The ROYAL COLLEGE of OPHTHALMOLOGISTS

NOD
NATIONAL OPHTHALMOLOGY DATABASE
AUDIT

National Ophthalmology Database Audit

Feasibility study of Post-cataract Posterior Capsule Opacification

2021

The Royal College of Ophthalmologists (RCOphth) is the professional body for eye doctors, who are medically qualified and have undergone or are undergoing specialist training in the treatment and management of eye disease, including surgery. As an independent charity, we pride ourselves on providing impartial and clinically based evidence, putting patient care and safety at the heart of everything we do. Ophthalmologists are at the forefront of eye health services because of their extensive training and experience. The Royal College of Ophthalmologists received its Royal Charter in 1988 and has a membership of over 4,000 surgeons of all grades. We are not a regulatory body, but we work collaboratively with government, health and charity organisations to recommend and support improvements in the coordination and management of eye care both nationally and regionally.

The ROYAL COLLEGE of OPHTHALMOLOGISTS

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Contents

Executive Summary

601,084
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From the Royal College of Ophthalmologists (RCOphth) National Ophthalmology Database (NOD) Cataract Audit dataset, 601,084 cataract operations performed by 2,566 surgeons in 58 centres were included in this analysis. Evidence of subsequent Posterior Capsular Opacification (PCO) or Yttrium Aluminium Garnet (YAG) posterior capsulotomy was identified from Electronic Medical Records (EMR) of the centre which had provided the cataract surgery. Attendance for eye care by patients previously operated for cataract for any reason without documentation of PCO or performance of YAG capsulotomy was taken as evidence of PCO not being present.

The overall one-, three-, and five-year PCO rates were 4.0%, 18.0% & 31.2% respectively.

Many Intraocular Lens (IOL) models and centres had higher observed PCO rates, as did lenses with a hydrophilic component. However, multiple surgical and ocular factors were found to influence the risk of PCO and none of these alone can account for the vast variation in observed PCO rates between IOL models or centres.

About half of the centres have a single preferred IOL model which they use in >90% of cases.

This strong association of centres with IOL models coupled with the very large variation in PCO rates between centres, introduces a great deal of uncertainty about the source of variation in the observed PCO rates. Therefore this analysis of RCOphth NOD cataract audit data cannot definitively state that any individual IOL put the patient at higher risk of developing PCO.

Consequently, the RCOphth NOD cannot advise changes in clinical practice regarding which IOL to use.

The same caution is not enforced for utilisation of the data to explore patient-related ocular or operative risk factors for PCO hence covariates that increased the risk of developing PCO included an axial length >26 mm, the presence of high myopia and implantation of lower IOL powers, previous vitrectomy surgery and uveitis / synechiae, along with younger age and female gender.

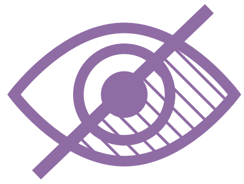
On the basis of this work we would recommend:

- Comparison of PCO rates for different IOL's utilised within the same centre would appear to be feasible and should be encouraged in order for centres to identify IOL which minimise the visual loss caused by PCO and the need for subsequent YAG laser for their patients.
- The extent of variation found suggests that there could be substantial benefits to patients and to the NHS from identifying IOL's or other modifiable risk factors that impact PCO rates.
- Contributing centres should investigate measures to improve data collection, including moving to utilisation of EMR across their whole eye service including any community-based follow-up.
- The cost of YAG laser capsulotomy to the NHS is £132 on average. It would be a false economy, therefore, for NHS providers to opt for a less expensive IOL with higher PCO rates. The perverse incentive created due to the purchaser provider split needs to be resisted, and PCO rates given due consideration when tendering for IOL's.

- The RCOphth has applied for section 251 exemption to facilitate data linkage, and if granted then repeat of a national PCO rate evaluation based upon RCOphth NOD data may be appropriate. Timing of repeated analysis would be best set for after completion of national EMR procurements and leaving a sufficient interval after normalisation of health care processes post-pandemic.

1. Introduction

A cataract is a clouding of the lens in the eye which sits just behind the iris, the coloured part of the eye. Normally the lens is clear and helps to focus light entering the eye. Developing cataracts causes sight to become cloudy, misty and unclear. Cataracts can affect either or both eyes, and usually do affect both eyes. They are treated by surgery, during which the cloudy lens is removed and replaced by an artificial lens. The artificial lens is known as an intraocular lens (IOL). There are no medicines or eye drops that can successfully treat cataracts; surgery is the only way to treat them.



Cataract surgery is the most frequently performed surgical procedure in the UK, with around 472,000 operations funded by the NHS in England and Wales during the 2018-2019 national cataract audit year nodaudit.org.uk/resources/publications-annual-report. Some weeks following cataract surgery, most patients attend their community optometrist (high street optician) for updating of their glasses prescription, and at this point the final 'best-corrected' visual acuity is established.

For the majority of patients, avoidance of intraoperative complications is achieved and follow-up is completed after the assessment of postoperative visual acuity (VA). Unfortunately, there are some known long-term issues affecting patients who have cataract surgery, for example Posterior Capsular Opacification (PCO), which can occur months or years after cataract surgery.

PCO occurs when a cloudy layer of scar tissue forms behind the lens implant; this can cause blurred or hazy vision or glare from lights. PCO is estimated to occur in roughly one in five eyes that have cataract surgery and is usually treated by Yttrium Aluminium Garnet (YAG) laser surgery. Reductions in the incidence of PCO would be of benefit to patients as they could avoid undergoing YAG laser capsulotomy, which while considered a safe procedure, can lead to complications that could require further medical interventions. Avoidance of PCO would help liberate NHS resources that could benefit patients elsewhere in the system, as when PCO is avoided, patients will have fewer hospital visits. The benefits to the NHS and to patients are particularly important given the elderly age of many patients having cataract surgery, the various issues the COVID pandemic has inflicted and the scale of cataract surgery provision in the UK, thus PCO and its treatment are economically important. Data from NHS Digital informs us that the HRG most frequently used for YAG capsulotomy (BZ33Z) was recorded over 60,000 times in England during the NHS 2018/19 year with a mean cost of £132, hence incurring the expenditure of >£8 million.

This report contains an analysis of data submitted to the Royal College of Ophthalmologists National Ophthalmology Database Audit (RCOphth NOD) investigating the feasibility of reporting post-cataract PCO outcomes for different types of IOL's implanted during surgery and centres. The study comprises operations performed over an eight-year period and is funded by Alcon Eye Care UK Limited as part of the grant contribution for the sustainability of the RCOphth NOD.

2. Aims

The aim of this analysis is to attempt to determine the risk factors for the development of PCO, and to explore the feasibility of periodic reporting and comparison of PCO rates for individual IOL models, IOL material, type of IOL and contributing centres.

3. Methodology

3.1 The RCOphth NOD database

The RCOphth NOD receives anonymised data from participating NHS Trusts in England, Local Health Boards in Wales and Independent Sector Treatment Centres providing publicly funded cataract surgery in England, Wales and Guernsey. The data is recorded on electronic medical record systems (EMR) or in-house databases and submitted annually for cataract operations using phacoemulsification to treat patients aged 18 years or older, where the primary intention was cataract surgery and not combined 'cataract + other' surgery, unless the 'other' surgery formed part of the cataract operation (e.g. an operative manoeuvre to increase the size of the pupil). Further information on an audit eligible cataract operation can be found on the audit website.

The data is recorded on the Medisoft EMR system (Medisoft Ophthalmology, Medisoft Limited, Leeds, UK, medisoft.co.uk), the Open Eyes EMR system (openeyes.org.uk), or 'in-house' data collection systems compliant with the National Cataract Dataset. Only EMR enabled centres are included in this analysis due to the in-house data collection systems submitting follow-up data at one fixed time point after surgery, instead of serial postoperative data. Only data from English NHS Trusts, Welsh Local Health Boards and Guernsey are included as these institutions can provide ocular services for more than just cataract surgery, for example age-related macular degeneration, glaucoma, medical retina, and non-cataract ocular surgery, thus these institutions have the facility to record follow up data from these services for eyes that do not develop PCO, whereas providers with an incomplete clinical repertoire, in some cases restricted solely to providing cataract and YAG capsulotomy services, have little opportunity to see patients who are PCO-free, hence would generate artificially high PCO rates.

3.2 Eligibility

Cataract operations submitted by English NHS Trusts, Welsh Local Health Boards and Guernsey to the RCOphth NOD complying with the national cataract audit eligibility criteria regarding planned cataract surgery are eligible for analysis, if from a centre that has a record of at least one case of PCO more than one month after cataract surgery. Operations with at least one month's follow-up are included, where the follow-up data could be for any post-surgery hospital visit for either clinical assessments or treatments. The study time period concerns operations performed between 01/04/2010 and 31/03/2018 with 31/08/2019 as the last date of any follow-up record, this enables all operations to have the opportunity for a minimum of one year and five months follow-up.

Excluded from the analysis are operations where no IOL was inserted, the IOL was not recorded, the IOL was one of the infrequently used (<1,000 operations) IOL's that could not be allocated to the IOL model grouping, operations with <1 month follow-up or with a missing patient age at surgery. Further exclusions are operations with missing IOL power as this could indicate the eye was left aphakic, operations where the recorded IOL power is outside the range of -10 to +40 dioptres and eyes with a recorded axial length measurement <18 mm as these could be abnormal eyes or data entry errors. Finally, only centres with at least 50 operations satisfying the above criteria are included in the analysis.

Each specified IOL has been allocated to an IOL model group based on specifications and manufacturer, and each of these groups has been allocated to secondary groups for the IOL material and IOL type. The IOL model allocation information can be found in Appendix 11.

3.3 PCO definition

Post-cataract PCO can be identified from postoperative complications, post-cataract surgical records and post-cataract diagnoses from eight days post-cataract surgery to the date of the last record of any post-cataract assessment for the patient. The first record of PCO post-cataract surgery is used as the index event for PCO, and for non-PCO eyes the last assessment date for the patient is used as a surrogate for final follow-up.

PCO is divided into YAG indicated (PCO YAG) and YAG not indicated (PCO no YAG) where this separation is detailed below;

From post-cataract postoperative complication records;

- Posterior Capsule Opacification - YAG indicated = PCO YAG
- Posterior Capsule Opacification = PCO no YAG

From post-cataract surgery records;

- YAG Posterior Capsulotomy = PCO YAG
- Posterior Capsulotomy (intended) = PCO YAG
- Posterior Capsule Capsulorhexis = PCO no YAG

From post-cataract diagnosis records;

- Posterior Capsule Opacification - YAG Capsulotomy indicated = PCO YAG
- Posterior Capsule Opacification – Surgical Capsulotomy indicated = PCO YAG
- YAG indicated = PCO YAG
- Posterior Capsulotomy (intended) = PCO YAG
- Posterior Capsule Opacification - YAG Capsulotomy not indicated = PCO no YAG
- Posterior Capsule Opacification = PCO no YAG
- YAG not indicated = PCO no YAG
- Posterior Capsule Capsulorhexis = PCO no YAG

For eyes with records of PCO on the same date, any record indicating YAG supersedes a record not indicating YAG. This logic is extended to records within six months of each other to allow for time between identification and surgery, for example a surgery record of 'YAG indicated' four months after a diagnosis or postoperative complication record of PCO no YAG. In this situation the date of the earlier record is used as the date of PCO and the eye is considered a PCO YAG case.

3.4 PCO as failure analysis

As PCO can occur at different points in time, the Kaplan-Meier method with the actuarial adjustment was used where PCO is the failure event to graphically display the failure rates over time and to create the observed PCO rates at specific post-cataract surgery time points.

Failure rates are created for PCO where PCO is the 'event' and eyes that do not develop PCO are censored at the date of the last clinical record for the patient. When creating failure rates for PCO YAG, the PCO no YAG cases are considered as 'event free' as they have not experienced PCO YAG. Similarly, when creating the PCO no YAG failure rates, cases of PCO YAG are considered as 'event free'. The failure rates for PCO YAG and PCO no YAG will sum to the PCO failure rate only at the first reported post-surgery time point, after this they will not sum to the PCO rate due to how Kaplan-Meier estimates are calculated and the reducing number at risk over time. At each reported time point the failure rate is the cumulative probability of PCO occurring up to the relevant time point.

3.5 Covariate definitions

The centre identifier used in this analysis is a unique identifier created from the number of eligible operations each centre has, where centre one is the centre with the most operations and centre 58 the fewest. This identifier is not the same as the centre number used in the published the RCOphth NOD annual reports.

The grade of operating surgeon was categorised as consultant surgeons, career grade non-consultant surgeons (associate specialists, staff grades and trust doctors), more experienced trainee surgeons (fellows, registrars and specialty trainees/registrars years 3-7), and less experienced trainee surgeons (senior house officer, specialty trainee/registrars years 1-2 and foundation doctors years 1 and 2).

Posterior capsular rupture (PCR) and preoperative VA are defined as in the RCOphth NOD with these definitions in Appendix 2. Further information about the data submitted to the RCOphth NOD can be found on the audit website.

3.6 PCO risk factor modelling

To identify potential risk factors influencing the development of PCO, an accelerated failure time Loglogistic model was fitted with robust cluster adjustment of the standard error using the patients as clusters to account for patient level correlation.

The covariates considered as potential risk factors are all known before cataract surgery starts except for PCR which occurs during the operation and in nearly all cases is known by the end of surgery. The idea behind limiting potential risk factors to those known by the end of surgery is that at that point or the post-cataract follow-up assessment, information could be provided to patients regarding their risk of PCO occurring within specific post-cataract time periods. Attempts to account for specific diseases that could develop between cataract surgery and PCO are not feasible with data currently submitted to the RCOphth NOD.

All candidate covariates were first investigated using the Logrank test, where any covariate significant at the 10% level was considered eligible for the multivariate Loglogistic model, which was fitted using backwards selection from the 'full' model to the 'best fitting' model by removing covariates with a significance level >1%. The strict use of 1% significance was adopted due to the increased chance of detecting very small significant differences from the large sample size, and to try to minimise negative impacts of possible overfitting. It is feasible that this approach does not produce the best model for the sample, but is practical for a very large sample where some covariates are for rare diseases, and to attempt to remove covariates with minimal clinical differences that otherwise could be found statistically significant if using a higher significance level.

Model diagnostics included comparison of the final model with other parametric modelling approaches (Weibull, Lognormal and Exponential) and plotting Cox-Snell residuals against the cumulative hazard where deviations away from the line of identity imply a poorer model fit.

4. Results

4.1 Sample and demographics

From 822,568 operations eligible for the national cataract audit performed within the study period from the EMR enabled centres that can offer ocular services for more than just cataract surgery with at least one case of PCO later than one-month post-cataract surgery, 221,484 (26.9%) operations are excluded from this analysis. Exclusions were due to: 1,291 were recorded as ‘no IOL inserted’, 340 with no IOL recorded, 210,095 with <1 month of follow-up data recorded, 3,056 with one of the infrequent IOL’s that could not be matched to an IOL model, 6,176 from one site where there is uncertainty about the IOL information and no follow-up data since November 2016, one due to a missing patient age at surgery, 413 with a missing IOL power, 97 with IOL powers outside the range of -10 to +40 dioptres and 15 as the recorded axial length was <18 mm. The 601,084 cataract operations eligible for this analysis were performed in 58 participating centres, 56 English NHS Trusts, one Welsh Local Health Board and one centre from Guernsey.

The operations were performed on 291,411 (48.5%) left eyes and 309,673 (51.5%) right eyes from 448,510 patients by 2,566 surgeons, 715 of whom had data for >1 surgeon grade. 1,105 consultant surgeons performed 364,153 (60.6%) operations, 337 career grade non-consultant surgeons performed 69,054 (11.5%) operations, 1,401 more experienced trainee surgeons performed 143,478 (23.9%) operations and 438 less experienced trainee surgeons performed 24,399 (4.1%) operations.

First eye surgery was performed in 396,668 patients where 229,447 (57.8%) were female, 167,221 (42.2%) male and the median age at surgery was 76.4 years (range 18.1 – 116.6 years). Second eye surgery was performed in 203,782 patients where 120,453 (59.1%) were female, 83,329 (40.9%) male and the median age at surgery was 77.4 years (range 18.0 – 112.4 years). Immediate simultaneous bilateral cataract surgery (ISBCS) was performed in 317 patients where 199 (62.8%) were female, 118 (37.2%) male and the median age at surgery was 73.1 years (range 22.5 – 100.2).

Over the analysis period 152,574 (34.0%) patients had surgery to both eyes, for the 152,257 patients who did not have ISBCS; the median time between the two operations was 4.3 months (range one day to 7.9 years).

Over the analysis period
152,574
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4.2 Data completeness for centres and NHS year

In the 2010 NHS year there was data from 33 centres which increased to 58 centres in the 2017 NHS year with an increase in the number of operations in each NHS year due to the increasing participation. The percentage of operations with data for postoperative complications (none or a complication) increased from 53.1% in the 2010 NHS year to 64.2% in the 2017 NHS year. The percentage of operations with post-cataract surgical data and post-cataract diagnosis data were lower for the latter two NHS years, which is influenced by less time for operations in the latter two NHS years to develop conditions that would be recorded as a diagnosis or require surgery, Table 1.

From the 58 participating centres, wide variation exists between the centres in the percentage of eyes with data for the parts of the cataract pathway where PCO can be identified. Overall, 59.9% of operations had postoperative complication data, 16.8% post-cataract surgical data and 37.4% post-cataract diagnosis data, Appendix 4.

Table 1: The number of centres with data, number of operations and percentage of operations with data for the PCO identifying parts of the post-cataract pathway in each NHS year

NHS year	Number of centres with data	Number of operations	Percentage of operations with postoperative complication data	Percentage of operations with post-cataract surgery data	Percentage of operations with post-cataract diagnosis data
2010	33	44,480	53.1	20.7	40.7
2011	36	54,055	56.8	21.8	43.1
2012	36	61,915	59.8	21.8	42.9
2013	37	68,230	61.2	21.6	43.1
2014	38	71,950	63.4	20.7	42.6
2015	49	82,720	56.9	16.4	39.4
2016	57	105,403	59.0	12.3	36.2
2017	58	112,331	64.2	9.3	34.0
Overall	**58**	**601,084**	**59.9**	**16.8**	**37.4**

4.3 IOL model, type and material

Monofocal Single Piece IOL's were used in 568,162 (94.5%) operations in 58 centres by 2,536 surgeons. Monofocal Multipiece IOL's were used in 30,553 (5.1%) operations in 49 centres by 1,560 surgeons. Monofocal Toric IOL's were used in 2,369 (0.4%) operations in 20 centres by 435 surgeons. All three types of IOL were used across all eight years of the study period and the median age of patients receiving a Monofocal Toric IOL was three years younger than the median age of patients receiving a Monofocal Single Piece or Monofocal Multipiece (medians; 73.1 vs. 76.8 and 76.2 respectively), Table 2.

The most frequently used IOL materials were Hydrophobic and Hydrophilic IOL's that were used in 61.8% and 26.2% of operations in 54 and 40 centres respectively (88.0% of operations combined). Silicone IOL's were used for 6.1% of operations in 24 centres, Hydrophobic / PMMA IOL's for 5.1% of operations in 49 centres and Hydrophobic / Hydrophilic IOL's for 0.8% of operations in nine centres by only 70 surgeons. All IOL materials were used across the eight-year study period, except for Hydrophobic / Hydrophilic where the first operation to use this IOL material was performed in January 2012. The median age of the patients for these IOL materials were similar, ranging between 76.2 and 77.5 years, Table 2.

In total there were 21 different IOL models used

In total there were 21 different IOL models used. Two IOL models were used in >100,000 operations (Figure 1) and these were the only IOL models to be used in >10% of operations (AcrySof IQ SN60WF and Tecnis ZCB00). Seven IOL models were used in <1% of operations (Figure 2). Three IOL models were used in 30 or more centres (Tecnis ZCB00, AcrySof SA60AT and AcrySof MA60AC (Multipiece)) and five IOL models were used in <10 centres. Two IOL models were used by >1,000 surgeons (AcrySof IQ SN60WF and AcrySof MA60AC (Multipiece)). Twelve of the IOL models have been used for all eight years of the study period, two IOL models have been used for <5 years (Zeiss CT Lucia and Bausch + Lomb Incise), and all IOL models have been used until February / March 2018. The median age of the patients receiving these IOL models varied, ranging between 71.8 years and 78.7 years, Table 3.

The number of different IOL models used in the contributing centres varied considerably, where two (3.4%) centres used only one IOL model, 12 (20.7%) centres three IOL models, 10 (17.2%) centres four IOL models and 34 (58.6%) centres five or more models with one centre having data for 14 IOL models. The two centres that used only one IOL model for all their operations in the sample used either of the Hoya ISERT or the Bausch + Lomb SofPort (Silicone) lenses.

Within centres, a very high proportion of operations used specific IOL models which could indicate institutional preference, for example, for eight (13.8%) centres their most frequently used IOL was used in <50% of operations, while 32 (55.2%) centres used one IOL model in >75% of operations and 27 (46.6%) centres used one IOL model in >90% operations. Fourteen of the IOL models were the most frequently used IOL model in at least one centre, Appendix 5.

