and colleague Robert Johnston, who sadly died in September 2016. Without his inspirational vision, determination and career long commitment to quality improvement in ophthalmology this work would not have been possible.