Figure 1: The number of operations in the sample where each IOL model was used

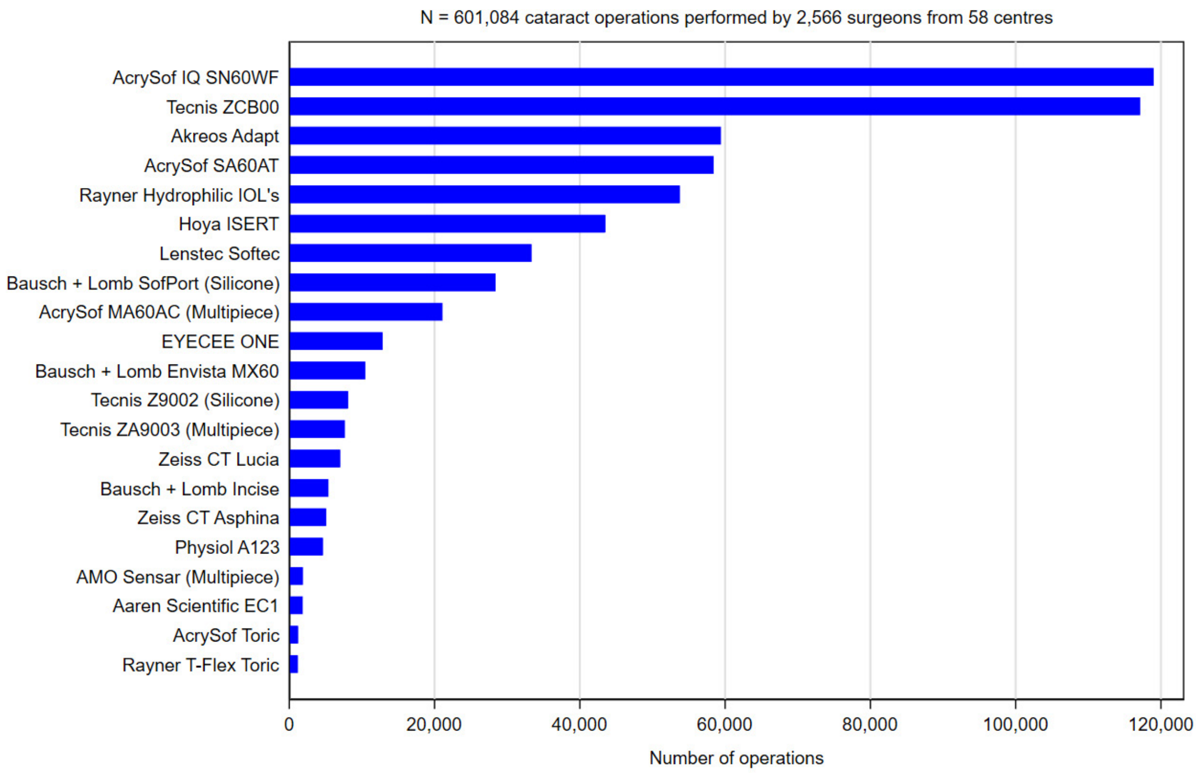


Figure 2: The percentage of operations in the sample where each IOL model was used

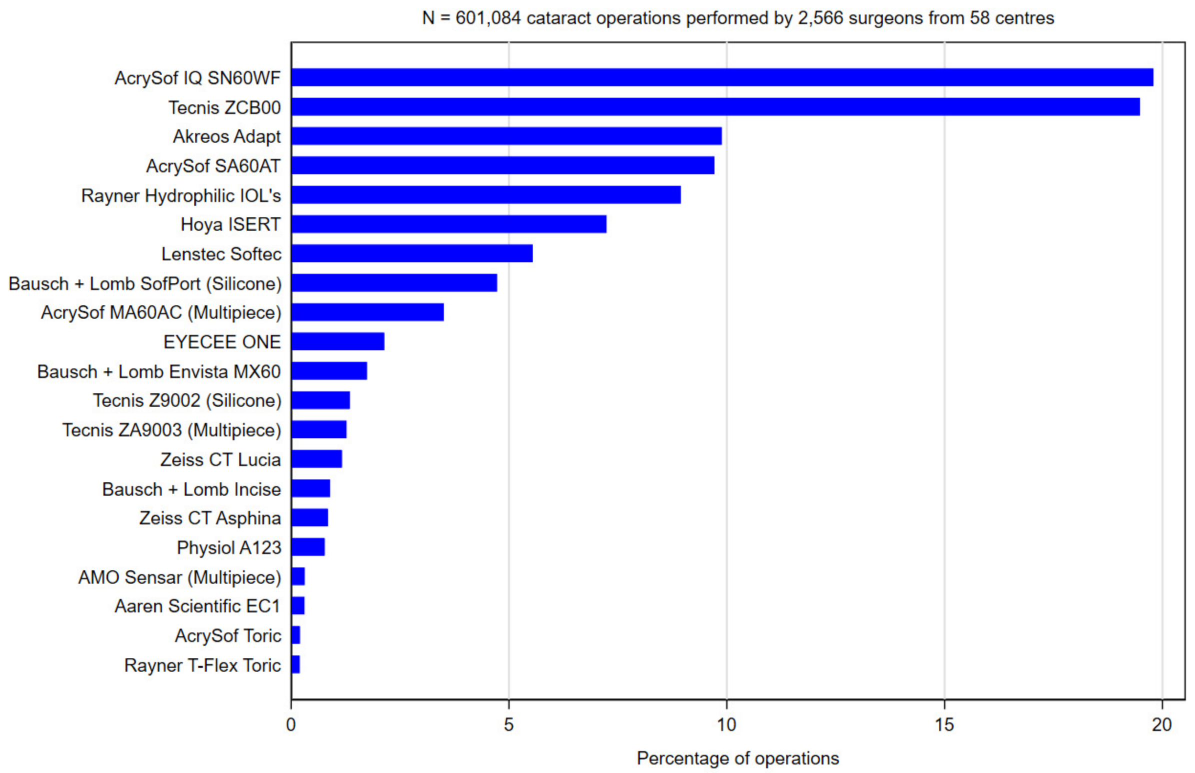


Table 2: The number centres and operations where the IOL was used, number of surgeons who have used the IOL, date of first IOL use, date of last IOL use, time period of IOL use and age of patients for each IOL type and material

	Number of centres	Number of operations	Number of surgeons	Date first use	Date last use	Time span of use (years)	Median age of patients*
IOL type							
Monofocal Single Piece	58	568,162	2,536	01 April 2010	31 March 2018	8.0	76.8
Monofocal Multipiece	49	30,553	1,560	01 April 2010	29 March 2018	8.0	76.2
Monofocal Toric	20	2,369	435	06 April 2010	31 March 2018	8.0	73.1
IOL material							
Hydrophobic	54	371,330	2,065	01 April 2010	31 March 2018	8.0	76.8
Hydrophilic	40	157,646	1,368	01 April 2010	31 March 2018	8.0	76.7
Silicone	24	36,485	609	01 April 2010	29 March 2018	8.0	77.1
Hydrophobic / PMMA	49	30,553	1,560	01 April 2010	29 March 2018	8.0	76.2
Hydrophobic / Hydrophilic	9	5,070	70	30 January 2012	26 March 2018	6.2	77.5
Overall	**58**	**601,084**	**2,566**	**01 April 2010**	**31 March 2018**	**8.0**	**76.7**

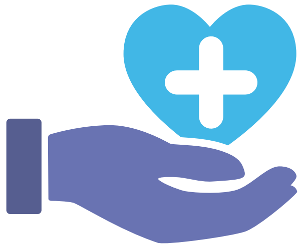
*Excluding simultaneous bilateral cataract surgery as some patients had different IOL's from different IOL type and IOL material used in each eye. For patients who have had both eyes operated on different dates, their age at each surgery is considered as separate events. N = 600,450 operations from 448,193 patients, where 152,257 patients had surgery to both eyes on different dates.

Table 3: For each IOL model, the number centres, operations and surgeons who have used each IOL, date of first, last and time period of use and the age of patients

IOL model	Number of centres	Number of operations	Number of surgeons	Date first use	Date last use	Time span of use (years)	Median age of patients*
AcrySof IQ SN60WF	29	118,981	1,113	01 April 2010	31 March 2018	8.0	76.2
Tecnis ZCB00	34	117,126	882	01 April 2010	31 March 2018	8.0	76.9
Akreos Adapt	23	59,400	696	01 April 2010	29 March 2018	8.0	77.1
AcrySof SA60AT	33	58,400	928	01 April 2010	31 March 2018	8.0	77.4
Rayner Hydrophilic IOL's	25	53,750	754	07 April 2010	29 March 2018	8.0	76.0
Hoya ISERT	17	43,509	493	01 April 2010	31 March 2018	8.0	76.4
Lenstec Softec	10	33,338	252	01 April 2010	29 March 2018	8.0	77.2
Bausch + Lomb SofPort (Silicone)	16	28,399	413	01 April 2010	29 March 2018	8.0	77.2
AcrySof MA60AC (Multipiece)	39	21,069	1,309	01 April 2010	29 March 2018	8.0	75.9
EYECEE ONE	21	12,839	286	18 November 2011	29 March 2018	6.4	77.4
Bausch + Lomb Envista MX60	8	10,448	146	07 December 2011	29 March 2018	6.3	76.6
Tecnis Z9002 (Silicone)	10	8,086	219	01 April 2010	03 March 2018	7.9	76.5
Tecnis ZA9003 (Multipiece)	17	7,632	366	01 April 2010	29 March 2018	8.0	77.6
Zeiss CT Lucia	10	6,999	142	06 October 2014	29 March 2018	3.5	77.6
Bausch + Lomb Incise	4	5,371	112	10 July 2013	28 March 2018	4.7	76.7
Zeiss CT Asphina	9	5,070	70	30 January 2012	26 March 2018	6.2	77.5
Physiol A123	5	4,618	104	26 July 2010	15 March 2018	7.6	77.6
AMO Sensar (Multipiece)	19	1,852	229	01 April 2010	29 March 2018	8.0	73.4
Aaren Scientific EC1	4	1,828	40	13 December 2010	26 February 2018	7.2	78.7
AcrySof Toric	13	1,200	232	17 September 2010	31 March 2018	7.5	71.8
Rayner T-Flex Toric	12	1,169	243	06 April 2010	31 March 2018	8.0	74.0
Overall	**58**	**601,084**	**2,566**	**01 April 2010**	**31 March 2018**	**8.0**	**76.7**

*Excluding simultaneous bilateral cataract surgery as some patients had different IOL models used in each eye. For patients who have had both eyes operated on different dates, their age at each surgery is considered as a separate event. N = 600,450 operations from 448,193 patients, where 152,257 patients had surgery to both eyes on different dates.

4.4 Follow-up and time to development of PCO



Follow-up time for patients can vary within and between centres due to different follow-up protocols, resource pressures on the hospital eye service, discharge to the community and patients remaining under the care of the hospital eye service if attending regular clinics for long term eye conditions. There are further biases on follow-up time from patients who return to the hospital due to experiencing ocular complications and patients who have both eyes undergo cataract surgery. Consequently, it is not a surprise that the median time to follow-up for each centre varies considerably ranging from 2.5 to 24.9 months. The median follow-up for centres was <6 months for 15 (25.9%) centres, between six and 12 months for 20 (34.5%) centres and >12 months for 23 (39.7%) centres, Appendix 4.

The variation in follow-up influences the 'exit' time used in assessing time to PCO, as patients whose eye experiences PCO 'exit' at the date of PCO and those whose eye is PCO free 'exit' at the last date of a clinical visit for the patient which can be a visit for the operated or the fellow eye. This is illustrated by different 'exit' patterns between the PCO free and PCO eyes, where 18.2% of PCO free cases last date of follow-up was within one and two months of cataract surgery and 44.0% of eyes last date of follow-up within six months of cataract surgery. In comparison PCO developed within one and two month's post-cataract surgery for 4.5% of PCO cases and within six months of cataract surgery for 15.3% of cases, Table 4.

Table 4: Time since cataract surgery for either the development of PCO or last date of follow-up for PCO free cases

	PCO free cases			PCO cases		
Time since cataract surgery	Number operations	Percentage	Cumulative percentage	Number operations	Percentage	Cumulative percentage
1 – 2 months	97,451	18.2	18.2	2,958	4.5	4.5
2 – 3 months	45,704	8.5	26.7	2,327	3.6	8.1
3 – 4 months	34,597	6.5	33.2	1,880	2.9	11.0
4 – 5 months	30,695	5.7	38.9	1,521	2.3	13.3
5 – 6 months	27,501	5.1	44.0	1,261	1.9	15.3
6 – 9 months	46,539	8.7	52.7	3,358	5.2	20.4
9 – 12 months	25,294	4.7	57.4	3,025	4.6	25.0
1 – 2 years	69,829	13.0	70.5	14,444	22.2	47.2
2 – 3 years	52,044	9.7	80.2	15,195	23.3	70.5
3 – 4 years	35,286	6.6	86.8	9,811	15.1	85.5
4 – 5 years	25,068	4.7	91.4	5,223	8.0	93.6
≥5 years	45,866	8.6	100.0	4,207	6.5	100.0
Total	**535,874**	-	-	**65,210**	-	-

4.5 Overall observed PCO rates

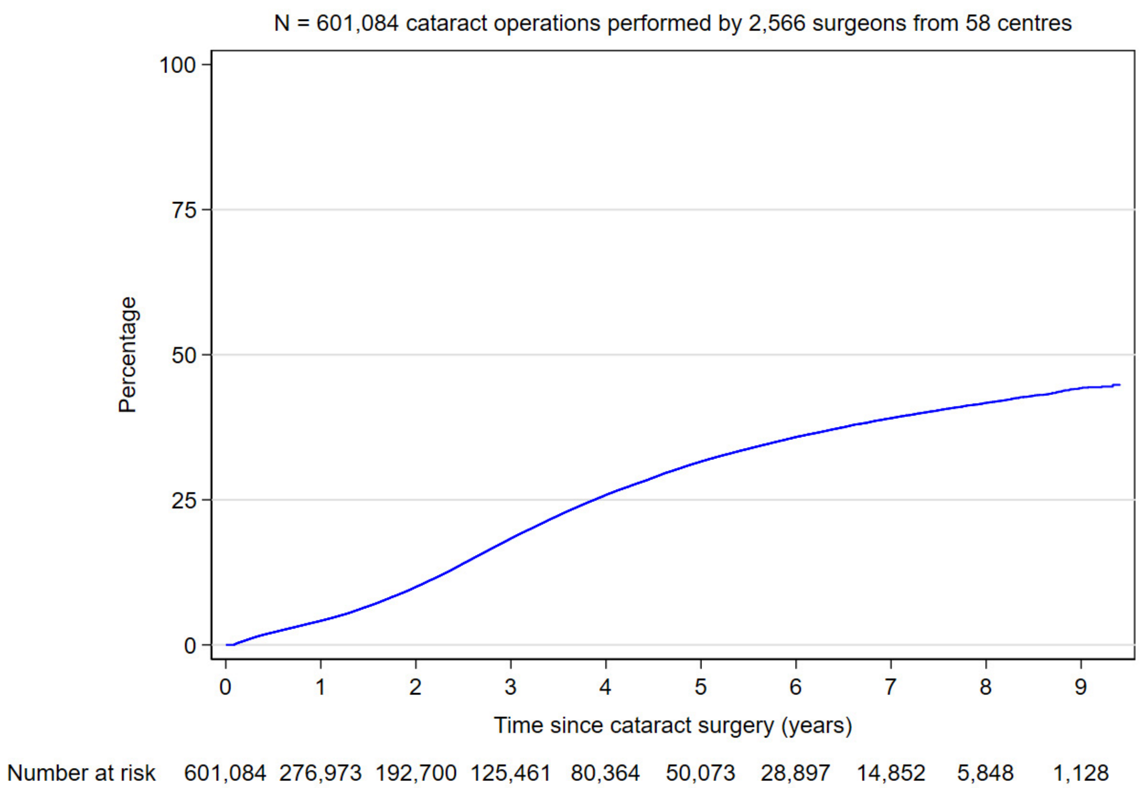
Post-cataract PCO was experienced by 65,210 (10.9%) eyes where 24,142 (37.0%) cases were PCO YAG and 41,068 (63.0%) cases PCO no YAG. The six month, one, three, five and nine year observed rates of PCO were 2.1%, 4.0%, 18.0%, 31.2% and 43.5% respectively, Figure 3 and Table 5.

Of the 152,574 patients who had both eyes undergo cataract surgery within the study period, 12,388 (8.1%) experienced PCO in both eyes. For 3,523 (28.4%) patients who developed PCO in both eyes, the same surgeon performed both cataract operations. This estimate is potentially an underestimate as the RCOphth NOD is not able to match records of patients undergoing treatment in different centres.

The six month, one, three, five and nine year rates of PCO YAG were 0.6%, 1.2%, 7.2%, 13.4% and 19.5% respectively, and the equivalent time point rates for PCO no YAG were 1.4%, 2.8%, 11.6%, 20.5% and 29.8% respectively. The observed higher rates of PCO no YAG than PCO YAG at each time point post-cataract surgery is possibly influenced by diagnosis of PCO without YAG, which could then go on to undergo YAG laser capsulotomy later. This will affect operations in the latter years of the study time period more than the first few years as these operations have less potential follow-up. This element is mitigated for the first few years of the study period, due to the inference backwards used in the PCO allocation where a diagnosis of PCO no YAG followed by PCO YAG within six months of the diagnosis of PCO no YAG is inferred backwards as PCO YAG at the time point of the initial diagnosis of PCO no YAG.

Generally, operations performed in the latter years of the study have less opportunity for PCO to develop and less follow-up for PCO free cases. There is variable follow-up between centres, and these results illustrate why using time to event analysis is the appropriate method of analysis.

Figure 3: Kaplan-Meier failure curve for the time to post-cataract PCO



4.6 IOL type observed PCO rates

For Monofocal Single Piece IOL's, the one, three, five and nine year rates of PCO were 4.1%, 18.6%, 32.2% and 44.7% respectively, these rates for PCO YAG were 1.3%, 7.4%, 14.0% and 20.1% respectively and for PCO no YAG these rates were 2.8%, 12.0%, 21.2% and 30.9% respectively. These rates are very similar to the overall PCO, PCO YAG and PCO no YAG rates as the Monofocal Single Piece IOL'S comprise 94.5% of the sample.

For Monofocal Multipiece IOL's, the one, three, five and nine year rates of PCO were 3.1%, 9.2%, 17.0% and 28.7% respectively, these rates for PCO YAG were 0.9%, 3.4%, 6.5% and 12.4% respectively and for PCO no YAG these rates were 2.2%, 6.0%, 11.3% and 18.7% respectively.

For Monofocal Toric IOL's, the one, three, five and nine year rates of PCO were 3.8%, 19.2%, 40.6% and 61.9% respectively, these rates for PCO YAG were 0.4%, 4.5%, 11.9% and 19.1% respectively and for PCO no YAG these rates were 3.4%, 15.3%, 32.6% and 52.8% respectively.

The development of PCO is similar for the three IOL types in the first year post-cataract surgery, and after this there is divergence, where Monofocal Multipiece IOL's have lower PCO rates, and the Monofocal Single Piece and Monofocal Toric lens follow a similar rate of PCO development until approximately three years before diverging. These differences should be interpreted with caution due to the vastly smaller sample size for Monofocal Toric IOL's, and the selection bias for Monofocal Multipiece IOL's which are often employed in cases of PC rupture where visually significant PCO is less likely as the PC is ruptured, Figure 4 and Table 5.

Figure 4: Kaplan-Meier failure curves for the time to post-cataract PCO by IOL type

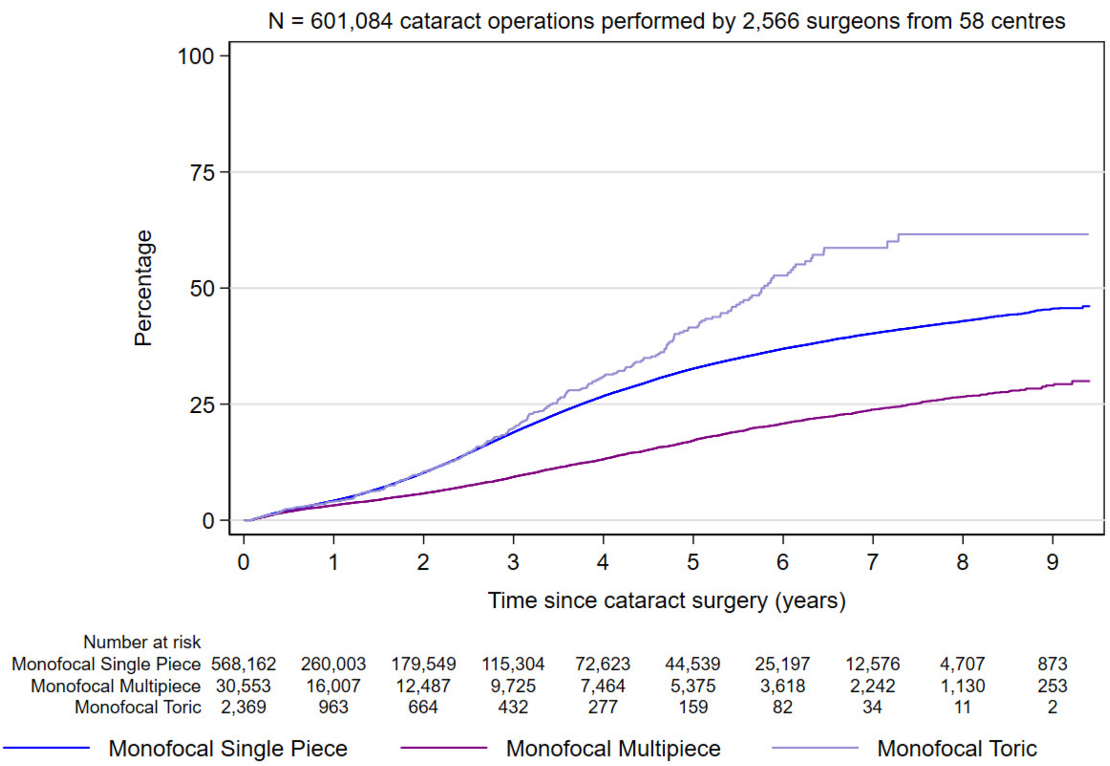


Table 5: Observed rates of post-cataract PCO, PCO YAG and PCO no YAG at specified time points for the IOL type

	Observed PCO rates at (%)									
	6 months	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years
Overall (N = 601,084)										
PCO	2.1	4.0	9.7	18.0	25.4	31.2	35.4	38.6	41.2	43.5
PCO YAG	0.6	1.2	3.5	7.2	10.6	13.4	15.5	17.0	18.2	19.5
PCO no YAG	1.4	2.8	6.5	11.6	16.5	20.5	23.5	26.1	28.1	29.8
Monofocal Single Piece (N = 568,162)										
PCO	2.1	4.1	10.0	18.6	26.3	32.2	36.5	39.8	42.4	44.7
PCO YAG	0.6	1.3	3.6	7.4	11.1	14.0	16.2	17.7	18.9	20.1
PCO no YAG	1.5	2.8	6.6	12.0	17.1	21.2	24.2	26.8	28.9	30.9
Monofocal Multipiece (N = 30,553)										
PCO	1.8	3.1	5.7	9.2	13.0	17.0	20.7	23.7	26.4	28.7
PCO YAG	0.5	0.9	1.8	3.4	5.0	6.5	8.2	9.2	10.6	12.4
PCO no YAG	1.3	2.2	3.9	6.0	8.4	11.3	13.6	15.9	17.7	18.7
Monofocal Toric (N = 2,369)										
PCO	2.3	3.8	10.1	19.2	30.2	40.6	51.3	58.4	61.9	61.9
PCO YAG	0.3	0.4	1.5	4.5	9.0	11.9	15.5	15.5	19.1	19.1
PCO no YAG	2.0	3.4	8.7	15.3	23.3	32.6	42.4	50.7	52.8	52.8

4.7 IOL material observed PCO rates

For Hydrophobic IOL's, the one, three, five and nine year rates of PCO were 3.3%, 12.0%, 23.7% and 37.2% respectively, these rates for PCO YAG were 1.0%, 4.2%, 9.2% and 14.8% respectively and for PCO no YAG these rates were 2.3%, 8.2%, 16.0% and 26.3% respectively.

For Hydrophilic IOL's, the one, three, five and nine year rates of PCO were 6.0%, 31.9%, 50.0% and 61.6% respectively, these rates for PCO YAG were 2.0%, 14.9%, 25.4% and 33.0% respectively and for PCO no YAG these rates were 4.1%, 19.9%, 32.8% and 42.7% respectively.

For Silicone IOL's, the one, three, five and nine year rates of PCO were 3.0%, 10.4%, 17.6% and 28.2% respectively, these rates for PCO YAG were 1.0%, 3.6%, 6.3% and 10.9% respectively and for PCO no YAG these rates were 2.0%, 7.1%, 12.1% and 19.4% respectively.

For Hydrophobic / PMMA IOL's, the one, three, five and nine year rates of PCO were 3.1%, 9.2%, 17.0% and 28.7% respectively, these rates for PCO YAG were 0.9%, 3.4%, 6.5% and 12.4% respectively and for PCO no YAG these rates were 2.2%, 6.0%, 11.3% and 18.7% respectively.

For Hydrophobic / Hydrophilic IOL's, the one, three and five year rates of PCO were 4.6%, 42.5% and 67.4% respectively, these rates for PCO YAG were 0.5%, 9.1% and 18.6% respectively and for PCO no YAG these rates were 4.2%, 36.6% and 59.8% respectively. It is not possible to calculate nine year rates of PCO for the Hydrophobic / Hydrophilic IOL's as these IOL's were used for 6.2 years of the study period.

The development of PCO is clearly different between IOL's with Hydrophobic materials and IOL's with Hydrophilic materials. Hydrophobic IOL's have a similar pattern for the development of PCO to Silicone and Hydrophobic / PMMA IOL's in the first three years post-cataract surgery, after which the Hydrophobic IOL development rate diverges, while the Silicone and Hydrophobic / PMMA lenses have near identical rates of development of PCO at each subsequent time point. Both the Hydrophilic and Hydrophobic / Hydrophilic IOL's have higher rates of PCO from one year onwards, although the results for the Hydrophobic / Hydrophilic IOL's need to be interpreted with caution as these lenses have been used in fewer operations, by fewer surgeons in fewer centres than the other four IOL materials, and the sample is extremely small after three years post-cataract surgery, Figure 5 and Table 6.

Figure 5: Kaplan-Meier failure curves for the time to post-cataract PCO by IOL material

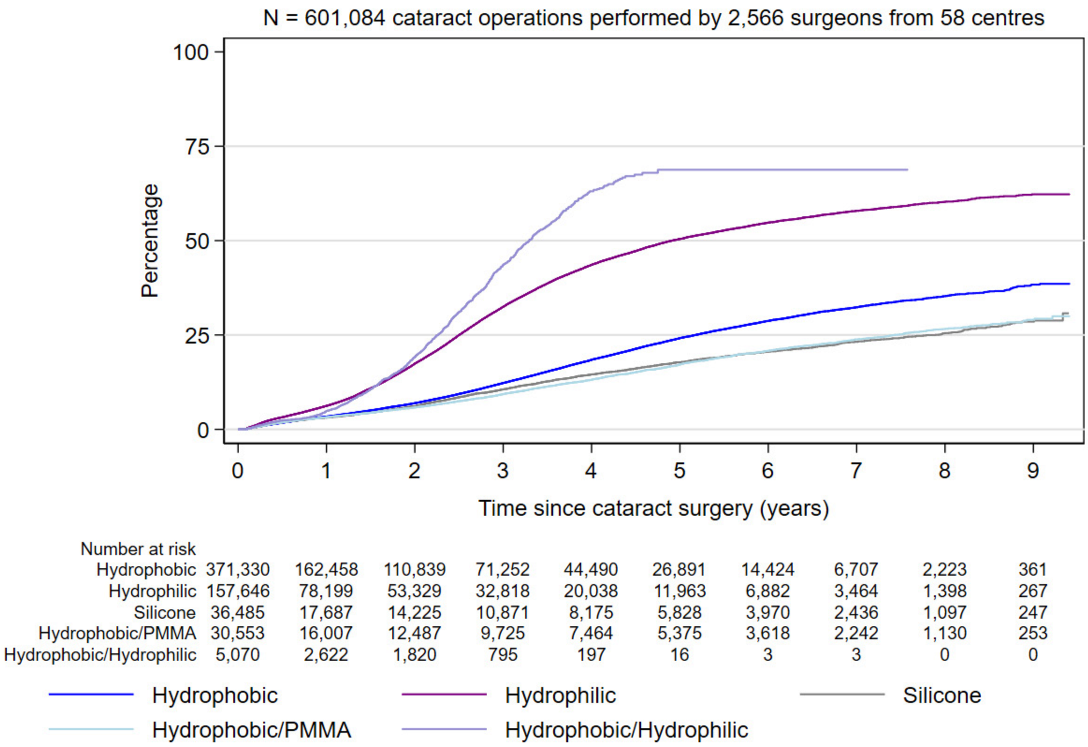


Table 6: Observed rates of post-cataract PCO, PCO YAG and PCO no YAG at specified time points for the IOL material

	Observed PCO rates at (%)									
	6 months	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years
Hydrophobic (N = 371,330)										
PCO	1.7	3.3	6.8	12.0	18.0	23.7	28.3	31.9	34.7	37.2
PCO YAG	0.5	1.0	2.2	4.2	6.7	9.2	11.2	12.6	13.8	14.8
PCO no YAG	1.2	2.3	4.7	8.2	12.1	16.0	19.2	22.0	24.3	26.3
Hydrophilic (N = 157,646)										
PCO	3.1	6.0	17.0	31.9	43.0	50.0	54.3	57.4	59.7	61.6
PCO YAG	0.9	2.0	7.0	14.9	21.2	25.4	28.3	30.0	31.6	33.0
PCO no YAG	2.1	4.1	10.8	19.9	27.6	32.8	36.1	39.0	41.0	42.7
Silicone (N = 36,485)										
PCO	1.7	3.0	6.0	10.4	14.4	17.6	20.4	23.0	25.2	28.2
PCO YAG	0.6	1.0	2.0	3.6	5.0	6.3	7.6	8.9	9.8	10.9
PCO no YAG	1.1	2.0	4.0	7.1	9.9	12.1	13.9	15.5	17.1	19.4
Hydrophobic / PMMA (N = 30,553)										
PCO	1.8	3.1	5.7	9.2	13.0	17.0	20.7	23.7	26.4	28.7
PCO YAG	0.5	0.9	1.8	3.4	5.0	6.5	8.2	9.2	10.6	12.4
PCO no YAG	1.3	2.2	3.9	6.0	8.4	11.3	13.6	15.9	17.7	18.7
Hydrophobic / Hydrophilic (N = 5,070)										
PCO	2.1	4.6	18.8	42.5	61.0	67.4	67.4	67.4	-	-
PCO YAG	0.2	0.5	3.1	9.1	15.4	18.6	18.6	18.6	-	-
PCO no YAG	1.9	4.2	16.1	36.6	53.7	59.8	59.8	59.8	-	-

4.8 IOL model observed PCO rates

The observed PCO rates varied considerably between the 21 IOL models, although with similar development patterns for some models, Figure 6. At one-year post-cataract surgery, the PCO rate ranged from 1.7% for AcrySof Toric lenses to 12.2% for Aaren Scientific EC1 lenses, at three years from 5.4% for Tecnis Z9002 (Silicone) lenses to 52.2% for Aaren Scientific EC1 lenses, and at five years from 9.0% for Tecnis Z9002 (Silicone) lenses to 72.9% for Aaren Scientific EC1 lenses. Fifteen of the 21 IOL models had a PCO rate at nine years post-cataract surgery where the PCO rates ranged from 16.3% for Tecnis Z9002 (Silicone) lenses to 71.5% for Physiol A123 lenses, Figure 7 and Appendix 6.

As observed for PCO, the rates of PCO YAG varied considerably between the 21 IOL models where the same IOL models had the lowest and highest rates at one-, three- and five-years post-cataract surgery as overall PCO. At one-year post-cataract surgery the PCO YAG rate ranged from 0.4% for AcrySof Toric lenses to 8.1% for Aaren Scientific EC1 lenses, at three years from 1.5% for Tecnis Z9002 (Silicone) lenses to 39.1% for Aaren Scientific EC1 lenses, and at five years from 2.4% for Tecnis Z9002 (Silicone) lenses to 57.7% for Aaren Scientific EC1 lenses, Appendix 6.

As observed for PCO and PCO YAG, the rates of PCO no YAG varied considerably between the 21 IOL models, although different IOL models had the lowest and highest rates at one-, three- and five-years post-cataract surgery than for overall PCO. At one-year post-cataract surgery the PCO no YAG rate ranged from 1.3% for Tecnis Z9002 (Silicone) lenses to 5.0% for Rayner T-Flex Toric lenses, at three years from 3.9% for Tecnis Z9002 (Silicone) lenses to 36.6% for Zeiss CT Asphina lenses, and at five years from 6.8% for Tecnis Z9002 (Silicone) lenses to 59.8% for Zeiss CT Asphina lenses, Appendix 6.

Some of the observed variation in PCO, PCO YAG and PCO no YAG rates between the IOL models could be explained by different sample sizes, usage periods, number of centres and surgeons that have used them, material, types and possible patient factors, although the observed variation is very large, and these reasons alone probably do not explain all the variation. It is very likely that eyes implanted with certain IOL models are at a higher risk of developing PCO, although due to the samples diminishing over time and the variability in IOL model usage, the PCO estimates for some IOL models are calculated from small samples, especially at latter time points, Appendix 7.

It is very likely that eyes implanted with certain IOL models are at a higher risk of developing PCO

Figure 6: Kaplan-Meier failure curves for the time to post-cataract PCO by IOL model

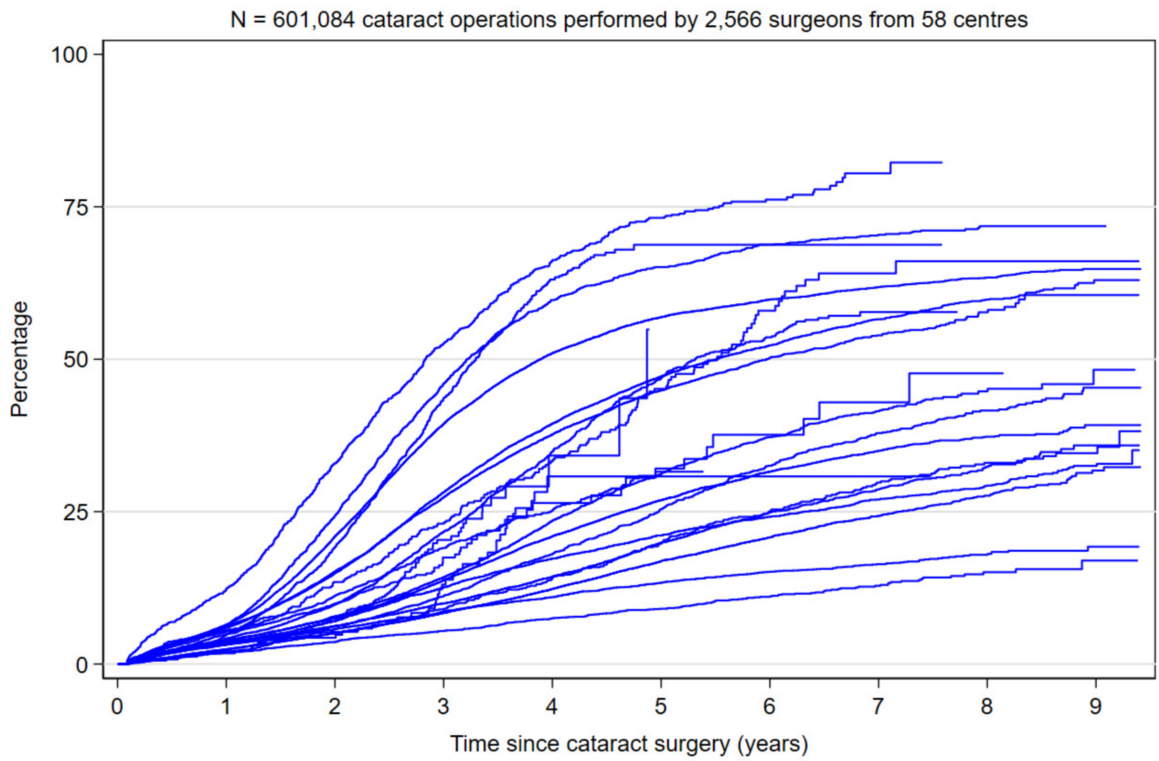
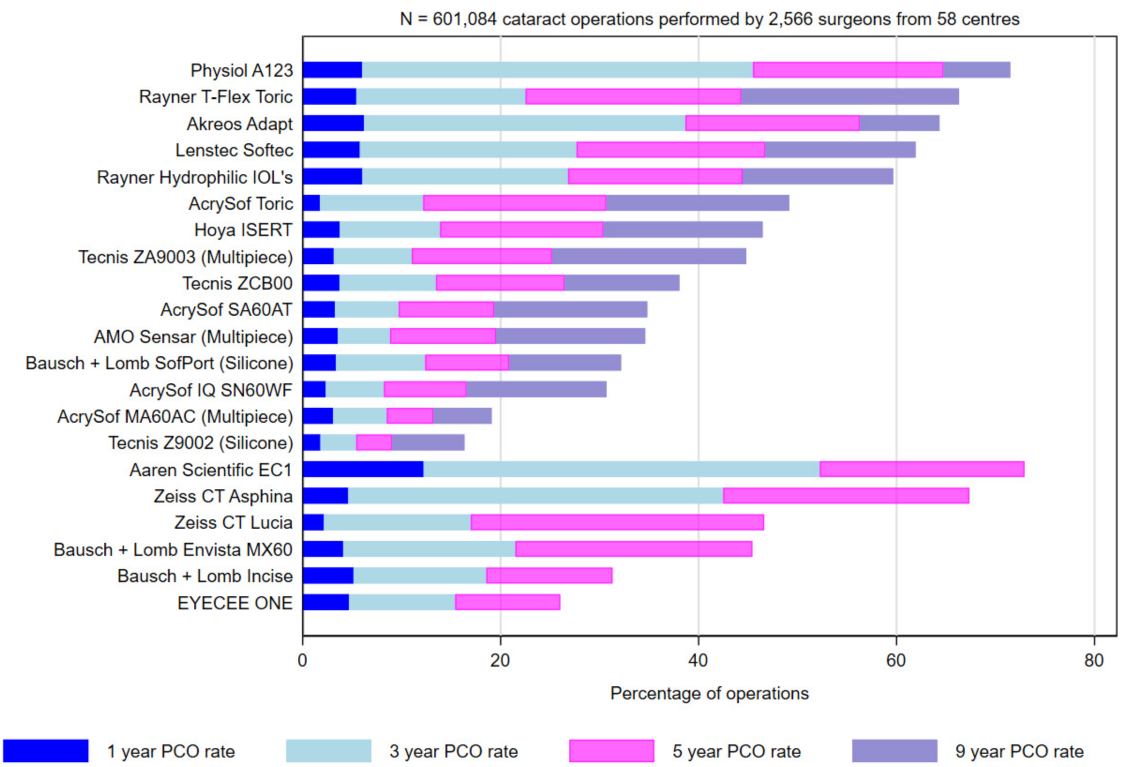


Figure 7: PCO rates at one-, three-, five- and nine-years post-cataract surgery for each IOL model



4.9 Contributing centres PCO rates

The development of PCO varied considerably between the 58 centres, where the rate of post-cataract PCO ranged from 0.0% to 9.0% at one year, from 0.0% to 53.8% for 56 centres at three years, from 0.1% to 71.6% for 40 centres at five years, and from 0.4% to 77.0% for 33 centres at nine years post-cataract surgery, Figure 8 and Appendix 8.

As for PCO, the development of PCO YAG varied considerably between the centres, ranging from 0.0% to 5.2% at one year, from 0.0% to 39.7% for 56 centres at three years, from <0.1% to 57.5% for 40 centres at five years, and from <0.1% to 63.4% for 33 centres at nine years post-cataract surgery, Appendix 8.

As for PCO and PCO YAG, the development of PCO no YAG varied considerably between the centres, ranging from 0.0% to 7.6% at one year, from 0.0% to 32.1% for 56 centres at three years, from <0.1% to 42.2% for 40 centres at five years, and from <0.1% to 54.3% for 33 centres at nine years post-cataract surgery, Appendix 8.

The variation in the observed PCO, PCO YAG and PCO no YAG rates is further illustrated by the number of centres with a rate below or above certain percentages at each time point. At one-year post-cataract surgery 12 (20.7%) centres PCO rate was <1%, this decreased to six (10.7%) centres at three years, and of notice is that two centres still had a PCO rate <1% at eight years, with one centre's PCO rate remaining <1% at nine years post-cataract surgery. No centre's PCO rate was >25% at one-year post-cataract surgery; 12 (21.4%) centres PCO rate was >25% at three years; this increased to 21 (52.5%) centres at five years and 27 (81.8%) centres at nine years post-cataract surgery, Table 7.

A certain amount of variation is expected between centres in the development of PCO, PCO YAG and PCO no YAG, as this is reflective of known variation between centres in their patient pathways, data collection and use of different IOL models. The vast variation observed is likely to be influenced by differences in data collection and use of the EMR systems between centres.

It is likely that the PCO rate for some centres is underestimated as patient's having cataract surgery in one centre could attend another for YAG laser capsulotomy. This is more likely when there are capacity limitations in one centre and patients have the option of YAG laser capsulotomy in another. In this situation the PCO rate for the centre performing the cataract surgery is underestimated. This is linked to geography as some parts of the country are more densely populated by NHS Trusts and / or independent sector treatment centres than other areas of the country.

Figure 8: Observed PCO rates at one, three, five and nine year's post-cataract surgery for each centre

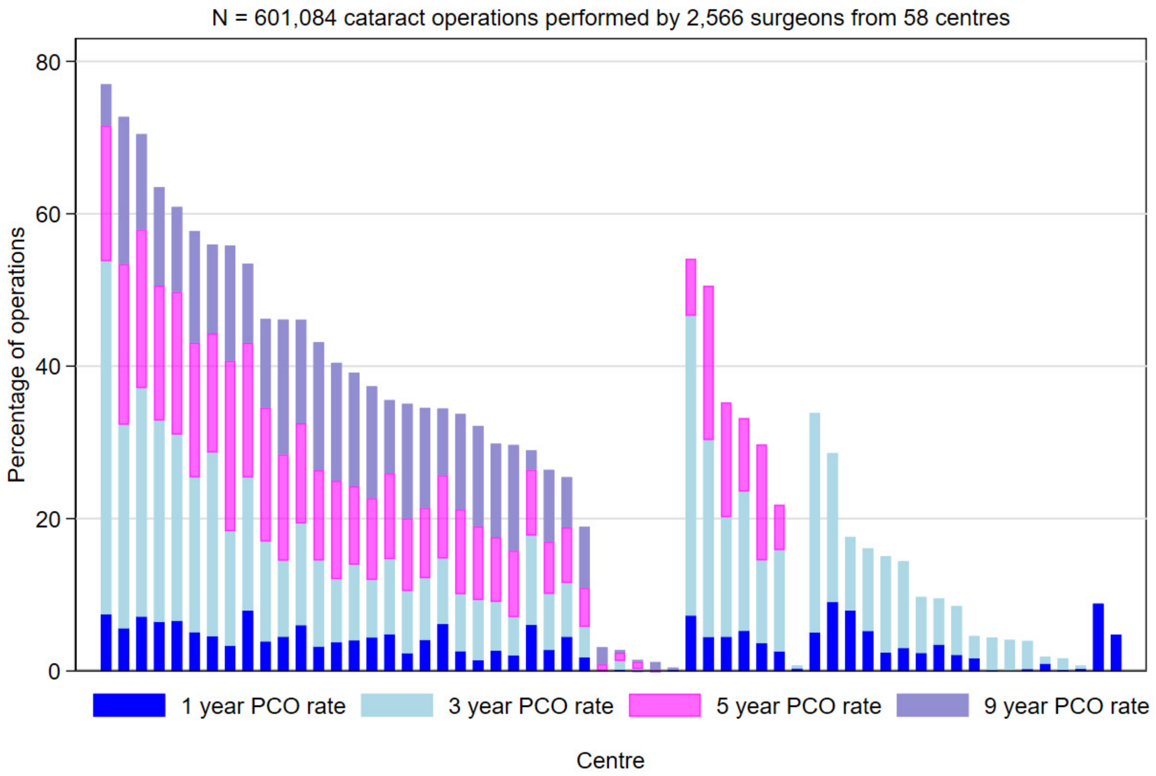


Table 7: The number of centres with observed PCO, PCO YAG and PCO no YAG rates <1% and >25% at each time point post-cataract surgery

Time point	N centres	PCO N (row %)	PCO YAG N (row %)	PCO no YAG N (row %)
Rates <1%				
6 months	58	20 (34.5)	48 (82.8)	24 (41.4)
1 year	58	12 (20.7)	33 (56.9)	13 (22.4)
2 years	58	10 (17.2)	15 (25.9)	10 (17.2)
3 years	56	6 (10.7)	12 (21.4)	7 (12.5)
4 years	50	5 (10.0)	7 (14.0)	6 (12.0)
5 years	40	4 (10.0)	5 (12.5)	4 (10.0)
6 years	37	2 (5.4)	4 (10.8)	2 (5.4)
7 years	36	2 (5.6)	4 (11.1)	2 (5.6)
8 years	36	2 (5.6)	4 (11.1)	2 (5.6)
9 years	33	1 (3.0)	3 (9.1)	2 (6.1)
Rates >25%				
6 months	58	0 (0.0)	0 (0.0)	0 (0.0)
1 year	58	0 (0.0)	0 (0.0)	0 (0.0)
2 years	58	3 (5.2)	0 (0.0)	0 (0.0)
3 years	56	12 (21.4)	2 (3.6)	4 (7.1)
4 years	50	18 (36.0)	5 (10.0)	9 (18.0)
5 years	40	21 (52.5)	5 (12.5)	12 (30.0)
6 years	37	25 (67.6)	5 (13.5)	13 (35.1)
7 years	36	25 (69.4)	4 (11.1)	15 (41.7)
8 years	36	29 (80.6)	5 (13.9)	17 (47.2)
9 years	33	27 (81.8)	6 (18.2)	19 (57.6)

4.10 PCO modelling

The overall hazard of developing PCO increased in the first three years post-cataract surgery and then decreased for longer time periods, Figure 9. For the individual IOL models there is massive variation in the hazard of developing PCO, with some models exhibiting similar patterns to overall and others a virtually flat hazard. This extreme variation is one of the reasons why the individual IOL models were not fitted as a covariate in the risk factor model, instead the IOL material was used, Figure 10.

The covariates considered for the risk factor modelling are grouped into factors related to the IOL, patient factors, cataract surgery and ocular factors. At the univariate level all covariates considered for the post-cataract PCO risk factor modelling showed association at the 10% level except for the patient's ability to cooperate ($p = 0.559$), the presence of corneal pathology ($p = 0.318$), the presence of no fundal view / vitreous opacity ($p = 0.380$) and the presence of optic nerve / CNS disease ($p = 0.676$), Tables 8, 9 and 10.

Removed from the multivariate model were the following covariates; the patient's ability to lie flat during surgery, and the presence of amblyopia, diabetic retinopathy, other retinal vascular pathology and previous trabeculectomy surgery. The final best fitting PCO risk factor model estimates are shown in Table 11.

The covariates that increased the risk of developing PCO were second eye surgery, an axial length >26 mm, no previous Anti-VEGF therapy, the presence of high myopia, other macular pathology, previous vitrectomy surgery, uveitis / synechiae and unspecified 'other' ocular co-pathology, along with younger age, female gender, lower IOL powers, IOL's with a hydrophilic component, the grade of operating surgeon, no diabetes, no brunescent / white / mature cataract, a medium or large pupil, the avoidance of PCR and the absence of AMD, glaucoma and pseudoexfoliation / phacodenesis.

The contribution to the development of PCO is not the same for each risk factor model covariate as illustrated by differing risk factor model covariate coefficients. When the covariate coefficient is negative this implies a higher risk of PCO, and when the covariate coefficient is positive this implies a lower risk of PCO. Each covariate has a reference category with a coefficient of zero, thus the closer a covariate category coefficient is to zero, the less difference there is between this category and the reference category, for example increasing age implies lower risk of PCO as can be seen from the larger positive coefficients for each successive older age group.

Many of the differences for a covariate occur after a period of time has elapsed, for example the difference in PCO rates between the occurrence of PCR and the presence of glaucoma, pseudoexfoliation / phacodenesis or unspecified 'other' ocular co-pathology is after one-year post-cataract surgery. The difference between male and female patients, diabetic status, previous Anti VEGF therapy and a brunescent / white / mature cataract occurs after two years post-cataract surgery. For some covariates the PCO rates diverge within the first year post-cataract surgery, for example the patient's age, first or second eye surgery, axial length, previous vitrectomy surgery and the presence of high myopia or other macular pathology. The risk of developing PCO for eyes with uveitis / synechiae switched at around four years post-cataract surgery, initially increasing the risk of PCO and then appearing to lower the risk. Uveitic eyes would be expected to have an increased inflammatory response following cataract surgery, hence one would expect higher PCO rates initially, as is observed. It may be that those eyes which are going to get PCO, therefore, get it in the first year or two post operatively. If you have not developed PCO by three years post operatively in a uveitic eye, then you are not going to develop PCO; this is just an acceleration of the assumption in non-uvietic eyes that if you have not developed PCO by 10 years post-surgery, you are less likely to develop this complication subsequently.

If you have not developed PCO by three years post operatively in a uveitic eye, then you are not going to develop PCO

The differences in when PCO occur for different risk factors illustrates that the risk profile for PCO is not only different between IOL models, centres and patients, but also variable over time depending on the covariate, Table 12 and Appendix 9. Even though the failure curves for IOL powers of 20 to 28.5 and 29 to 40 dioptres overlap, these IOL powers were not combined to aid clinicians with interpreting the lower failure rates shown for higher IOL powers. The differences in PCO rates for the grade of operating surgeon were very small and the grade of operating surgeons was kept in the model as this is useful information for clinicians.

Some of the PCO risk factor model covariates are related, for example a brunescent / white / mature cataract is a high risk factor for the occurrence of PCR and the lower PCO rates for eyes that had this type of cataract and/or experienced PCR could be linked to a lower chance of visually significant PCO once the PC is ruptured.

Variation may be due to differences in the ability of clinicians to diagnose, or willingness to treat PCO.

Those with small pupils might have been expected to have more residual soft-lens material at the end of surgery, which would increase their chances of PCO, but the rates are lower, potentially due to the small pupil making any PCO present less visible to an examining ophthalmologist, hence reducing their tendency to offer YAG laser. Amblyopia was seen to increase rates of YAG laser; which could be expected as clinicians are unable to be certain whether maximum visual benefits have been gained and are therefore more likely to revert to YAG for levels of PCO that might be ignored in non-amblyopic eyes where both clinician and patient are happy with the acuity attained. It is feasible that some surgeons would be reluctant to perform YAG laser surgery on people with diabetes.

For certain ocular diseases the patient will have regular visits to the hospital and potential treatment, for example anti-VEGF therapy for AMD or glaucoma monitoring and treatment, and if this continues after cataract surgery it is possible that PCO could be diagnosed earlier. The effect of younger age (<50 years) indicating higher risk of PCO is partially related to reducing life expectancy with increasing age, and the difference in gender could also be due to life expectancy differences between males and females. The higher PCO rate in eyes with an axial length >26 mm and the presence of high myopia is related and potentially linked to other issues in myopic eyes, possibly the larger size of the capsular bag producing a less tight apposition of the square posterior edge of the IOL to the capsule hence reducing the effectiveness of that square edge in preventing posterior migration of lens epithelial cells. Higher rates of PCO for vitrectomised eyes and eyes with other macular pathology could be linked to related ocular issues potentially affecting the development of PCO. The grade of operating surgeon is related to case allocation, surgery location and the complexity of the actual cataract surgery. The lower rates in eyes without pseudoexfoliation / phacodenesis could be due to other things related to these eyes, or an increase utilisation of capsule tension rings which could inhibit PCO formation. The higher PCO rates for second eye surgery are harder to hypothesise an explanation for, although first eyes with no subsequent problems are much more likely to be seen again in clinic (to discuss second eye surgery), compared to second eyes with no subsequent problems who would therefore exit the series sooner or it is possible that certain higher risk covariates were present more in the second treated eyes. At every subsequent visit to eye care services, first eyes will contribute a few more months to the failure analysis than second eyes – which will tend first eyes to display slower PCO development than 2nd eyes.

The higher PCO rate for eyes with an unspecified 'other' co-pathology is not unexpected as this is a generic category with little information supplied to the RCOphth NOD about what the 'other' condition is and the difference is minor. The extremely low PCO rate for eyes with a missing pupil size is influenced by the missing data being from three centres, two of which have low PCO rates themselves (<2% at three years post-surgery for these two centres).

The large amount of variation between the IOL models is unlikely to be fully explained by the identified patient, surgery and ocular covariates, and it is possible that some of the significant covariates were unduly over-represented for some individual IOL models.

For many PCO risk factor model covariates there were similar percentages for each IOL model within the covariate (i.e. none vs present for a binary ocular disease), with variation between the IOL models due to the variable number of operations and centres where each IOL model was used. The covariates with the biggest differences for specific IOL models were covariates that included missing data and PCR. For axial length, 60.1% of eyes with a missing axial length had an AcrySof IQ SN60WF IOL inserted which was the most frequently used IOL, while the second most frequently used IOL (Tecnis ZCB00) was inserted into 3.9% of eyes with a missing axial length. Influencing this result was data from one contributing centre, where the AcrySof IQ SN60WF lens was used in >70% of operations, and from these eyes, 47.6% had a missing axial length. For pupil size, 72.2% of eyes with a missing pupil size had an AcrySof IQ SN60WF

IOL inserted, 8.1% of eyes an Akreos Adapt IOL inserted, 12.7% of eyes an Zeiss CT Lucia IOL inserted and 2.4% of eyes an AcrySof Toric IOL inserted. These percentages are due to all eyes with a missing pupil size undergoing cataract surgery in one of three contributing centres, where one centre used the AcrySof IQ SN60WF IOL in >70% of their operations, accounted for 68.5% of all operations that used the AcrySof Toric IOL and had 35.5% of their eyes with a missing pupil size. The other two centres had 100% of eyes with a missing pupil size, where one centre used the Akreos Adapt IOL in >95% of their operations and the other used the Zeiss CT Lucia IOL in >95% of their operations. As expected, Multipiece lens were more often used in eyes that experienced PCR, Appendix 10 Tables 1 – 11.

The PCO risk factor model was not a perfect fit and the number of significant covariates is a concern regarding possible over-fitting. There is deviation away from the line of identity between the cumulative hazard and the Cox-Snell residuals, Figure 11. Although the deviation is less for Cox-Snell residuals <1.5 which account for 99.98% of the sample, and the least deviating section when the Cox-Snell residuals are <1 accounts for 99.67% of the sample, thus the deviation that indicates extremely poor model fitting accounts for a tiny proportion of the sample, Figure 12. As a sensitivity analysis, these operations were removed, the PCO model re-fitted and the very similar estimates found for each covariate.

The PCO risk factor model should not be viewed as a definitive clinical explanation of the development of PCO over time. There is extreme variation between the centres in data collection, post-operative pathways and the time period they have data for. The sample is large with many of the ocular diseases relatively rare events, there is domination in the sample from certain IOL's, the number of significant covariates is indicative of possible over-fitting, there are potentially influential variables that were not considered and there are many things that can happen between cataract surgery and the development of PCO, for example development of ocular diseases.

Both the IOL model and the IOL type were not investigated as these are correlated with each other and the IOL material due to being related groupings. Another reason for not investigating the IOL models was the vastly different hazards for the individual lenses. Anterior Chamber Depth was not investigated as it is correlated with axial length and was missing for 36.2% of the sample with the missing data linked to operations performed in the earlier years of the study, thus the missing data is more likely to be for operations with longer potential follow-up. The presence of Inherited Eye Diseases was not investigated as these were only recorded for 0.17% of the sample and are a collection of many different rare diseases where it is impossible to distinguish which disease was relevant. Social deprivation was not investigated as this data is not received from centres using one of the two EMR systems that have collected the data; there are different indices for English centres and Welsh centres and no indices for the centre from Guernsey. Preoperative VA was not included in the PCO risk factor model as the observed differences were between the VA measurement being recorded or not recorded, with no difference in the preoperative VA when only considering the eyes with a recorded VA measurement (p = 0.066).

Figure 9: Overall smoothed hazard

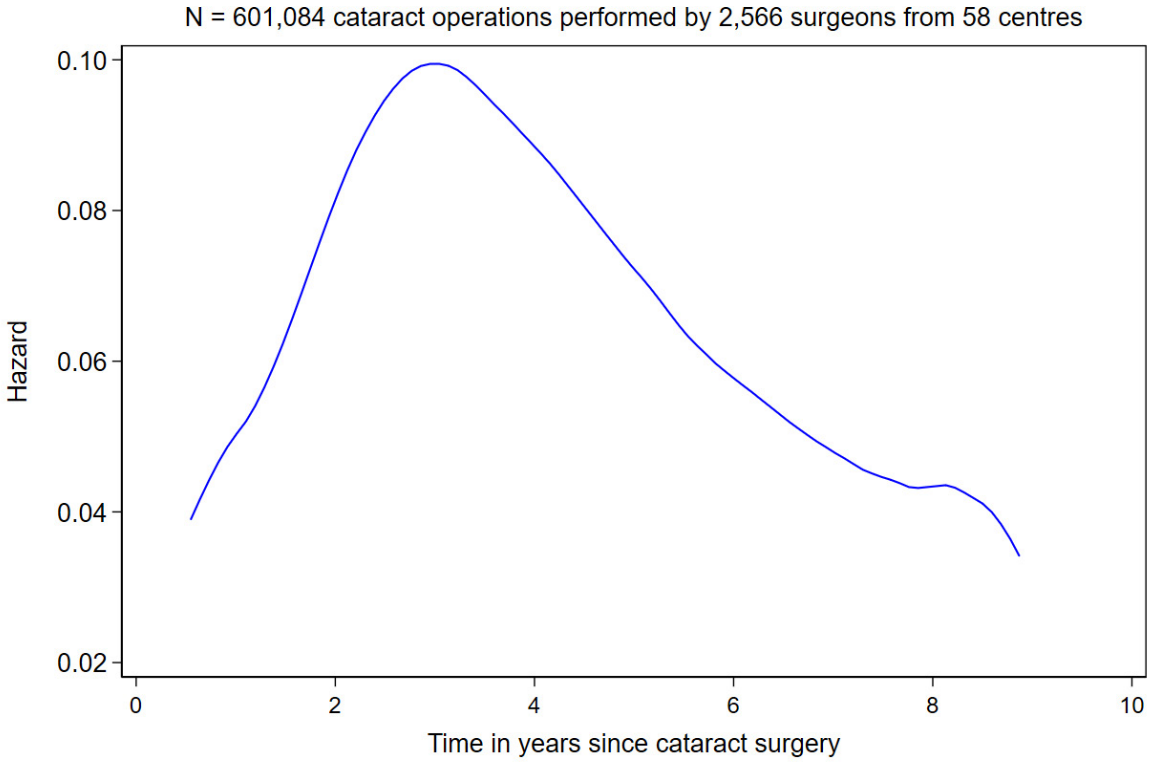


Figure 10: Smoothed hazard for each IOL model

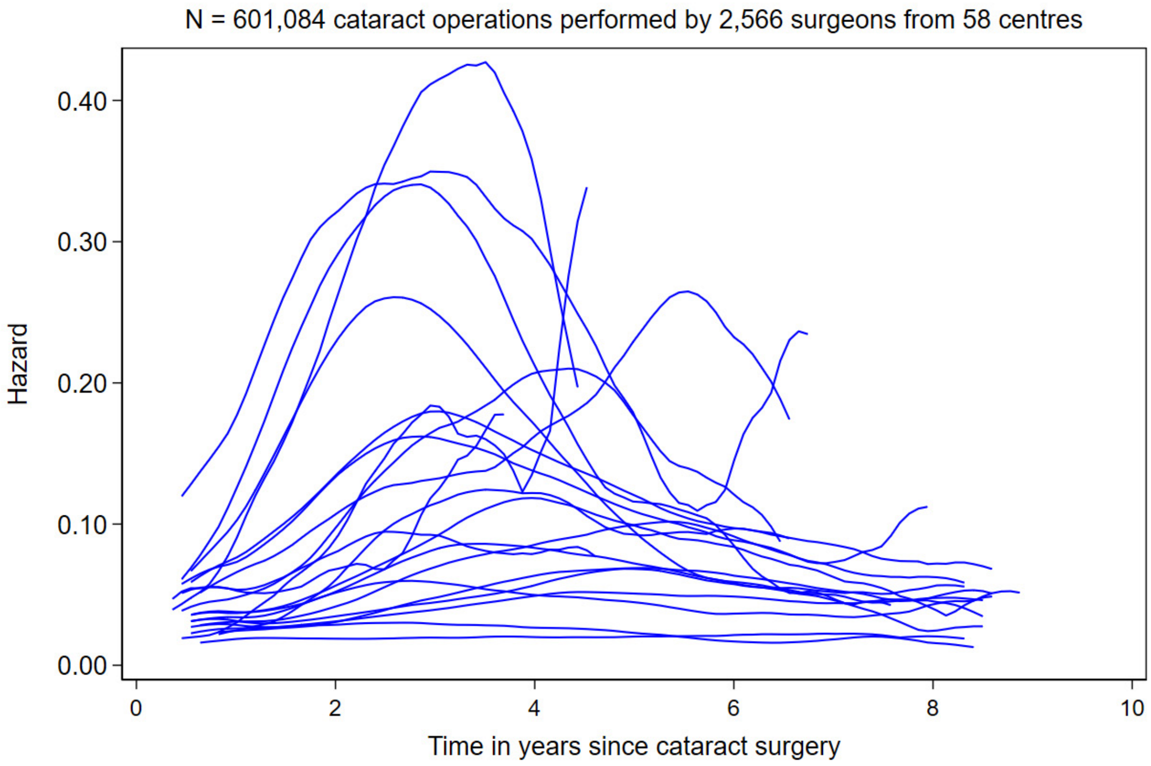


Table 8: Univariate analysis of IOL covariates under consideration in the PCO model

IOL covariate	NO PCO 'Event free' (N = 535,874)	PCO 'Events' (N = 65,210)	Overall (N = 601,084)	p-value
IOL material				
Hydrophobic	344,286 (92.7)	27,044 (7.3)	371,330	<0.001
Hydrophilic	126,131 (80.0)	31,515 (20.0)	157,646	
Silicone	33,574 (92.0)	2,911 (8.0)	36,485	
Hydrophobic / PMMA	27,985 (91.6)	2,568 (8.4)	30,553	
Hydrophobic / Hydrophilic	3,898 (76.9)	1,172 (23.1)	5,070	
IOL power (dioptres)				
<15	32,026 (84.7)	5,819 (15.4)	37,845	<0.001
15 to 19.5	103,636 (88.3)	13,724 (11.7)	117,360	
20 to 28.5	389,112 (89.8)	44,377 (10.2)	433,489	
29 to 40	11,100 (89.6)	1,290 (10.4)	12,390	

Table 9: Univariate analysis of patient level covariates under consideration in the PCO model

IOL covariate	NO PCO 'Event free' (N = 535,874)	PCO 'Events' (N = 65,210)	Overall (N = 601,084)	p-value
Age at surgery (years)				
<40	2,195 (78.0)	620 (22.0)	2,815	<0.001
40 – 49	7,873 (83.1)	1,605 (16.9)	9,478	
50 – 89	503,885 (89.1)	61,433 (10.9)	565,318	
≥90	21,921 (93.4)	1,552 (6.6)	23,473	
Gender				
Female	310,312 (88.6)	39,986 (11.4)	350,298	<0.001
Male	225,562 (89.9)	25,224 (10.1)	250,786	
Diabetic status				
No diabetes	424,674 (89.3)	50,940 (10.7)	475,614	<0.001
Is diabetic	111,200 (88.6)	14,270 (11.4)	125,470	
Ability to lie flat				
Able to lie flat	527,295 (89.1)	64,177 (10.9)	591,472	<0.001
Not able to lie flat	8,579 (89.3)	1,033 (10.7)	9,612	
Ability to cooperate				
Able to cooperate	522,194 (89.1)	63,713 (10.9)	585,907	0.559
Not able to cooperate	13,680 (90.1)	1,497 (9.9)	15,177	

Table 10: Univariate analysis of cataract surgery and ocular level covariates under consideration in the PCO model

Cataract surgery and ocular level covariate	NO PCO 'Event free' (N = 535,874)	PCO 'Events' (N = 65,210)	Overall (N = 601,084)	p-value
Grade of operating surgeon				
Consultant surgeon	324,161 (89.0)	39,992 (11.0)	364,153	<0.001
Career grade non-consultant surgeon	60,916 (88.2)	8,138 (11.8)	69,054	
More experienced trainee surgeon	128,880 (89.8)	14,598 (10.2)	143,478	
Les experienced trainee surgeon	21,917 (89.8)	2,482 (10.2)	24,399	
First / second eye surgery				
First eye surgery	357,467 (90.0)	39,835 (10.0)	397,302	<0.001
Second eye surgery	178,407 (87.5)	25,375 (12.5)	203,782	
PCR occurring during surgery				
No	527,696 (89.1)	64,666 (10.9)	592,362	<0.001
Yes	8,178 (93.8)	544 (6.2)	8,722	
Pupil size				
Small	23,174 (90.3)	2,502 (9.7)	25,676	<0.001
Medium	132,596 (88.5)	17,230 (11.5)	149,826	
Large	358,854 (88.8)	45,412 (11.2)	404,266	
Missing	21,250 (99.7)	66 (0.3)	21,316	
Preoperative visual acuity (LogMAR)				
-0.30 to 0.30	163,556 (88.6)	21,097 (11.4)	184,653	<0.001
>0.30	337,198 (89.3)	40,369 (10.7)	377,567	
Missing	35,120 (90.4)	3,744 (9.6)	38,864	
Axial length (mm)				
<26	475,465 (89.1)	58,002 (10.9)	533,467	<0.001
≥26	24,760 (83.5)	4,886 (16.5)	29,646	
Missing	35,649 (93.9)	2,322 (6.1)	37,971	
Anti-VEGF therapy				
No previous Anti-VEGF therapy	522,594 (89.2)	63,103 (10.8)	585,697	<0.001
Anti-VEGF therapy	13,280 (86.3)	2,107 (13.7)	15,387	
The presence of ocular co-pathology / known PCR risk factors				
Age-related macular degeneration				
No	478,861 (89.2)	58,068 (10.8)	536,929	<0.001
Yes	57,013 (88.9)	7,142 (11.1)	64,155	
Amblyopia				
No	527,059 (89.2)	64,017 (10.8)	591,076	<0.001
Yes	8,815 (88.1)	1,193 (11.9)	10,008	
Brunescent / white / mature cataract				
No	513,101 (89.0)	63,192 (11.0)	576,293	<0.001
Yes	22,773 (91.9)	2,018 (8.1)	24,791	

Table 10 continued…

Cataract surgery and ocular level covariate	NO PCO 'Event free' (N = 535,874)	PCO 'Events' (N = 65,210)	Overall (N = 601,084)	p-value
Corneal pathology				
No	518,475 (89.2)	62,888 (10.8)	581,363	0.318
Yes	17,399 (88.2)	2,322 (11.8)	19,721	
Diabetic retinopathy				
No	496,964 (89.4)	58,987 (10.6)	555,951	<0.001
Yes	38,910 (86.2)	6,223 (13.8)	45,133	
Glaucoma				
No	477,524 (89.4)	56,755 (10.6)	534,279	<0.001
Yes	58,350 (87.3)	8,455 (12.7)	66,805	
High myopia				
No	515,014 (89.4)	61,058 (10.6)	576,072	<0.001
Yes	20,860 (83.4)	4,152 (16.6)	25,012	
No fundal view / Vitreous opacities				
No	529,471 (89.1)	64,582 (10.9)	594,053	0.380
Yes	6,403 (91.1)	628 (8.9)	7,031	
Optic nerve / CNS disease				
No	533,043 (89.2)	64,830 (10.8)	597,873	0.676
Yes	2,831 (88.2)	380 (11.8)	3,211	
Other macular pathology				
No	521,873 (89.3)	62,637 (10.7)	584,510	<0.001
Yes	14,001 (84.5)	2,573 (15.5)	16,574	
Other retinal vascular pathology				
No	529,124 (89.2)	64,145 (10.8)	593,269	0.049
Yes	6,750 (86.4)	1,065 (13.6)	7,815	
Pseudoexfoliation / Phacodenesis				
No	529,420 (89.1)	64,540 (10.9)	593,960	<0.001
Yes	6,454 (90.6)	670 (9.4)	7,124	
Previous vitrectomy surgery				
No	526,427 (89.4)	62,479 (10.6)	588,906	<0.001
Yes	9,447 (77.6)	2,731 (22.4)	12,178	
Previous trabeculectomy surgery				
No	532,573 (89.2)	64,645 (10.8)	597,218	<0.001
Yes	3,301 (85.4)	565 (14.6)	3,866	
Uveitis / Synechiae				
No	530,741 (89.2)	64,201 (10.8)	594,942	0.052
Yes	5,133 (83.6)	1,009 (16.4)	6,142	
Unspecified 'other' co-pathology				
No	489,824 (89.1)	60,029 (10.9)	549,853	<0.001
Yes	46,050 (89.9)	5,181 (10.1)	51,231	

Table 11: PCO risk factor model covariate estimates

PCO risk factor model covariate	Coefficient	Standard error	p-value	95% Confidence Interval
Gamma	0.707	0.002	<0.001	0.702 to 0.711
Constant	1.946	0.050	<0.001	1.848 to 2.044
IOL material				
Hydrophobic	0.000	N/A	N/A	N/A
Hydrophilic	-0.741	0.008	<0.001	-0.756 to -0.726
Silicone	0.235	0.017	<0.001	0.201 to 0.269
Hydrophobic / PMMA	0.246	0.018	<0.001	0.210 to 0.281
Hydrophobic / Hydrophilic	-0.927	0.024	<0.001	-0.974 to -0.880
IOL power (dioptres)				
<15	-0.155	0.020	<0.001	-0.194 to -0.115
15 to 19.5	-0.042	0.009	<0.001	-0.060 to -0.025
20 to 28.5*	0.000	N/A	N/A	N/A
29 to 40	-0.034	0.026	0.192	-0.085 to 0.017
Age at surgery (years)				
<40	0.000	N/A	N/A	N/A
40 – 49	0.354	0.052	<0.001	0.252 to 0.456
50 – 89	0.630	0.046	<0.001	0.540 to 0.720
≥90	0.718	0.051	<0.001	0.619 to 0.818
Gender				
Female	0.000	N/A	N/A	N/A
Male	0.099	0.007	<0.001	0.084 to 0.114
Diabetic status				
No diabetes	0.000	N/A	N/A	N/A
Is diabetic	0.144	0.009	<0.001	0.127 to 0.162
Grade of operating surgeon				
Consultant surgeon	0.000	N/A	N/A	N/A
Career grade non-consultant surgeon	-0.030	0.010	0.003	-0.050 to -0.010
More experienced trainee surgeon	0.025	0.008	0.002	0.009 to 0.041
Les experienced trainee surgeon	-0.024	0.017	0.155	-0.057 to 0.009
First / second eye surgery				
First eye surgery	0.000	N/A	N/A	N/A
Second eye surgery	-0.137	0.006	<0.001	-0.149 to -0.126
PCR occurring during surgery				
No	0.000	N/A	N/A	N/A
Yes	0.384	0.038	<0.001	0.309 to 0.458

Table 11 continued…

PCO risk factor model covariate	Coefficient	Standard error	p-value	95% Confidence Interval
Pupil size				
Small	0.000	N/A	N/A	N/A
Medium	-0.091	0.018	<0.001	-0.127 to -0.055
Large	-0.034	0.018	0.055	-0.069 to 0.001
Missing	1.519	0.093	<0.001	1.335 to 1.702
Axial length (mm)				
<26	0.000	N/A	N/A	N/A
≥26	-0.079	0.022	<0.001	-0.122 to -0.036
Missing	0.410	0.018	<0.001	0.375 to 0.445
Anti-VEGF therapy				
No previous Anti-VEGF therapy	0.000	N/A	N/A	N/A
Anti-VEGF therapy	0.121	0.020	<0.001	0.083 to 0.160
The presence of any of the following				
Age-related macular degeneration	0.046	0.011	<0.001	0.024 to 0.069
Brunescent / white / mature cataract	0.065	0.019	0.001	0.028 to 0.103
Glaucoma	0.298	0.011	<0.001	0.278 to 0.319
High myopia	-0.076	0.019	<0.001	-0.113 to -0.040
Other macular pathology	-0.128	0.019	<0.001	-0.166 to -0.091
Pseudoexfoliation / Phacodenesis	0.206	0.034	<0.001	0.140 to 0.272
Previous vitrectomy surgery	-0.621	0.020	<0.001	-0.662 to -0.581
Uveitis / synechiae	-0.083	0.030	0.006	-0.143 to -0.024
Unspecified ‘other’ co-pathology	-0.088	0.013	<0.001	-0.112 to -0.063

*The 20 to 28.5 dioptre group is the reference group

Table 12: PCO risk factor model covariate differences and point of departure

PCO risk factor model covariate	Higher risk	Point of departure
IOL material	Hydrophobic / Hydrophilic lens	>1 year
	Hydrophilic lens	>1 year
	Hydrophobic lens	>2 years
IOL power (dioptres)	<15 dioptres	Within 1 year
	15 to 19 dioptres	After 3 years
Age at surgery (years)	Younger age (<50)	Within months
Gender	Female patients	>2 years
Diabetic status	Not diabetic	>2 years
Grade of operating surgeon	Career grade non-consultant surgeons	>3 years and minor
First / second eye surgery	Second eye surgery	>1 year
PCR occurring during surgery	No PCR	>1 year
Pupil size	Medium	>1 year
	Large	>3 years, different profile for missing
Axial length (mm)	Higher axial length	Within months, different profile for missing axial length
Anti-VEGF therapy	No previous Anti-VEGF	>2 year
The presence of any of the following		
Age-related macular degeneration	No Age-related macular degeneration	>3 years
Brunescent / white / mature cataract	No brunescent / white / mature cataract	>2 years
Glaucoma	No glaucoma	>1 year
High myopia	High myopia	Within months
Other macular pathology	Other macular pathology present	Immediately
Pseudoexfoliation / Phacodenesis	No Pseudoexfoliation / Phacodenesis	>1 year
Previous vitrectomy surgery	Previous vitrectomy surgery	Immediately
Uveitis / synechiae	Uveitis / synechiae and then absent disease	Up to 4 years
	No uveitis / synechiae	>4 years
Unspecified 'other' co-pathology	Unspecified 'other' co-pathology present	>1 year and minor

Figure 11: Cumulative hazard and Cox-Snell residuals for the PCO risk factor model

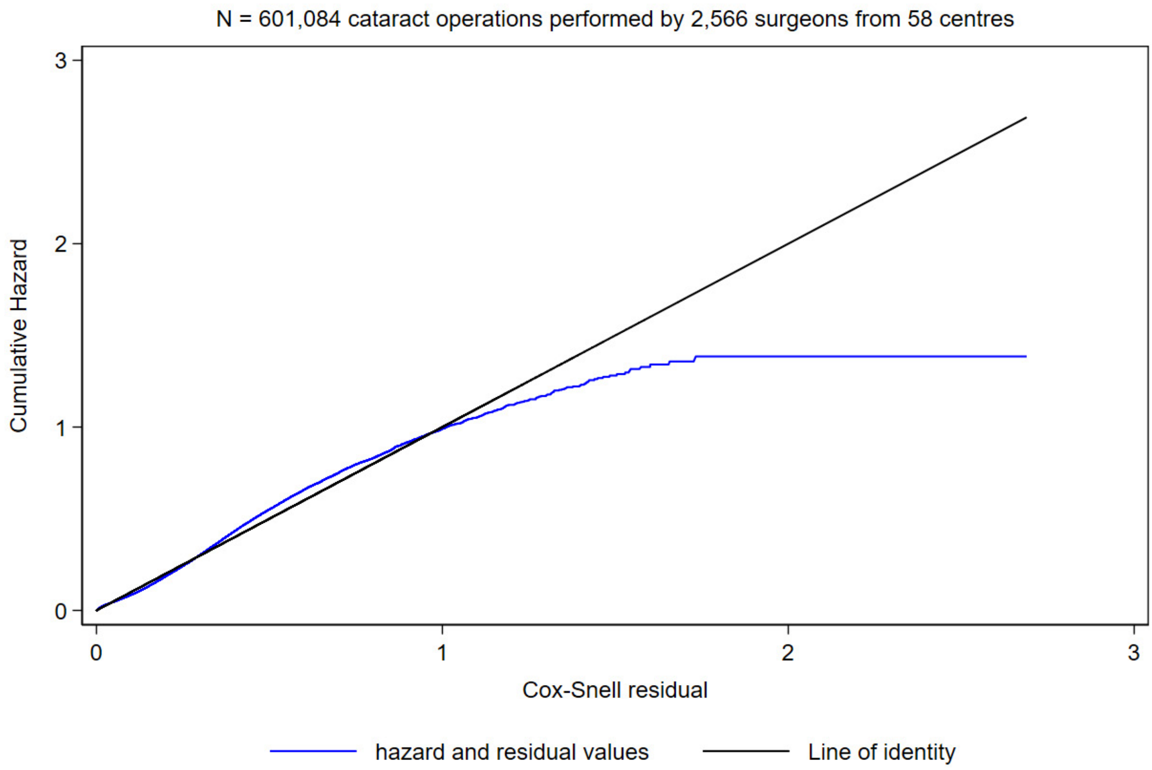
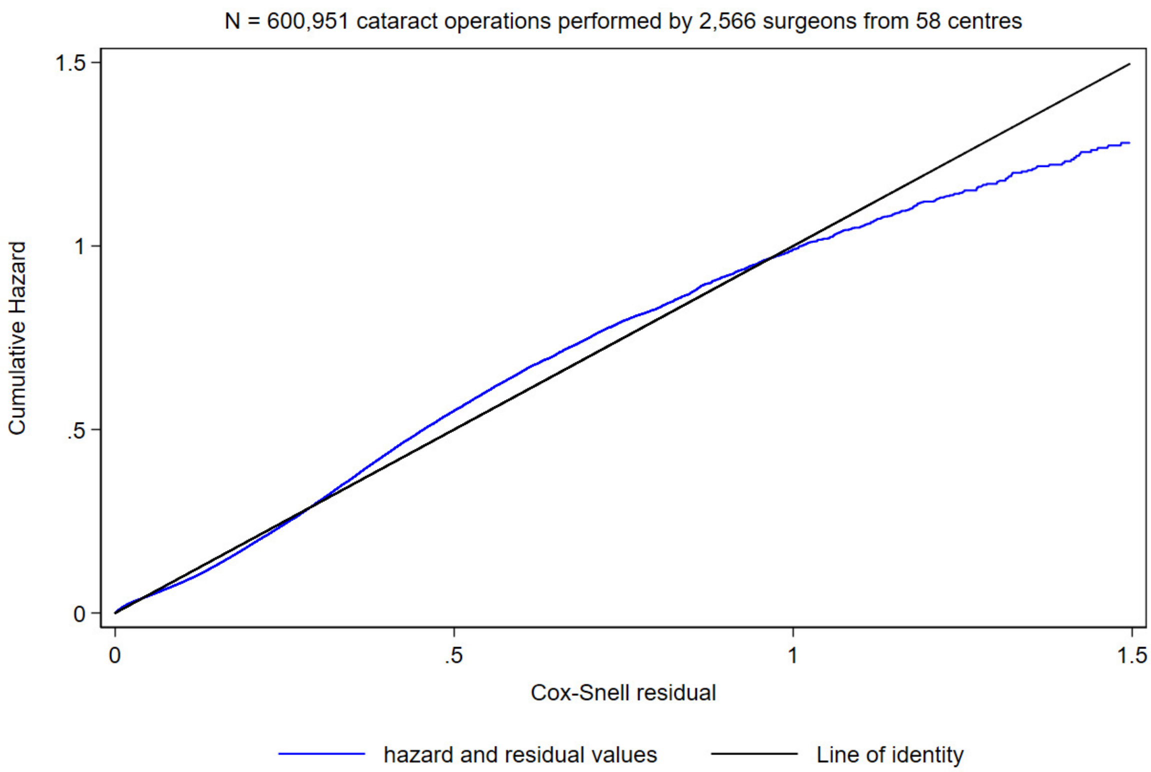


Figure 12: Cumulative hazard and Cox-Snell residuals for the PCO risk factor model, for operations where the Cox-Snell residual is <1.5



4.11 Adjusted PCO rates

The standard approach for risk adjustment is to multiply a mean or overall value by the ratio of the observed and expected rate, where the expected rate is created from a risk factor model. This is problematic for a time to event analysis due to the nature of 'over time'. One option is to select a time point and estimate the adjusted rate at this time point, for example 3 years post-cataract surgery. This is not ideal as the results clearly show that PCO does develop at different time points for different lenses, centres and patients, and loss to follow-up is a limitation of any time to event analysis.

For these results there are further issues with attempting this method of adjustment as the risk factor model is not a perfect fit to the data, has not been validated in another sample and cannot account for any variation after cataract surgery regarding plausible development of influential diseases between cataract surgery and PCO.

Deriving confidence intervals is a problem with large samples because the intervals become extremely narrow as the sample size increases; this can lead to the appearance of misleading statistical outliers due to the various biases affecting the data in this analysis. For these reasons the RCOphth NOD have decided not to report risk adjusted estimates in this report.

5. Study limitations

The last assessment date for eyes without PCO is biased by patients with assessments within the hospital eye service after discharge from cataract surgery, i.e. for the fellow eye or for eye assessments in a non-cataract clinic. This bias does affect the estimate of time to PCO due to the eyes with less follow-up time leaving the denominator earlier than they would if they remained under continuous follow-up. The PCO rates at different time point's post-cataract surgery for each centre are influenced by some centres with very few cases of PCO, and there is evidence of institutional preference for the choice of IOL to use during surgery.

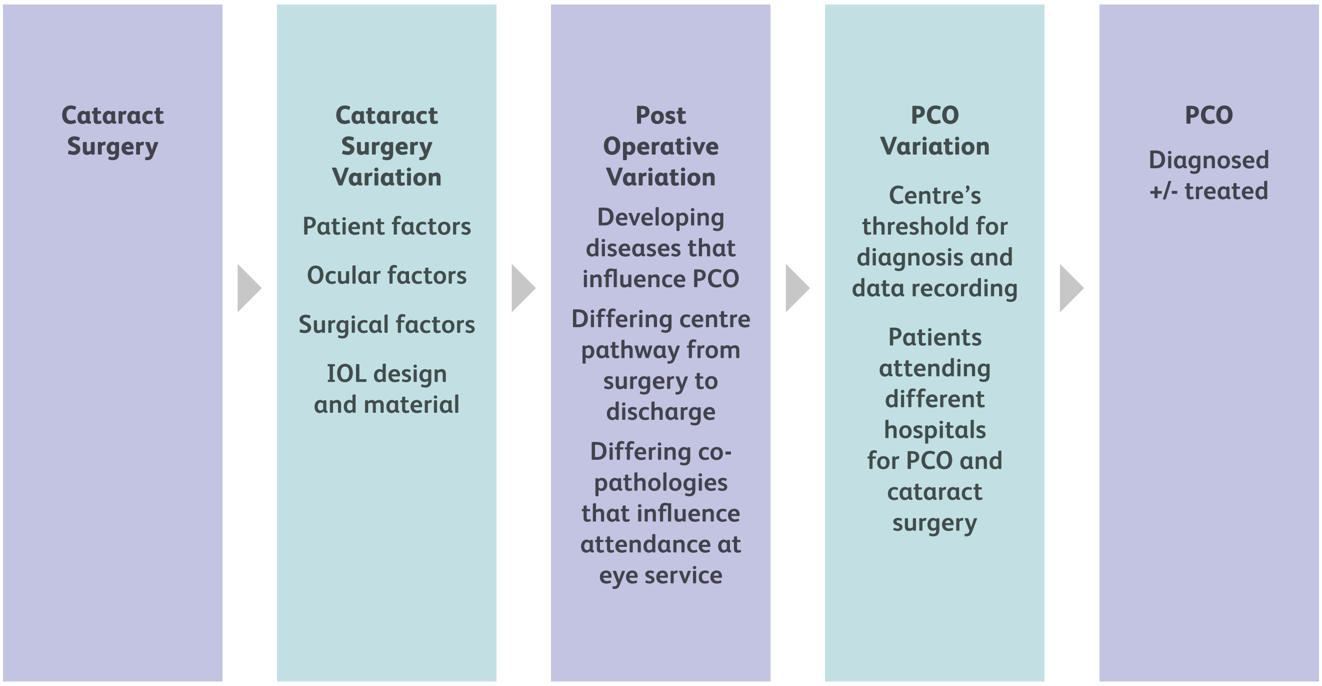
The RCOphth NOD includes data for cataract surgery to the first treated eye, the second treated eye and in some cases immediate sequential bilateral surgery, but for some patients the record for the first treated eye may be missing. This may arise for example if the first eye operation was performed prior to the centre adopting electronic data collection, or the first treated eye operation could have been performed in a different centre.

It is possible that the observed PCO rates are underestimated as patient's having cataract surgery in one centre could attend another for YAG laser capsulotomy. This is more likely to happen when there is a capacity limitation in one centre and patients have the option of YAG laser capsulotomy in another centre, and is linked to geography. At present the RCOphth NOD cannot link patients' data if collected at different centres.

6. Conclusions

- This analysis of a very large sample of 601,084 cataract operations performed by 2,566 surgeons in 58 contributing RCOphth NOD centres clearly shows variation in post-cataract surgery data recording between centres which does impact on the outcome of post-cataract PCO. Monofocal Single Piece lenses were used in 94.5% of operations and two lenses were used in >100,000 operations.
- The overall one-, three-, and five-year observed PCO rates were 4.0%, 18.0% and 31.2% respectively and lenses with a hydrophilic component had higher PCO rates as did many IOL models and centres. **Multiple surgical and ocular factors were found to influence the risk of PCO and none of these alone can account for the vast variation in observed PCO rates between IOL models or centres.**
- **Due to the magnitude of variation observed, this analysis cannot definitively state that any individual IOL put the patient at higher risk of developing PCO, or say for sure what drove the variation in PCO rates for individual IOL's and centres.** Consequently the RCOphth NOD cannot advise changes in clinical practice regarding which IOL to use.
- The results are derived from the data submitted to the RCOphth NOD, and there are various possible reasons for differing PCO results. The RCOphth NOD does not have fully complete information on, for example, pathway factors specific to particular hospitals that explain some of the variation in PCO rates observed, which will be associated more strongly with certain IOL models than others given that over 45% of centres use one model of IOL in >90% of cases, Figure 13.
- The extreme variation of PCO rates between centres and the near exclusive use of certain IOL models by certain centres brings us to the conclusion that it is not feasible to use the RCOphth NOD cataract audit data to compare IOL models under current conditions.
- The same caution is not enforced for utilisation of the data to explore patient-related ocular or operative risk factors for PCO hence covariates that increased the risk of developing PCO included an axial length >26 mm, the presence of high myopia and implantation of lower IOL powers, previous vitrectomy surgery and uveitis / synechiae, along with younger age and female gender.
- Comparison of PCO rates for different IOL's utilised within the same centre would also appear to be feasible – and should be encouraged in order for centres to identify IOL's which minimise the visual loss caused by PCO and the need for subsequent YAG laser for their patients.
- The extent of variation found suggests that there could be substantial benefits to patients and to the NHS from identifying IOL's or other modifiable risk factors that impact PCO rates.

Figure 13: Summary of reasons for the different sources of variation that affect estimates of post-cataract PCO



7. Recommendations

Any improvement in reducing post-cataract PCO will have benefits to patients. It is expected that an IOL inserted during cataract surgery will be in-situ for the remainder of that patient's life. Some patients will endure PCO related symptoms that remain undetected (or unreported), others will endure PCO related symptoms for a limited period until detected and treated, and all those treated will incur costs to the NHS that divert resources from a finite pool. If any lens is more likely to lead to PCO than others, then patients implanted with that IOL are at increased risk of PCO and the attendant reduction in quality of life along with the necessity for resource utilisation to diagnose, refer and treat.

Clearer characterisation of the risk factors for PCO formation, including IOL model, is desirable therefore for patient benefit. From the results in this analysis, there are recommendations to help reduce the burden of PCO on patients and the NHS, but also recommendations that, if adopted, could help reduce variation in data collection and aid further research. These are;

- Contributing centres should investigate measures to improve data collection, including moving to utilisation of EMR across their whole eye service including any community-based follow-up.
- Contributing centres should perform regular internal audits of their PCO rates for each IOL model they use.
- The NHS tariff for YAG laser capsulotomy is £132 on average. It would be a false economy, therefore, for NHS providers to opt for a less expensive IOL with higher PCO rates. The perverse incentive created due to the purchaser provider split needs to be resisted, and PCO rates given due consideration when tendering for IOL's.
- The RCOphth has applied for section 251 exemption to facilitate data linkage, and if granted then repeat of a national PCO rate evaluation based upon NOD data may be appropriate. Timing of repeated analysis would be best set for after completion of national EMR procurements and leaving a sufficient interval after normalisation of health care processes post-pandemic.

8. Future analysis

The RCOphth NOD have received donation from Alcon Eye Care UK Limited to support the ongoing work of the National Cataract Audit which is likely to include further work regarding PCO and IOL, with plans for specific analysis for peer review publication. These papers can look at specific questions using more refined eligibility criteria, for example analyses of the Monofocal Single Piece lenses which are the most frequently used IOL's by the NHS and were used for 94.5% of this sample. Even though the percentage of operations in this sample was low for Monofocal Multipiece and Monofocal Toric lenses, due to the continuing annual submission of data to the RCOphth NOD the number of operations where these types of lenses are used could increase to the point where bespoke analysis of these lenses is feasible.

9. Acknowledgements

We would like to acknowledge the support and guidance we have received from the RCOphth Executive Committee in reviewing this report.

We also acknowledge the support of the hospitals that are participating in the prospective audit and thank our medical and non-medical colleagues for the considerable time and effort devoted to conscientious electronic data collection as they go about caring for their patients. All participating centres with data in this analysis are acknowledged in Appendix 3.

10. Funding

The RCOphth NOD National Cataract Audit is currently funded through participation fees from centres as well as contributions from Alcon Eye Care UK Limited and Bausch + Lomb. We are grateful for the donations received from these organisations.

11. Interpreting the graphs

Among the results there are four types of graphs;

- Bar charts – these are either horizontally or vertically aligned depending on the data being plotted. One axis displays the categorical element (IOL model or contributing centre) and the other axis the numeric quantity. When a bar chart is sub-divided by another category, the length of each bar indicates the quantity of interest for the sub-category as read from the numeric axis. Each bar chart is ordered (sorted) by a quantity being plotted. Figure 1 is an example of a bar chart.
- Kaplan-Meier curves – these display PCO failure rates over time where the failure rate is up to time t and the number at risk displayed below when feasible. The number at risk is the number of eyes who enter the time interval and can be interpreted as the number at risk for calculating the respective time interval failure rate.
- Hazzard plots – these display the hazard function which is the likelihood of failure as a function of time, i.e. the instantaneous failure rate at a particular time. Interpretations of this rely of the direction of the curves within a time period, decreasing curves imply reducing hazard, horizontal (flat) curves imply constant hazard and increasing curves imply increasing hazard, for example a curve that initially increases and then decrease implies that the underlying hazard is increasing for earlier time points and decreasing for latter time points. Figure 10 is an example of a hazard plot.
- Scatter plots – these display data for two variables, one on the x-axis and the other on the y-axis. In this report these are used to show the cumulative hazard and the Cox-Snell residuals with the line of identity as a part of risk factor model diagnostics. Interpretation of these plots concerns the closeness of the plotted values to the line of identity. Figure 11 is an example of a scatter plot.

12. The RCOphth NOD Audit Team

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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.

Appendix 1: Glossary

Abbreviation	Description
AMD	Age-related Macular Degeneration
B&L	Bausch + Lomb
CNS	Central Nervous System
DR	Diabetic Retinopathy
EMR	Electronic Medical Record
IOL	Intra-ocular lens is an artificial lens generally inserted into the capsule of the lens after cataract removal
ISBCS	Immediate Sequential Bilateral Cataract Surgery
LogMAR	Logarithm of the Minimum Angle of Resolution
N/A	Not Applicable
NHS	National Health Service
NOD	National Ophthalmology Database
PCO	Posterior Capsule Opacification occurs when a cloudy layer of scar tissue forms behind the lens implant, this can cause blurred or hazy vision or glares from lights.
PCR	Posterior capsule rupture is a break in the posterior capsule of the lens, usually as a complication of cataract surgery. It may allow vitreous to move forward into the anterior chamber of the eye.
PMMA	Polymethyl methacrylate
RCOphth	The Royal College of Ophthalmologists
UK	United Kingdom
VA	Visual acuity is the sharpness of vision, measured by the ability to distinguish letters or numbers at a given distance according to a fixed standard. We have reported VA using the LogMAR scale (base 10 Log of the reciprocal of the visual angle). A normal LogMAR VA is 0.0 and the number increases as vision gets worse. LogMAR=0.3 would be at the boundary for driving a car and 1.0 would be at the level of registrable severe sight impairment. A postoperative VA of 0.3 or better is often used as a measure of a favourable outcome from surgery.
VEGF	Vascular Endothelial Growth Factor
YAG	Yttrium Aluminium Garnet is a crystal located within the laser, and YAG laser is the standard treatment for PCO.

Appendix 2: PCR and preoperative VA Definitions

PCR – Posterior Capsule Rupture or Vitreous Prolapse or both

PCR was deemed to have occurred if any of the following intra-operative complications are recorded during surgery; Zonule rupture – vitreous loss, PC rupture ± vitreous loss, Vitreous to the section at end of surgery, Vitreous loss, Nuclear/ epinuclear fragment into vitreous, intra-ocular lens (IOL) into the vitreous, lens fragments into vitreous, or if any of the following occurred.

- The operation includes any of 'Sponge and scissors vitrectomy', 'Automated anterior vitrectomy' or 'Scleral fixed IOL'
- The operative procedure includes 'Fragmatome lensectomy ± IOL' with a previous or concurrent phacoemulsification procedure
- The operative procedure includes 'Removal of retained lens fragments' combined with a pars plana vitrectomy
- If either of 'vitreous to the section' or 'vitreous in the anterior chamber' were recorded within eight weeks of cataract surgery, this includes the day of cataract surgery in the time frame
- If there is a record of a dropped nucleus operation with 90 days of cataract surgery, this includes the day of cataract surgery in the time frame

Preoperative Visual Acuity (VA)

Visual acuity measurements are reported using the LogMAR scale with numeric substitutions of 2.10, 2.40, 2.70 and 3.00 for the ability to count fingers, the ability to distinguish hand movements, perception of light and no perception of light respectively.

Preoperative VA was defined as the better of corrected distance visual acuity and uncorrected distance visual acuity recorded within a six month 'time window' prior to surgery. Where there are multiple occasions of measurement the VA measurement closest to the date of surgery is used and measurements recorded on the same day as cataract surgery are considered as preoperative measurements. Pinhole measurements are not used preoperatively.

Appendix 3: Contributing RCOphth NOD centres with data in his analysis

The 58 centres with data in this analysis are listed in alphabetical order below separated into the region they are located in.

English NHS Trusts:

Barking, Havering and Redbridge University Hospitals NHS Trust; Barts Health NHS Trust; Bolton NHS Foundation Trust; Bradford Teaching Hospitals NHS Foundation Trust; Calderdale and Huddersfield NHS Foundation Trust; Chesterfield Royal Hospital NHS Foundation Trust; County Durham and Darlington NHS Foundation Trust; East Kent Hospitals University NHS Foundation Trust; East Sussex Healthcare NHS Trust; Epsom and St Helier University Hospitals NHS Trust; Frimley Health NHS Foundation Trust; Gloucestershire Hospitals NHS Foundation Trust; Great Western Hospitals NHS Foundation Trust; Hampshire Hospitals NHS Foundation Trust; Harrogate and District NHS Foundation Trust; Imperial College Healthcare NHS Trust; Isle of Wight NHS Trust; King's College Hospital NHS Foundation Trust; Leeds Teaching Hospitals NHS Trust; Liverpool University Hospitals NHS Foundation Trust; Manchester University NHS Foundation Trust; Mid Cheshire Hospitals NHS Foundation Trust; Mid Essex Hospital Services NHS Trust; Moorfields Eye Hospital NHS Foundation Trust*; Norfolk and Norwich University Hospitals NHS Foundation Trust; North Middlesex University Hospital NHS Trust; North West Anglia NHS Foundation Trust; Northern Devon Healthcare NHS Trust; Nottingham University Hospitals NHS Trust; Oxford University Hospitals NHS Foundation Trust; Portsmouth Hospitals NHS Trust; Royal Berkshire NHS Foundation Trust; Royal Cornwall Hospitals NHS Trust; Royal Free London NHS Foundation Trust; Royal United Hospitals Bath NHS Foundation Trust; Salisbury NHS Foundation Trust; Sandwell and West Birmingham Hospitals NHS Trust; Sheffield Teaching Hospitals NHS Foundation Trust; Shrewsbury and Telford Hospital NHS Trust; South Tees Hospitals NHS Foundation Trust; South Warwickshire NHS Foundation Trust; The Hillingdon Hospitals NHS Foundation Trust; The Mid Yorkshire Hospitals NHS Trust; The Newcastle upon Tyne Hospitals NHS Foundation Trust; The Princess Alexandra Hospital NHS Trust; The Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust; Torbay and South Devon NHS Foundation Trust; University Hospital Southampton NHS Foundation Trust; University Hospitals Birmingham NHS Foundation Trust; University Hospitals Bristol NHS Foundation Trust; University Hospitals Coventry and Warwickshire NHS Trust; University Hospitals Plymouth NHS Trust; Warrington and Halton Hospitals NHS Foundation Trust; Wirral University Teaching Hospital NHS Foundation Trust; Wrightington, Wigan and Leigh NHS Foundation Trust; Yeovil District Hospital NHS Foundation Trust;

Welsh Local Health Boards:

Cardiff & Vale University Local Health Board;

Guernsey:

Medical specialists group Guernsey;

*Includes data from Bedford Hospital NHS Trust and Croydon Health Services NHS Trust as the ophthalmology services for these two NHS Trusts are part of Moorfields Eye Hospital NHS Foundation Trust.

Appendix 4: Data recording percentages for contributing centres

Appendix 4 table: Centre percentages of operations postoperative complication data, post-cataract diagnosis data, post-cataract surgery data and median follow-up time

Centre	Number of operations	Percentage with postoperative complication data	Percentage with post-cataract surgery data	Percentage with post-cataract diagnosis data	Median follow-up time (months)
1	47,481	18.1	6.5	32.9	5.9
2	31,398	55.2	16.5	38.8	19.8
3	28,641	68.9	14.9	35.0	16.8
4	27,607	55.7	20.8	38.4	14.5
5	27,227	46.6	11.6	31.6	11.2
6	19,173	42.4	19.8	33.4	19.1
7	17,797	28.1	10.4	17.9	19.8
8	17,731	44.4	3.6	10.9	5.0
9	17,630	39.5	13.1	31.4	21.5
10	17,394	62.4	16.4	38.1	15.6
11	17,332	54.7	10.9	27.4	17.4
12	16,025	47.0	21.9	43.5	21.6
13	15,205	49.9	12.8	32.3	8.4
14	15,101	35.2	11.3	24.5	11.7
15	15,075	8.2	4.6	3.8	3.5
16	13,852	42.1	6.9	17.0	14.9
17	13,804	90.8	10.8	34.5	12.2
18	13,391	68.6	11.1	31.3	10.6
19	12,697	60.6	11.1	32.4	17.4
20	12,016	16.0	18.2	13.6	19.7
21	12,005	3.8	8.3	6.1	6.0
22	11,729	51.2	9.2	14.2	5.8
23	11,576	62.2	11.8	32.6	19.5
24	11,568	36.2	28.2	31.1	24.0
25	11,127	30.3	15.6	18.6	22.2
26	10,803	39.3	17.0	31.0	13.9
27	9,657	70.9	11.8	28.0	22.0
28	9,239	10.9	2.4	2.2	8.6
29	8,973	29.6	12.3	20.5	6.9
30	8,538	11.9	7.7	8.8	5.1
31	8,070	51.6	10.7	32.6	11.3
32	7,814	53.0	14.5	33.6	13.6
33	7,346	11.2	4.0	4.8	6.2
34	7,305	66.1	15.3	30.7	9.7
Overall	**601,084**	**59.9**	**16.8**	**39.4**	**10.5**

Appendix 4 table continued…

Centre	Number of operations	Percentage with postoperative complication data	Percentage with post-cataract surgery data	Percentage with post-cataract diagnosis data	Median follow-up time (months)
35	6,959	64.6	8.0	14.0	7.4
36	6,712	24.2	3.2	2.0	2.5
37	5,951	33.2	10.7	25.8	24.9
38	5,047	71.5	15.9	45.4	11.0
39	4,455	24.3	7.5	28.3	9.1
40	4,199	37.3	6.7	19.6	6.9
41	3,740	6.7	3.0	2.2	7.0
42	3,561	44.2	1.2	19.9	4.6
43	3,374	1.5	1.1	0.7	2.8
44	3,164	83.8	12.5	49.9	14.6
45	2,715	24.5	0.9	4.7	7.8
46	2,559	27.9	3.2	10.9	4.7
47	2,294	31.2	4.5	2.0	3.1
48	1,959	19.4	1.4	2.9	2.5
49	1,914	37.4	8.3	24.3	21.0
50	1,767	36.9	0.2	12.1	7.6
51	1,719	49.9	4.9	40.7	9.4
52	1,510	11.3	0.9	1.1	2.8
53	1,485	19.6	3.3	8.7	5.5
54	1,190	36.8	4.9	27.2	11.9
55	859	19.9	2.2	9.3	7.3
56	838	17.7	2.7	7.3	6.5
57	559	68.2	5.6	14.2	5.3
58	227	10.5	1.7	7.0	14.7
Overall	**601,084**	**59.9**	**16.8**	**39.4**	**10.5**

Appendix 5: The percentage of operations where each IOL model was used for each centre

Appendix 5 table: The percentage of operations where each IOL model was used for each centre. For each centre the IOL that was used the most is highlighted in lilac

Centre	Number of operations	AcrySof IQ SN60WF	Tecnis ZCB00	Akreos Adapt	AcrySof SA60AT	Rayner Hydrophilic IOL's	Hoya ISERT	Lenstec Softec	Bausch + Lomb SofPort (Silicone)	AcySof MA60AC (Multipiece)	Eyecee One	Bausch + Lomb Envista MX60	Tecnis Z9002 (Silicone)	Tecnis ZA9003 (Multipiece)	Zeiss CT Lucia	Bausch + Lomb Incise	Zeiss CT Asphina	Physiol A123	AMO sensar (Multipiece)	Aaren Scientific EC1	AcrySof Toric	Rayner T-Flex Toric
1	47,481	73.7	11.3	2.8	2.5	<0.1	0.0	0.1	<0.1	7.2	0.0	0.1	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	1.7	<0.1
2	31,398	0.2	<0.1	11.0	0.3	5.5	0.0	61.1	8.1	0.5	0.0	<0.1	<0.1	0.1	0.0	13.0	0.1	0.1	0.0	0.0	0.0	0.0
3	28,641	0.0	62.2	<0.1	0.8	0.0	0.0	0.0	<0.1	0.0	18.1	17.2	0.0	1.1	0.2	0.0	0.0	0.0	0.3	0.0	<0.1	0.0
4	27,607	0.1	0.0	21.6	41.7	33.6	0.0	0.0	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.1	<0.1	<0.1	0.0	0.1	0.1
5	27,227	0.0	0.0	0.1	70.3	0.1	0.1	0.0	28.6	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	19,173	<0.1	44.2	51.1	0.3	0.0	0.0	0.0	<0.1	2.7	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
7	17,797	1.0	30.8	19.1	8.5	0.0	0.0	0.0	0.0	2.0	0.2	0.0	37.6	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	<0.1	0.7
8	17,731	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	17,630	0.0	96.7	0.0	0.1	0.4	0.1	0.5	0.0	1.0	0.4	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
10	17,394	0.2	58.1	<0.1	0.0	0.0	0.0	<0.1	0.0	<0.1	7.2	0.0	0.0	33.4	0.0	0.0	<0.1	0.0	0.9	0.0	<0.1	0.1
11	17,332	96.8	0.2	0.0	2.0	0.0	0.0	0.0	0.0	0.8	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	<0.1	0.0
12	16,025	2.7	0.0	11.3	0.5	0.0	0.3	70.7	0.0	0.3	12.1	0.0	0.0	0.0	0.0	2.2	0.0	0.0	0.0	0.0	0.0	0.0
13	15,205	12.4	44.6	7.1	28.5	<0.1	0.0	0.0	0.0	0.7	0.0	0.0	6.5	<0.1	0.0	0.0	0.0	0.0	<0.1	0.0	0.0	0.0
14	15,101	88.8	0.1	0.0	0.8	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	8.8	0.0	<0.1	0.0
15	15,075	49.4	0.4	0.0	0.5	0.0	20.3	0.0	0.0	28.1	0.4	0.0	<0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.6	0.0
16	13,852	15.8	69.3	<0.1	1.7	1.3	6.5	0.0	0.0	5.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	<0.1	<0.1	0.0	0.0
17	13,804	89.9	4.7	1.6	2.1	0.0	0.0	0.0	0.0	1.6	<0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Overall	**601,084**	**19.8**	**19.5**	**9.9**	**9.7**	**8.9**	**7.2**	**5.5**	**4.7**	**3.5**	**2.1**	**1.7**	**1.3**	**1.3**	**1.2**	**0.9**	**0.8**	**0.8**	**0.3**	**0.3**	**0.2**	**0.2**

Appendix 5 table continued…

Centre	Number of operations	AcrySof IQ SN60WF	Tecnis ZCB00	Akreos Adapt	AcrySof SA60AT	Rayner Hydrophilic IOL's	Hoya ISERT	Lenstec Softec	Bausch + Lomb SofPort (Silicone)	AcrySof MA60AC (Multipiece)	Eyecee One	Bausch + Lomb Envista MX60	Tecnis Z9002 (Silicone)	Tecnis ZA9003 (Multipiece)	Zeiss CT Lucia	Bausch + Lomb Incise	Zeiss CT Asphina	Physiol A123	AMO sensar (Multipiece)	Aaren Scientific EC1	AcrySof Toric	Rayner T-Flex Toric
18	13,391	0.0	0.0	0.0	0.0	97.3	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.9
19	12,697	94.6	0.0	0.0	3.5	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
20	12,016	0.4	2.6	0.0	31.4	4.8	<0.1	0.2	11.0	0.3	0.0	0.0	0.2	0.2	0.2	0.0	41.5	7.2	0.0	0.0	0.0	0.0
21	12,005	39.3	0.0	0.0	0.4	0.1	32.9	0.0	0.2	1.2	0.0	0.0	0.0	0.0	25.8	0.0	<0.1	0.0	0.0	0.0	<0.1	0.0
22	11,729	<0.1	0.1	98.1	<0.1	0.0	0.3	0.0	0.9	<0.1	0.3	<0.1	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0
23	11,576	2.4	0.2	0.0	2.1	29.5	41.5	0.0	0.0	21.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7
24	11,568	4.2	0.0	60.0	0.9	1.1	0.0	0.0	1.6	0.8	0.1	0.0	0.0	0.0	0.0	0.0	0.0	31.3	0.0	0.0	0.0	0.0
25	11,127	0.0	7.5	0.9	0.0	0.1	8.3	0.0	1.8	0.0	22.6	48.9	0.0	0.0	0.0	8.3	0.0	0.0	0.0	0.0	0.0	1.7
26	10,803	<0.1	0.0	0.0	0.0	98.9	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0
27	9,657	0.1	0.2	5.3	0.1	4.0	86.2	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	3.5
28	9,239	23.6	0.0	0.0	73.6	0.1	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.1	0.0	<0.1	0.0	0.0	0.0	0.7	0.2
29	8,973	0.0	0.0	<0.1	0.0	0.0	<0.1	0.0	95.3	0.2	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	8,538	0.0	0.0	37.0	0.0	0.5	0.0	0.2	62.0	0.1	0.2	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	<0.1	0.0	0.0	0.0
31	8,070	0.1	41.8	0.0	0.6	0.0	0.0	0.0	0.0	57.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	7,814	0.0	3.1	0.0	0.0	94.7	0.0	0.0	0.0	0.0	0.0	0.0	0.7	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	7,346	0.0	93.5	0.0	0.0	0.0	0.0	0.0	0.0	5.3	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
34	7,305	0.0	0.1	0.0	68.7	0.0	0.0	2.4	0.0	1.2	0.0	0.0	2.7	0.0	0.0	0.0	0.0	0.0	0.2	24.5	0.3	0.0
35	6,959	0.0	99.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0
36	6,712	0.0	0.0	93.4	<0.1	5.5	0.0	0.0	0.0	0.7	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	5,951	0.0	98.5	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	1.0	0.0	0.0	0.0
38	5,047	0.0	0.0	0.0	0.0	50.2	0.0	48.7	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Overall	**601,084**	**19.8**	**19.5**	**9.9**	**9.7**	**8.9**	**7.2**	**5.5**	**4.7**	**3.5**	**2.1**	**1.7**	**1.3**	**1.3**	**1.2**	**0.9**	**0.8**	**0.8**	**0.3**	**0.3**	**0.2**	**0.2**

Appendix 5 table continued...

Centre	Number of operations	AcrySof IQ SN60WF	Tecnis ZCB00	Akreos Adapt	AcrySof SA60AT	Rayner Hydrophilic IOL's	Hoya ISERT	Lenstec Softec	Bausch + Lomb SofPort (Silicone)	AcrySof MA60AC (Multipiece)	Eyecee One	Bausch + Lomb Envista MX60	Tecnis Z9002 (Silicone)	Tecnis ZA9003 (Multipiece)	Zeiss CT Lucia	Bausch + Lomb Incise	Zeiss CT Asphina	Physiol A123	AMO sensar (Multipiece)	Aaren Scientific EC1	AcrySof Toric	Rayner T-Flex Toric
39	4,455	98.2	0.3	0.0	0.4	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
40	4,199	0.0	73.4	0.0	0.0	22.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	3,740	98.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42	3,561	8.9	0.0	0.0	2.4	0.0	87.7	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
43	3,374	0.0	97.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.4	0.0	0.7	0.0	0.0	0.0	0.4	0.0	0.0	0.1
44	3,164	2.8	<0.1	0.0	73.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.1	0.0
45	2,715	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<0.1	0.0	0.0	0.0	0.0	99.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0
46	2,559	0.0	85.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0
47	2,294	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48	1,959	0.0	95.9	0.0	0.0	3.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0
49	1,914	0.0	0.0	97.4	0.0	0.1	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	1,767	0.0	0.0	97.3	0.0	0.0	0.0	0.0	1.8	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
51	1,719	0.0	40.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.8	0.0	58.0	0.0	0.0	0.0	0.2	0.9	0.0	0.0
52	1,510	0.0	0.0	0.0	0.0	98.1	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8
53	1,485	4.6	0.0	0.0	0.0	93.4	0.0	0.0	0.0	0.7	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
54	1,190	0.0	7.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	91.9	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55	859	0.0	0.8	0.0	32.2	0.0	0.0	0.0	0.0	66.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
56	838	96.8	0.0	0.0	2.5	0.0	0.0	0.4	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
57	559	0.0	0.4	1.3	0.0	0.0	98.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
58	227	0.0	0.0	98.7	0.0	0.0	0.0	0.0	0.9	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Overall	**601,084**	**19.8**	**19.5**	**9.9**	**9.7**	**8.9**	**7.2**	**5.5**	**4.7**	**3.5**	**2.1**	**1.7**	**1.3**	**1.3**	**1.2**	**0.9**	**0.8**	**0.8**	**0.3**	**0.3**	**0.2**	**0.2**

Appendix 6: Observed PCO, PCO YAG and PCO no YAG rates over time for IOL models

Appendix 6 table: Observed rates of post-cataract PCO, PCO YAG and PCO no YAG at specified time points for each IOL model

	Observed PCO rates at (%)									
IOL model	6 months	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years
AcrySof IQ SN60WF (N = 118,981)										
PCO	1.1	2.3	4.9	8.2	12.1	16.6	20.4	24.0	27.2	30.7
PCO YAG	0.4	0.8	1.6	2.8	4.4	6.6	8.2	9.6	11.0	12.5
PCO no YAG	0.7	1.6	3.3	5.6	8.0	10.7	13.3	15.8	18.2	20.8
Tecnis ZCB00 (N = 117,126)										
PCO	1.9	3.7	7.4	13.5	20.6	26.5	31.1	34.4	36.8	38.1
PCO YAG	0.6	1.1	2.5	4.9	8.3	11.1	13.4	14.6	15.4	15.8
PCO no YAG	1.4	2.6	5.1	9.0	13.4	17.3	20.4	23.2	25.3	26.4
Akreos Adapt (N = 59,400)										
PCO	3.2	6.2	20.4	38.7	50.3	56.3	59.2	61.2	62.8	64.3
PCO YAG	1.2	2.3	9.3	18.7	25.1	28.5	30.3	31.1	31.7	32.3
PCO no YAG	2.0	4.0	12.3	24.5	33.6	38.8	41.4	43.6	45.4	47.2
AcrySof SA60AT (N = 58,400)										
PCO	1.8	3.3	6.0	9.7	14.0	19.4	24.3	27.9	31.5	34.8
PCO YAG	0.6	1.0	1.9	3.3	5.1	7.5	10.0	11.2	13.1	14.0
PCO no YAG	1.2	2.3	4.2	6.6	9.3	12.8	15.8	18.8	21.2	24.2
Rayner Hydrophilic IOL's (N = 53,750)										
PCO	3.1	6.0	14.5	26.8	37.1	44.5	49.7	53.1	56.2	59.7
PCO YAG	0.7	1.7	5.3	11.8	17.2	21.8	25.5	28.8	32.0	37.4
PCO no YAG	2.4	4.4	9.8	17.0	24.0	28.9	32.4	34.2	35.6	35.6
Overall PCO (N = 601,084)	**2.1**	**4.0**	**9.7**	**18.0**	**25.4**	**31.2**	**35.4**	**38.6**	**41.2**	**43.5**

Appendix 6 table continued…

	Observed PCO rates at (%)									
IOL model	6 months	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years
Hoya ISERT (N = 43,509)										
PCO	2.0	3.8	7.6	13.9	22.7	30.4	36.5	41.1	44.3	46.5
PCO YAG	0.4	0.8	1.9	3.9	6.4	8.5	10.6	12.5	13.5	14.6
PCO no YAG	1.7	3.0	5.9	10.4	17.4	23.9	28.9	32.7	35.6	37.3
Lenstec Softec (N = 33,338)										
PCO	2.9	5.8	14.9	27.7	38.9	46.7	51.8	56.2	59.4	61.9
PCO YAG	0.9	2.0	6.1	13.5	20.5	25.1	28.1	30.2	32.1	34.2
PCO no YAG	2.0	3.9	9.3	16.4	23.2	28.9	32.9	37.2	40.1	42.1
Bausch + Lomb SofPort (Silicone) (N = 28,399)										
PCO	2.0	3.4	6.8	12.4	17.1	20.9	23.9	26.8	28.9	32.2
PCO YAG	0.7	1.2	2.4	4.4	6.1	7.8	9.4	11.0	11.9	13.3
PCO no YAG	1.3	2.2	4.5	8.3	11.7	14.1	16.0	17.7	19.3	21.8
AcrySof MA60AC (Multipiece) (N = 21,069)										
PCO	1.8	3.1	5.6	8.5	10.8	13.2	15.0	16.3	17.8	19.1
PCO YAG	0.5	0.8	1.6	2.6	3.5	4.1	4.9	5.2	6.0	6.9
PCO no YAG	1.3	2.3	4.1	6.1	7.6	9.5	10.7	11.7	12.5	13.1
EYECEE ONE (N = 12,839)										
PCO	1.9	4.7	9.7	15.4	26.0	26.0	26.0	26.0	-	-
PCO YAG	0.5	1.1	2.4	3.9	7.5	7.5	7.5	7.5	-	-
PCO no YAG	1.5	3.6	7.5	12.0	20.0	20.0	20.0	20.0	-	-
Bausch + Lomb Envista MX60 (N = 10,448)										
PCO	1.9	4.1	9.5	21.5	34.0	45.4	52.5	57.2	57.2	-
PCO YAG	0.6	1.4	2.3	4.8	8.2	11.0	12.5	13.6	13.6	-
PCO no YAG	1.2	2.7	7.4	17.5	28.1	38.7	45.6	50.5	50.5	-
Overall PCO (N = 601,084)	**2.1**	**4.0**	**9.7**	**18.0**	**25.4**	**31.2**	**35.4**	**38.6**	**41.2**	**43.5**

Appendix 6 table continued…

	Observed PCO rates at (%)									
IOL model	6 months	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years
Tecnis Z9002 (Silicone) (N = 8,086)										
PCO	1.0	1.8	3.6	5.4	7.5	9.0	11.0	12.9	15.1	16.3
PCO YAG	0.3	0.5	1.0	1.5	2.0	2.4	2.8	3.3	4.0	4.0
PCO no YAG	0.6	1.3	2.7	3.9	5.6	6.8	8.5	9.8	11.6	12.8
Tecnis ZA9003 (Multipiece) (N = 7,632)										
PCO	1.7	3.1	6.0	11.0	17.9	25.2	32.3	37.7	41.5	44.8
PCO YAG	0.6	1.2	2.7	5.4	8.9	12.2	16.0	17.9	20.1	23.3
PCO no YAG	1.1	2.0	3.5	5.9	9.9	14.8	19.4	24.1	26.7	28.0
Zeiss CT Lucia (N = 6,999)										
PCO	1.1	2.2	6.7	17.0	27.2	46.6	-	-	-	-
PCO YAG	0.3	0.8	1.9	3.1	4.3	18.0	-	-	-	-
PCO no YAG	0.8	1.4	5.0	14.4	23.9	34.8	-	-	-	-
Bausch + Lomb Incise (N = 5,371)										
PCO	2.7	5.1	10.9	18.6	24.8	31.3	31.3	-	-	-
PCO YAG	0.6	1.2	3.1	5.5	6.8	8.0	8.0	-	-	-
PCO no YAG	2.0	4.0	8.0	13.8	19.3	25.4	25.4	-	-	-
Zeiss CT Asphina (N = 5,070)										
PCO	2.1	4.6	18.8	42.5	61.0	67.4	67.4	67.4	-	-
PCO YAG	0.2	0.5	3.1	9.1	15.4	18.6	18.6	18.6	-	-
PCO no YAG	1.9	4.2	16.1	36.6	53.7	59.8	59.8	59.8	-	-
Physiol A123 (N = 4,618)										
PCO	2.8	6.0	23.9	45.5	59.3	64.8	68.5	70.1	71.5	71.5
PCO YAG	1.0	1.9	8.9	23.7	36.4	42.5	46.4	47.6	49.7	49.7
PCO no YAG	1.8	4.2	16.4	28.4	35.6	38.4	40.9	42.7	43.1	43.1
Overall PCO (N = 601,084)	**2.1**	**4.0**	**9.7**	**18.0**	**25.4**	**31.2**	**35.4**	**38.6**	**41.2**	**43.5**

Appendix 6 table continued…

	Observed PCO rates at (%)									
IOL model	6 months	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years
AMO Sensar (Multipiece) (N = 1,852)										
PCO	2.0	3.5	5.2	8.8	13.8	19.5	24.9	29.6	32.9	34.6
PCO YAG	0.4	0.9	1.5	3.1	4.7	6.9	8.6	11.2	12.4	13.5
PCO no YAG	1.7	2.7	3.7	5.9	9.6	13.6	17.8	20.7	23.4	24.4
Aaren Scientific EC1 (N = 1,828)										
PCO	6.9	12.2	32.7	52.2	65.7	72.9	76.0	80.1	82.3	-
PCO YAG	4.7	8.1	21.6	39.1	51.3	57.7	58.0	60.9	60.9	-
PCO no YAG	2.3	4.4	14.0	21.3	29.2	35.7	42.4	48.8	54.5	-
AcrySof Toric (N = 1,200)										
PCO	0.7	1.7	4.5	12.2	25.3	30.7	36.3	42.4	49.2	49.2
PCO YAG	0.4	0.4	0.4	3.5	12.0	12.0	12.0	12.0	12.0	12.0
PCO no YAG	0.4	1.4	4.1	9.0	15.0	21.2	27.6	34.5	42.2	42.2
Rayner T-Flex Toric (N = 1,169)										
PCO	3.6	5.4	13.1	22.5	32.8	44.3	56.6	63.9	66.3	66.3
PCO YAG	0.3	0.4	2.0	5.0	8.1	11.9	17.0	17.0	22.5	22.5
PCO no YAG	3.3	5.0	11.3	18.5	26.9	36.8	47.6	56.5	56.5	56.5
Overall PCO (N = 601,084)	**2.1**	**4.0**	**9.7**	**18.0**	**25.4**	**31.2**	**35.4**	**38.6**	**41.2**	**43.5**

Appendix 7: Number at risk and number of PCO, PCO YAG and PCO no YAG cases over time for IOL models

In this appendix is the number at risk and number of cases with PCO, PCO YAG and PCO no YAG at specified time points for each individual IOL model. The number at risk is the number of eyes at the start of the time interval who have not completed follow up or not developed PCO, for example the 6 month interval is from the day of surgery to 6 months later and the number at risk is the number who had surgery, while the 1 year interval is the number at risk after 6 months up to 1 year post-surgery. This is the number at risk for calculating the respective time interval failure rate as this is the number who 'entered' the interval. The number of cases with PCO, PCO YAG and PCO no YAG are the number of eyes who developed PCO in the respective time interval, for example for the 6 month interval these are the number of eyes who developed PCO between surgery and 6 months post-surgery.

Appendix 7 table: Number at risk and number of PCO, PCO YAG and PCO no YAG cases at specified time points for each IOL model

	Observed PCO rates at (%)									
IOL model	6 months	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years
Overall (N = 601,084)										
Number at risk	601,084	355,189	276,973	192,700	125,461	80,364	50,073	28,897	14,852	5,848
Number of PCO cases	9,947	6,383	14,444	15,195	9,811	5,223	2,492	1,127	443	145
Number of PCO YAG cases	2,993	1,994	5,463	6,143	3,922	2,057	979	374	158	59
Number of PCO no YAG cases	6,954	4,389	8,981	9,052	5,889	3,166	1,513	753	285	86
AcrySof IQ SN60WF (N = 118,981)										
Number at risk	118,981	65,906	50,258	35,458	24,762	16,548	10,335	5,858	2,875	970
Number of PCO cases	1,029	725	1,150	1,059	892	705	381	199	83	29
Number of PCO YAG cases	343	229	384	355	347	307	139	71	28	11
Number of PCO no YAG cases	686	496	766	704	545	398	242	128	55	18
Tecnis ZCB00 (N = 117,126)										
Number at risk	117,126	71,898	56,790	39,844	25,583	16,176	9,692	4,872	2,223	776
Number of PCO cases	1,857	1,170	1,910	2,200	1,785	1,001	473	176	55	9
Number of PCO YAG cases	534	354	671	831	750	402	195	50	14	2
Number of PCO no YAG cases	1,323	816	1,239	1,369	1,035	599	278	126	41	7

Appendix 7 table continued…

	Observed PCO rates at (%)									
IOL model	6 months	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years
Akreos Adapt (N = 59,400)										
Number at risk	59,400	35,618	28,494	18,980	10,972	6,556	4,165	2,650	1,517	732
Number of PCO cases	1,530	1,021	3,894	3,876	1,843	686	237	104	47	19
Number of PCO YAG cases	561	366	1,760	1,640	713	251	86	25	10	4
Number of PCO no YAG cases	969	655	2,134	2,236	1,130	435	151	79	37	15
AcrySof SA60AT (N = 58,400)										
Number at risk	58,400	34,241	25,318	17,194	11,312	7,049	4,131	2,108	932	344
Number of PCO cases	838	448	622	564	444	363	195	75	33	10
Number of PCO YAG cases	257	125	197	208	174	145	84	20	14	2
Number of PCO no YAG cases	581	323	425	356	270	218	111	55	19	8
Rayner Hydrophilic IOL's (N = 53,750)										
Number at risk	53,750	32,556	25,560	17,125	10,716	6,544	3,551	1,615	547	106
Number of PCO cases	1,348	900	2,026	2,152	1,310	624	254	77	22	5
Number of PCO YAG cases	318	281	798	984	552	286	126	48	15	5
Number of PCO no YAG cases	1,030	619	1,228	1,168	758	338	128	29	7	0
Hoya ISERT (N = 43,509)										
Number at risk	43,509	22,191	15,920	10,434	6,005	3,224	1,961	1,217	595	130
Number of PCO cases	677	337	539	577	498	272	145	69	20	3
Number of PCO YAG cases	124	79	144	173	121	60	36	20	4	1
Number of PCO no YAG cases	553	258	395	404	377	212	109	49	16	2

Appendix 7 table continued…

	Observed PCO rates at (%)									
IOL model	6 months	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years
Lenstec Softec (N = 33,338)										
Number at risk	33,338	22,793	17,929	12,878	8,446	5,415	3,533	2,171	1,137	452
Number of PCO cases	831	608	1,559	1,735	1,172	611	286	156	60	17
Number of PCO YAG cases	257	221	656	876	583	267	119	47	23	8
Number of PCO no YAG cases	574	387	903	859	589	344	167	109	37	9
Bausch + Lomb SofPort (Silicone) (N = 28,399)										
Number at risk	28,399	15,161	12,666	10,098	7,578	5,712	4,171	2,925	1,838	863
Number of PCO cases	431	202	414	542	367	232	140	90	40	27
Number of PCO YAG cases	157	73	134	187	119	91	62	42	14	10
Number of PCO no YAG cases	274	129	280	355	248	141	78	48	26	17
AcrySof MA60AC (Multipiece) (N = 21,069)										
Number at risk	21,069	13,346	10,888	8,286	6,353	4,909	3,530	2,298	1,289	537
Number of PCO cases	309	159	252	230	146	114	62	26	17	5
Number of PCO YAG cases	90	32	76	76	51	28	24	6	8	3
Number of PCO no YAG cases	219	127	176	154	95	86	38	20	9	2
EYECEE ONE (N = 12,839)										
Number at risk	12,839	6,984	4,995	2,003	188	21	6	2	0	0
Number of PCO cases	193	170	191	71	14	0	0	0	-	-
Number of PCO YAG cases	48	35	49	16	4	0	0	0	-	-
Number of PCO no YAG cases	145	135	142	55	10	0	0	0	-	-

Appendix 7 table continued…

	Observed PCO rates at (%)									
IOL model	6 months	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years
Bausch + Lomb Envista MX60 (N = 10,448)										
Number at risk	10,448	6,678	5,514	4,219	2,662	1,105	556	272	50	0
Number of PCO cases	161	140	284	487	325	158	57	17	0	-
Number of PCO YAG cases	55	48	46	89	67	26	7	2	0	-
Number of PCO no YAG cases	106	92	238	398	258	132	50	15	0	-
Tecnis Z9002 (Silicone) (N = 8,086)										
Number at risk	8,086	5,707	5,021	4,127	3,293	2,463	1,657	1,045	598	234
Number of PCO cases	67	45	84	71	64	35	30	17	11	2
Number of PCO YAG cases	24	7	22	22	14	8	5	5	3	0
Number of PCO no YAG cases	43	38	62	49	50	27	25	12	8	2
Tecnis ZA9003 (Multipiece) (N = 7,632)										
Number at risk	7,632	4,844	4,032	3,267	2,582	1,894	1,310	891	609	353
Number of PCO cases	109	64	111	159	179	150	110	62	30	13
Number of PCO YAG cases	39	25	55	84	83	60	49	17	13	9
Number of PCO no YAG cases	70	39	56	75	96	90	61	45	17	4
Zeiss CT Lucia (N = 6,999)										
Number at risk	6,999	3,733	2,156	671	139	13	0	0	0	0
Number of PCO cases	62	30	68	47	10	2	-	-	-	-
Number of PCO YAG cases	18	14	15	5	1	1	-	-	-	-
Number of PCO no YAG cases	44	16	53	42	9	1	-	-	-	-

Appendix 7 table continued…

	Observed PCO rates at (%)									
IOL model	6 months	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years
Bausch + Lomb Incise (N = 5,371)										
Number at risk	5,371	3,437	2,802	1,909	1,148	566	72	0	0	0
Number of PCO cases	119	80	148	137	68	29	0	-	-	-
Number of PCO YAG cases	28	18	46	38	12	4	0	-	-	-
Number of PCO no YAG cases	91	62	102	99	56	25	0	-	-	-
Zeiss CT Asphina (N = 5,070)										
Number at risk	5,070	3,035	2,622	1,820	795	197	16	3	0	0
Number of PCO cases	88	72	356	447	190	19	0	0	-	-
Number of PCO YAG cases	10	6	60	83	36	4	0	0	-	-
Number of PCO no YAG cases	78	66	296	364	154	15	0	0	-	-
Physiol A123 (N = 4,618)										
Number at risk	4,618	3,157	2,747	1,971	1,216	742	527	391	242	100
Number of PCO cases	110	99	496	527	283	92	51	17	8	0
Number of PCO YAG cases	41	26	174	281	179	64	32	7	7	0
Number of PCO no YAG cases	69	73	322	246	104	28	19	10	1	0
AMO Sensar (Multipiece) (N = 1,852)										
Number at risk	1,852	1,244	1,087	934	790	661	535	429	344	240
Number of PCO cases	32	18	17	34	41	41	33	25	14	6
Number of PCO YAG cases	6	6	6	14	12	14	9	11	4	4
Number of PCO no YAG cases	26	12	11	20	29	27	24	14	10	2

Appendix 7 table continued…

	Observed PCO rates at (%)									
IOL model	6 months	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years
Aaren Scientific EC1 (N = 1,828)										
Number at risk	1,828	1,385	1,211	818	489	292	166	68	17	0
Number of PCO cases	114	77	268	222	128	54	14	8	1	-
Number of PCO YAG cases	77	48	161	164	87	32	1	3	0	-
Number of PCO no YAG cases	37	29	107	58	41	22	13	5	1	-
AcrySof Toric (N = 1,200)										
Number at risk	1,200	476	296	198	112	62	44	27	13	3
Number of PCO cases	6	4	7	13	14	4	3	2	1	0
Number of PCO YAG cases	3	0	0	5	8	0	0	0	0	0
Number of PCO no YAG cases	3	4	7	8	6	4	3	2	1	0
Rayner T-Flex Toric (N = 1,169)										
Number at risk	1,169	799	667	466	320	215	115	55	21	8
Number of PCO cases	36	14	48	45	38	31	21	7	1	0
Number of PCO YAG cases	3	1	9	12	9	7	5	0	1	0
Number of PCO no YAG cases	33	13	39	33	29	24	16	7	0	0

Appendix 8: Observed PCO, PCO YAG and PCO no YAG rates over time for contributing centres

Appendix 8 table : Observed rates of post-cataract PCO, PCO YAG and PCO no YAG at specified time points for each contributing centre

		Observed PCO rates at (%)									
Centre	Number of operations	6 months	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years
1											
PCO	47,481	1.0	2.3	5.6	10.5	15.7	20.1	24.3	28.1	31.1	35.1
PCO YAG	47,481	0.2	0.6	1.8	3.7	6.4	8.7	10.7	12.4	14.2	16.7
PCO no YAG	47,481	0.8	1.8	4.0	7.0	10.0	12.4	15.2	17.9	19.7	22.1
2											
PCO	31,398	2.8	5.1	13.6	25.4	35.7	43.1	48.1	52.4	55.5	57.7
PCO YAG	31,398	0.8	1.4	4.3	9.8	15.1	19.3	22.6	24.9	26.9	28.9
PCO no YAG	31,398	2.0	3.7	9.6	17.3	24.2	29.4	32.9	36.6	39.1	40.6
3											
PCO	28,641	2.8	4.8	8.7	14.7	21.0	26.0	29.4	31.7	34.0	35.5
PCO YAG	28,641	1.0	1.8	3.2	5.9	9.0	11.4	13.1	13.7	14.5	15.4
PCO no YAG	28,641	1.8	3.1	5.7	9.4	13.1	16.5	18.7	20.9	22.8	23.8
4											
PCO	27,607	4.6	7.9	14.4	25.4	36.2	43.1	46.9	49.9	51.5	53.5
PCO YAG	27,607	1.2	2.0	4.1	8.4	12.3	15.4	17.2	18.3	19.0	19.7
PCO no YAG	27,607	3.5	6.1	10.8	18.6	27.2	32.7	35.8	38.6	40.1	42.0
5											
PCO	27,227	1.5	2.7	5.4	9.1	13.3	17.6	21.5	24.7	26.6	29.8
PCO YAG	27,227	0.6	1.1	2.2	4.0	6.2	8.6	10.9	12.8	13.9	15.7
PCO no YAG	27,227	1.0	1.6	3.2	5.3	7.6	9.9	11.9	13.7	14.7	16.7
Overall PCO	**601,084**	**2.1**	**4.0**	**9.7**	**18.0**	**25.4**	**31.2**	**35.4**	**38.6**	**41.2**	**43.5**

Appendix 8 table continued…

		Observed PCO rates at (%)									
Centre	Number of operations	6 months	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years
6											
PCO	19,173	3.0	6.5	18.5	32.9	43.3	50.6	54.5	57.7	60.7	63.5
PCO YAG	19,173	0.8	1.8	5.2	9.3	12.5	14.4	15.8	17.0	18.3	20.1
PCO no YAG	19,173	2.2	4.8	14.0	26.0	35.2	42.2	46.0	49.0	51.8	54.3
7											
PCO	17,797	1.4	2.8	5.7	10.1	14.2	17.0	19.1	21.4	24.6	26.4
PCO YAG	17,797	0.3	0.5	1.2	2.0	2.9	3.5	3.9	4.2	5.0	5.0
PCO no YAG	17,797	1.1	2.2	4.6	8.3	11.6	14.0	15.8	17.9	20.6	22.5
8											
PCO	17,731	1.5	2.4	4.9	9.7	15.7	-	-	-	-	-
PCO YAG	17,731	0.4	0.7	1.5	3.4	4.8	-	-	-	-	-
PCO no YAG	17,731	1.2	1.7	3.4	6.5	11.4	-	-	-	-	-
9											
PCO	17,630	2.0	3.6	7.6	14.5	22.6	29.7	35.6	40.0	43.1	-
PCO YAG	17,630	0.7	1.2	3.1	6.5	11.2	15.5	19.9	22.2	24.0	-
PCO no YAG	17,630	1.3	2.5	4.7	8.6	12.9	16.8	19.6	23.0	25.2	-
10											
PCO	17,394	2.1	4.5	9.1	14.5	21.7	28.4	34.6	39.2	42.8	46.1
PCO YAG	17,394	0.6	1.5	3.4	5.9	9.5	13.4	17.0	18.7	20.9	23.6
PCO no YAG	17,394	1.4	3.0	5.9	9.1	13.4	17.4	21.3	25.3	27.8	29.4
11											
PCO	17,332	1.3	2.6	5.9	10.1	15.0	21.2	26.0	30.4	33.7	33.7
PCO YAG	17,332	0.2	0.5	1.2	2.2	3.2	4.4	4.8	5.8	6.2	6.2
PCO no YAG	17,332	1.1	2.1	4.7	8.1	12.1	17.5	22.3	26.1	29.3	29.3
Overall PCO	**601,084**	**2.1**	**4.0**	**9.7**	**18.0**	**25.4**	**31.2**	**35.4**	**38.6**	**41.2**	**43.5**

Appendix 8 table continued…

		Observed PCO rates at (%)									
Centre	Number of operations	6 months	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years
12											
PCO	16,025	3.3	7.1	19.5	37.1	50.2	57.9	62.3	65.5	67.8	70.4
PCO YAG	16,025	1.1	2.7	9.5	21.1	30.4	35.8	38.7	40.1	41.5	43.0
PCO no YAG	16,025	2.2	4.5	11.1	20.2	28.2	34.4	38.4	42.3	44.8	48.0
13											
PCO	15,205	1.7	3.2	8.2	14.5	20.9	26.4	33.0	37.2	40.8	43.1
PCO YAG	15,205	0.4	0.8	3.0	6.1	9.7	12.7	16.1	18.3	21.2	21.2
PCO no YAG	15,205	1.3	2.4	5.4	9.0	12.4	15.6	20.1	23.2	24.8	27.8
14											
PCO	15,101	0.8	2.1	4.3	7.1	11.0	15.8	20.6	24.3	27.5	29.7
PCO YAG	15,101	0.3	0.7	1.7	2.7	4.2	6.5	8.6	10.7	11.9	13.1
PCO no YAG	15,101	0.5	1.4	2.6	4.5	7.1	9.9	13.1	15.3	17.7	19.1
15											
PCO	15,075	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.2	0.2	0.2	1.2
PCO YAG	15,075	0.0	0.0	0.0	<0.1	0.1	0.1	0.2	0.2	0.2	1.2
PCO no YAG	15,075	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
16											
PCO	13,852	0.9	1.8	3.6	5.8	8.5	10.9	13.7	16.2	18.4	18.9
PCO YAG	13,852	0.3	0.7	1.2	2.2	3.4	4.6	5.8	6.3	6.9	7.5
PCO no YAG	13,852	0.6	1.1	2.5	3.7	5.2	6.7	8.4	10.6	12.4	12.4
17											
PCO	13,804	2.5	4.4	7.7	12.0	16.6	22.7	26.2	29.1	31.8	37.4
PCO YAG	13,804	1.5	2.5	4.3	7.0	10.2	14.9	17.6	20.4	22.2	28.5
PCO no YAG	13,804	1.0	1.9	3.6	5.3	7.1	9.2	10.4	10.9	12.4	12.4
Overall PCO	**601,084**	**2.1**	**4.0**	**9.7**	**18.0**	**25.4**	**31.2**	**35.4**	**38.6**	**41.2**	**43.5**

Appendix 8 table continued…

		Observed PCO rates at (%)									
Centre	Number of operations	6 months	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years
18											
PCO	13,391	2.5	4.5	10.6	20.2	29.3	35.2	40.4	43.4	46.0	-
PCO YAG	13,391	0.4	0.9	3.2	7.4	10.6	13.4	16.1	18.9	21.3	-
PCO no YAG	13,391	2.1	3.6	7.6	13.8	20.8	25.2	28.9	30.2	31.3	-
19											
PCO	12,697	2.2	4.1	7.8	12.2	17.0	21.4	25.5	29.4	32.7	34.5
PCO YAG	12,697	0.8	1.4	2.8	4.2	6.0	8.2	9.9	11.0	12.0	12.6
PCO no YAG	12,697	1.4	2.7	5.1	8.3	11.7	14.4	17.3	20.7	23.6	25.1
20											
PCO	12,016	2.0	4.6	14.9	28.7	39.0	44.3	47.3	50.6	53.2	56.0
PCO YAG	12,016	0.3	0.6	2.2	4.8	7.0	8.7	9.7	11.0	11.7	12.6
PCO no YAG	12,016	1.7	4.0	13.0	25.1	34.4	39.0	41.6	44.5	47.0	49.6
21											
PCO	12,005	0.5	1.4	4.6	9.3	14.2	19.0	21.6	23.7	26.6	32.2
PCO YAG	12,005	0.2	0.5	1.4	2.7	4.4	5.9	6.4	7.0	7.0	7.0
PCO no YAG	12,005	0.3	0.9	3.2	6.8	10.3	13.9	16.2	17.9	21.1	27.0
22											
PCO	11,729	3.3	5.3	12.5	23.6	30.9	33.2	36.6	38.8	38.8	-
PCO YAG	11,729	1.3	2.2	5.0	9.0	12.4	14.0	15.6	16.4	16.4	-
PCO no YAG	11,729	2.0	3.2	7.9	16.0	21.1	22.3	24.9	26.8	26.8	-
23											
PCO	11,576	3.2	6.0	11.8	19.4	26.6	32.5	36.8	39.6	43.2	46.1
PCO YAG	11,576	0.7	1.5	3.6	6.5	9.9	12.1	14.9	16.2	18.4	19.5
PCO no YAG	11,576	2.5	4.5	8.5	13.8	18.6	23.3	25.7	27.9	30.3	33.0
Overall PCO	**601,084**	**2.1**	**4.0**	**9.7**	**18.0**	**25.4**	**31.2**	**35.4**	**38.6**	**41.2**	**43.5**

Appendix 8 table continued…

		Observed PCO rates at (%)									
Centre	Number of operations	6 months	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years
24											
PCO	11,568	4.2	7.4	28.7	53.8	66.6	71.6	74.4	75.9	77.0	77.0
PCO YAG	11,568	2.4	4.2	19.4	39.7	52.4	57.5	60.5	62.0	63.4	63.4
PCO no YAG	11,568	1.9	3.4	11.4	22.9	29.4	32.7	34.8	36.1	36.7	36.7
25											
PCO	11,127	1.2	3.3	8.3	18.3	30.3	40.7	48.1	53.6	55.8	55.8
PCO YAG	11,127	0.2	0.6	1.4	3.2	5.7	8.3	10.0	11.5	11.5	11.5
PCO no YAG	11,127	1.0	2.7	7.0	15.6	26.1	35.4	42.3	47.6	50.1	50.1
26											
PCO	10,803	2.3	5.6	16.8	32.3	44.5	53.4	60.2	63.6	67.4	72.7
PCO YAG	10,803	0.9	2.6	9.1	20.3	29.7	37.3	43.4	47.3	51.5	59.4
PCO no YAG	10,803	1.4	3.1	8.4	15.0	20.9	25.6	29.6	30.7	32.6	32.6
27											
PCO	9,657	1.9	3.9	8.7	17.0	26.8	34.6	40.1	43.5	45.2	46.2
PCO YAG	9,657	0.3	0.6	1.5	3.5	6.1	7.9	9.4	10.5	11.1	12.0
PCO no YAG	9,657	1.6	3.3	7.3	14.0	22.0	29.0	33.9	36.8	38.3	38.9
28											
PCO	9,239	0.1	0.1	0.1	0.1	0.1	0.1	0.4	0.4	0.4	0.4
PCO YAG	9,239	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PCO no YAG	9,239	0.1	0.1	0.1	0.1	0.1	0.1	0.4	0.4	0.4	0.4
29											
PCO	8,973	2.4	4.0	7.9	13.9	19.1	24.3	28.0	31.2	34.4	39.1
PCO YAG	8,973	1.0	1.6	3.1	5.8	7.7	9.7	11.2	12.8	13.3	14.2
PCO no YAG	8,973	1.5	2.5	4.9	8.6	12.3	16.1	19.0	21.2	24.3	29.1
Overall PCO	**601,084**	**2.1**	**4.0**	**9.7**	**18.0**	**25.4**	**31.2**	**35.4**	**38.6**	**41.2**	**43.5**

Appendix 8 table continued…

		Observed PCO rates at (%)									
Centre	Number of operations	6 months	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years
30											
PCO	8,538	0.1	0.2	0.5	1.3	1.9	2.4	2.7	2.7	2.7	2.7
PCO YAG	8,538	0.1	0.2	0.3	0.8	1.2	1.3	1.3	1.3	1.3	1.3
PCO no YAG	8,538	0.0	<0.1	0.2	0.6	0.7	1.1	1.5	1.5	1.5	1.5
31											
PCO	8,070	2.7	4.5	7.6	11.5	15.2	18.9	21.8	23.1	25.4	25.4
PCO YAG	8,070	0.6	1.1	2.1	3.3	5.0	5.9	7.3	7.9	10.8	10.8
PCO no YAG	8,070	2.1	3.4	5.6	8.5	10.8	13.8	15.6	16.4	16.4	16.4
32											
PCO	7,814	2.1	4.5	14.6	30.3	42.0	50.6	54.9	-	-	-
PCO YAG	7,814	0.6	1.3	5.1	11.9	17.5	24.1	27.9	-	-	-
PCO no YAG	7,814	1.6	3.2	10.1	20.9	29.6	34.8	37.4	-	-	-
33											
PCO	7,346	<0.1	0.1	0.1	0.3	0.7	1.2	1.4	1.4	1.4	1.4
PCO YAG	7,346	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PCO no YAG	7,346	<0.1	0.1	0.1	0.1	0.5	1.1	1.3	1.3	1.3	1.3
34											
PCO	7,305	3.7	6.6	17.5	31.0	42.0	49.8	54.0	58.5	60.9	60.9
PCO YAG	7,305	2.1	3.8	10.4	20.9	29.1	34.4	35.0	37.0	37.0	37.0
PCO no YAG	7,305	1.6	2.9	7.9	12.8	18.1	23.3	29.2	34.0	37.9	37.9
35											
PCO	6,959	3.6	6.2	9.4	14.8	19.8	25.7	29.3	31.8	32.9	34.4
PCO YAG	6,959	0.5	1.0	1.9	3.1	4.8	7.8	8.5	9.7	9.7	9.7
PCO no YAG	6,959	3.1	5.2	7.6	12.1	15.7	19.5	22.7	24.4	25.7	27.4
Overall PCO	**601,084**	**2.1**	**4.0**	**9.7**	**18.0**	**25.4**	**31.2**	**35.4**	**38.6**	**41.2**	**43.5**

Appendix 8 table continued…

		Observed PCO rates at (%)									
Centre	Number of operations	6 months	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years
36											
PCO	6,712	0.2	0.3	0.7	0.7	0.7	0.7	-	-	-	-
PCO YAG	6,712	0.1	0.1	0.2	0.2	0.2	0.2	-	-	-	-
PCO no YAG	6,712	0.1	0.2	0.5	0.5	0.5	0.5	-	-	-	-
37											
PCO	5,951	1.4	3.0	6.5	14.4	28.9	-	-	-	-	-
PCO YAG	5,951	0.4	1.1	2.5	6.0	13.0	-	-	-	-	-
PCO no YAG	5,951	1.0	2.0	4.1	9.0	18.2	-	-	-	-	-
38											
PCO	5,047	4.7	9.0	20.5	28.6	-	-	-	-	-	-
PCO YAG	5,047	1.0	2.0	4.3	7.9	-	-	-	-	-	-
PCO no YAG	5,047	3.7	7.2	17.0	22.4	-	-	-	-	-	-
39											
PCO	4,455	1.1	2.6	7.4	15.9	21.8	21.8	-	-	-	-
PCO YAG	4,455	0.1	0.3	1.2	2.8	5.6	5.6	-	-	-	-
PCO no YAG	4,455	1.0	2.2	6.3	13.5	17.2	17.2	-	-	-	-
40											
PCO	4,199	3.1	6.0	11.1	17.8	23.5	26.4	29.0	29.0	29.0	29.0
PCO YAG	4,199	1.2	2.4	5.3	9.1	11.2	12.6	12.6	12.6	12.6	12.6
PCO no YAG	4,199	1.9	3.7	6.1	9.5	13.9	15.9	18.7	18.7	18.7	18.7
41											
PCO	3,740	0.0	0.0	0.0	0.0	0.5	0.9	1.6	3.1	3.1	3.1
PCO YAG	3,740	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.4	0.4	0.4
PCO no YAG	3,740	0.0	0.0	0.0	0.0	0.5	0.5	1.2	2.7	2.7	2.7
Overall PCO	**601,084**	**2.1**	**4.0**	**9.7**	**18.0**	**25.4**	**31.2**	**35.4**	**38.6**	**41.2**	**43.5**

Appendix 8 table continued…

		Observed PCO rates at (%)									
Centre	Number of operations	6 months	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years
42											
PCO	3,561	6.1	7.9	11.4	17.6	26.0	-	-	-	-	-
PCO YAG	3,561	0.2	0.4	1.2	3.2	3.2	-	-	-	-	-
PCO no YAG	3,561	5.9	7.6	10.3	14.8	23.5	-	-	-	-	-
43											
PCO	3,374	0.0	0.1	0.8	1.7	1.7	-	-	-	-	-
PCO YAG	3,374	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-
PCO no YAG	3,374	0.0	0.1	0.8	1.7	1.7	-	-	-	-	-
44											
PCO	3,164	1.8	3.8	6.6	12.1	17.2	25.0	28.9	31.9	37.4	40.4
PCO YAG	3,164	0.4	0.6	1.5	3.9	6.7	11.3	14.2	15.0	18.9	18.9
PCO no YAG	3,164	1.5	3.2	5.1	8.4	11.3	15.4	17.1	19.9	22.8	26.6
45											
PCO	2,715	0.9	1.0	1.9	1.9	-	-	-	-	-	-
PCO YAG	2,715	0.0	0.0	0.0	0.0	-	-	-	-	-	-
PCO no YAG	2,715	0.9	1.0	1.9	1.9	-	-	-	-	-	-
46											
PCO	2,559	1.2	2.1	4.4	8.5	16.8	-	-	-	-	-
PCO YAG	2,559	0.2	0.3	0.6	2.7	2.7	-	-	-	-	-
PCO no YAG	2,559	1.1	1.8	3.8	5.9	14.5	-	-	-	-	-
47											
PCO	2,294	3.1	5.0	12.6	33.9	44.4	-	-	-	-	-
PCO YAG	2,294	0.2	0.9	1.2	2.5	5.8	-	-	-	-	-
PCO no YAG	2,294	2.9	4.2	11.5	32.1	40.9	-	-	-	-	-
Overall PCO	**601,084**	**2.1**	**4.0**	**9.7**	**18.0**	**25.4**	**31.2**	**35.4**	**38.6**	**41.2**	**43.5**

Appendix 8 table continued…

		Observed PCO rates at (%)									
Centre	Number of operations	6 months	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years
48											
PCO	1,959	0.3	0.3	0.3	3.9	-	-	-	-	-	-
PCO YAG	1,959	0.0	0.0	0.0	0.0	-	-	-	-	-	-
PCO no YAG	1,959	0.3	0.3	0.3	3.9	-	-	-	-	-	-
49											
PCO	1,914	3.2	7.3	27.7	46.6	54.1	54.1	-	-	-	-
PCO YAG	1,914	1.7	3.1	15.2	26.0	28.7	28.7	-	-	-	-
PCO no YAG	1,914	1.6	4.3	14.6	27.7	35.4	35.4	-	-	-	-
50											
PCO	1,767	0.3	0.3	0.7	0.7	-	-	-	-	-	-
PCO YAG	1,767	0.0	0.0	0.0	0.0	-	-	-	-	-	-
PCO no YAG	1,767	0.3	0.3	0.7	0.7	-	-	-	-	-	-
51											
PCO	1,719	2.5	5.3	9.5	16.1	16.1	-	-	-	-	-
PCO YAG	1,719	0.9	1.9	3.2	6.1	6.1	-	-	-	-	-
PCO no YAG	1,719	1.6	3.4	6.5	10.7	10.7	-	-	-	-	-
52											
PCO	1,510	0.0	0.0	0.0	4.1	4.1	-	-	-	-	-
PCO YAG	1,510	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-
PCO no YAG	1,510	0.0	0.0	0.0	4.1	4.1	-	-	-	-	-
53											
PCO	1,485	0.1	0.1	2.3	4.4	4.4	-	-	-	-	-
PCO YAG	1,485	0.0	0.0	1.0	3.1	3.1	-	-	-	-	-
PCO no YAG	1,485	0.1	0.1	1.3	1.3	1.3	-	-	-	-	-
Overall PCO	**601,084**	**2.1**	**4.0**	**9.7**	**18.0**	**25.4**	**31.2**	**35.4**	**38.6**	**41.2**	**43.5**

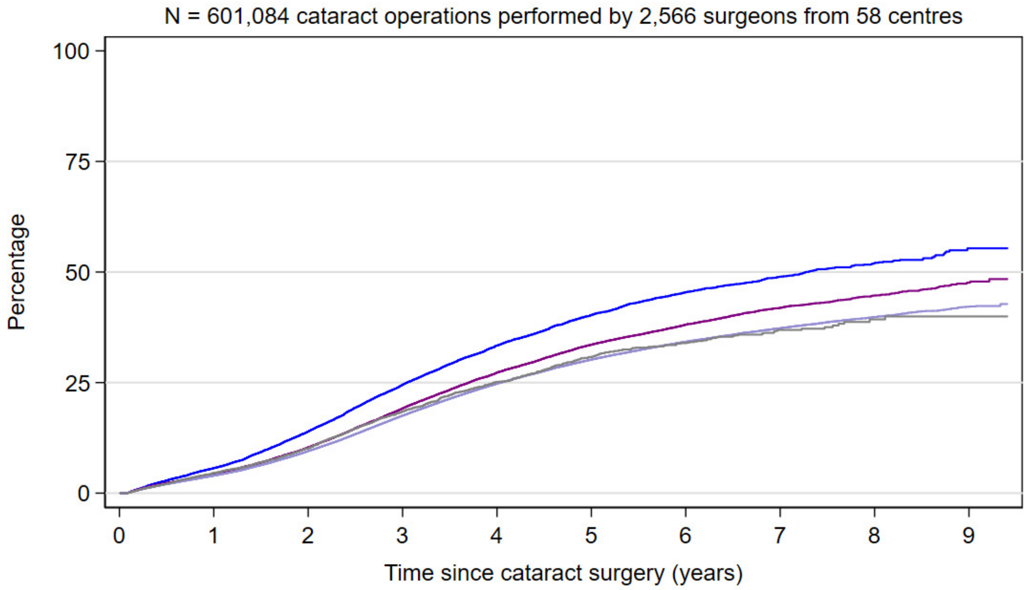
Appendix 8 table continued…

		Observed PCO rates at (%)									
Centre	Number of operations	6 months	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years
54											
PCO	1,190	0.7	2.4	6.8	15.1	21.4	-	-	-	-	-
PCO YAG	1,190	0.0	0.3	1.4	2.7	2.7	-	-	-	-	-
PCO no YAG	1,190	0.7	2.1	5.5	12.7	19.2	-	-	-	-	-
55											
PCO	859	0.9	1.7	4.6	4.6	-	-	-	-	-	-
PCO YAG	859	0.3	0.6	1.7	1.7	-	-	-	-	-	-
PCO no YAG	859	0.6	1.1	2.9	2.9	-	-	-	-	-	-
56											
PCO	838	0.9	3.5	4.6	9.5	-	-	-	-	-	-
PCO YAG	838	0.2	0.4	0.4	0.4	-	-	-	-	-	-
PCO no YAG	838	0.8	3.0	4.2	9.1	-	-	-	-	-	-
57											
PCO	559	1.7	4.8	7.7	-	-	-	-	-	-	-
PCO YAG	559	0.0	0.6	0.6	-	-	-	-	-	-	-
PCO no YAG	559	1.7	4.2	7.1	-	-	-	-	-	-	-
58											
PCO	227	0.5	8.8	28.2	-	-	-	-	-	-	-
PCO YAG	227	0.0	5.2	17.3	-	-	-	-	-	-	-
PCO no YAG	227	0.5	3.8	13.1	-	-	-	-	-	-	-
Overall PCO	**601,084**	**2.1**	**4.0**	**9.7**	**18.0**	**25.4**	**31.2**	**35.4**	**38.6**	**41.2**	**43.5**

Appendix 9: PCO risk factor model covariate Kaplan-Meier graphs

In this appendix are Kaplan-Meier failure curves for the covariates found to be significant in the PCO risk factor model, except for the IOL material which is shown in Figure 5 in the main document. These figures display the clear differences in PCO rates over time for some covariates, and for others they show at what point in time the rates diverge before or after a period of a similar pattern.

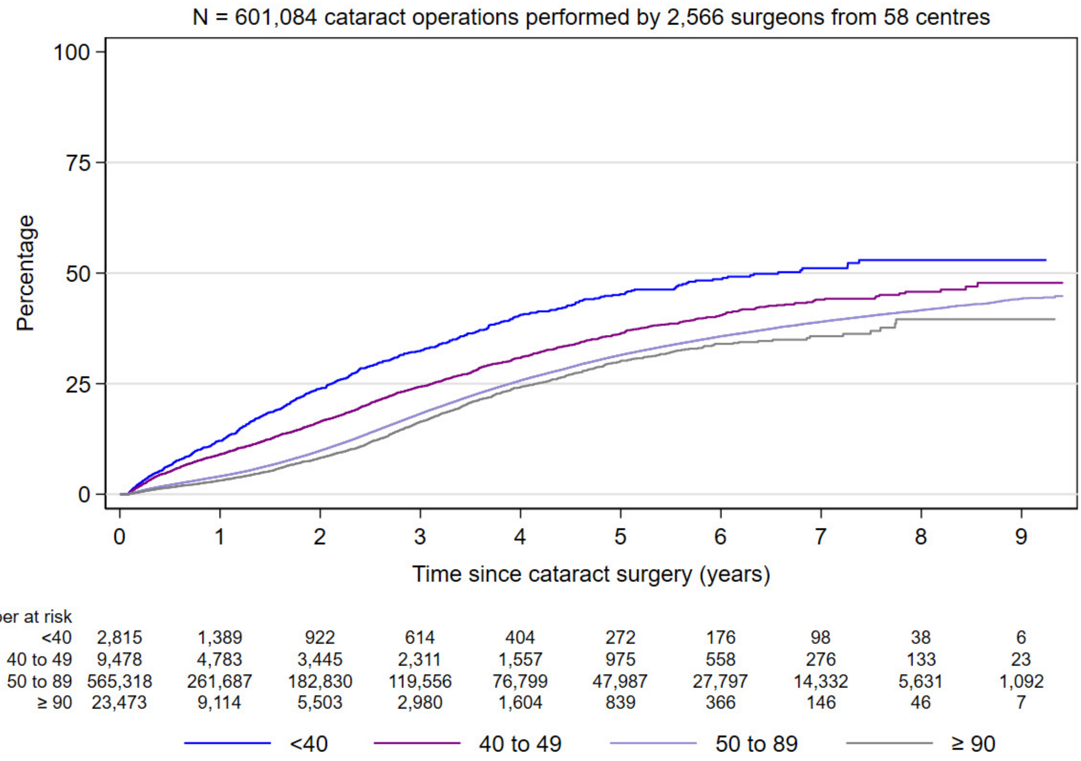
Appendix 9 Figure 1: Kaplan-Meier failure curves for the time to post-cataract PCO by IOL power



Number at risk										
<15 dioptres	37,845	17,660	12,533	8,236	5,354	3,367	2,025	1,056	456	95
15 to 19.5 dioptres	117,360	54,340	38,143	24,924	15,928	9,935	5,803	3,002	1,188	213
20 to 28.5 dioptres	433,489	199,288	138,183	89,787	57,482	35,764	20,498	10,523	4,102	800
29 to 40 dioptres	12,390	5,685	3,841	2,514	1,600	1,007	571	271	102	20

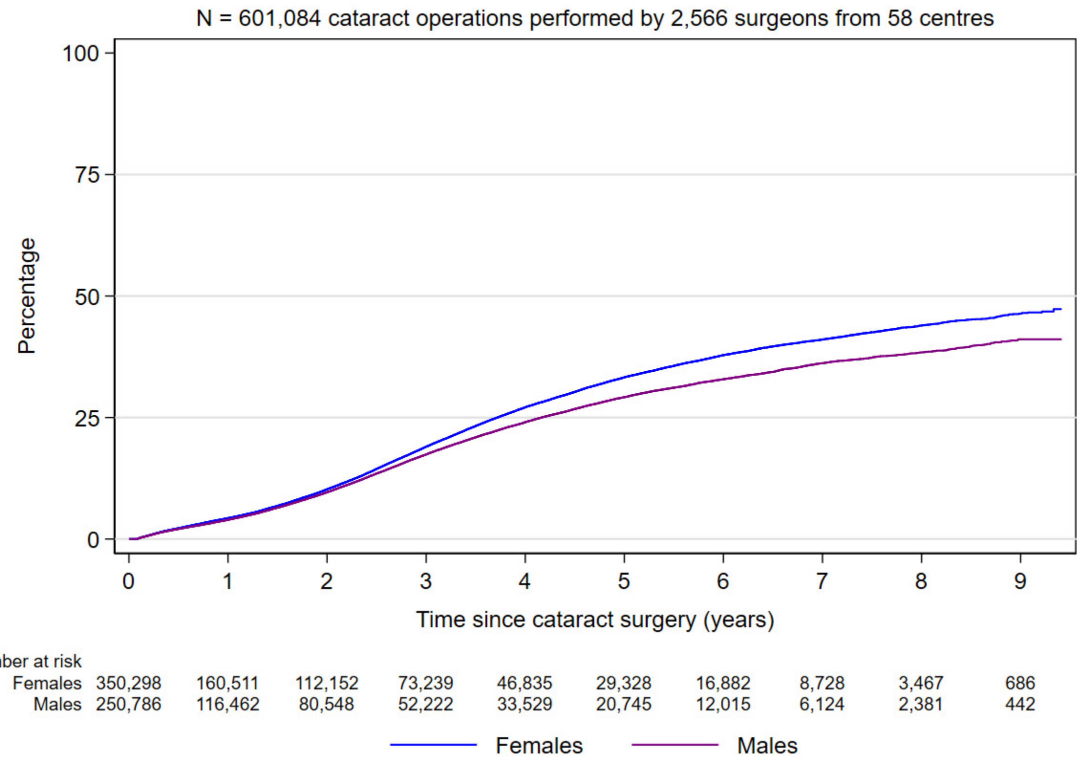
<15 dioptres — 15 to 19.5 dioptres — 20 to 28.5 dioptres — 29 to 40 dioptres

Appendix 9 Figure 2: Kaplan-Meier failure curves for the time to post-cataract PCO by the patient's age



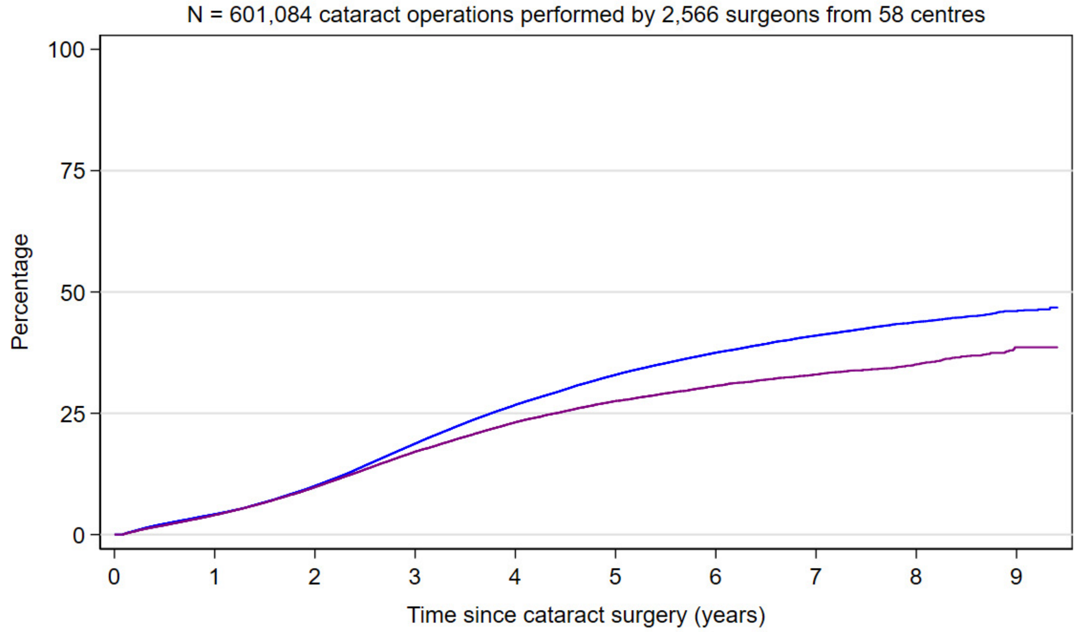
Number at risk	0	1	2	3	4	5	6	7	8	9
<40	2,815	1,389	922	614	404	272	176	98	38	6
40 to 49	9,478	4,783	3,445	2,311	1,557	975	558	276	133	23
50 to 89	565,318	261,687	182,830	119,556	76,799	47,987	27,797	14,332	5,631	1,092
≥ 90	23,473	9,114	5,503	2,980	1,604	839	366	146	46	7

Appendix 8 Figure 3: Kaplan-Meier failure curves for the time to post-cataract PCO by the patient's gender



Number at risk	0	1	2	3	4	5	6	7	8	9
Females	350,298	160,511	112,152	73,239	46,835	29,328	16,882	8,728	3,467	686
Males	250,786	116,462	80,548	52,222	33,529	20,745	12,015	6,124	2,381	442

Appendix 9 Figure 4: Kaplan-Meier failure curves for the time to post-cataract PCO by the patient's diabetic status

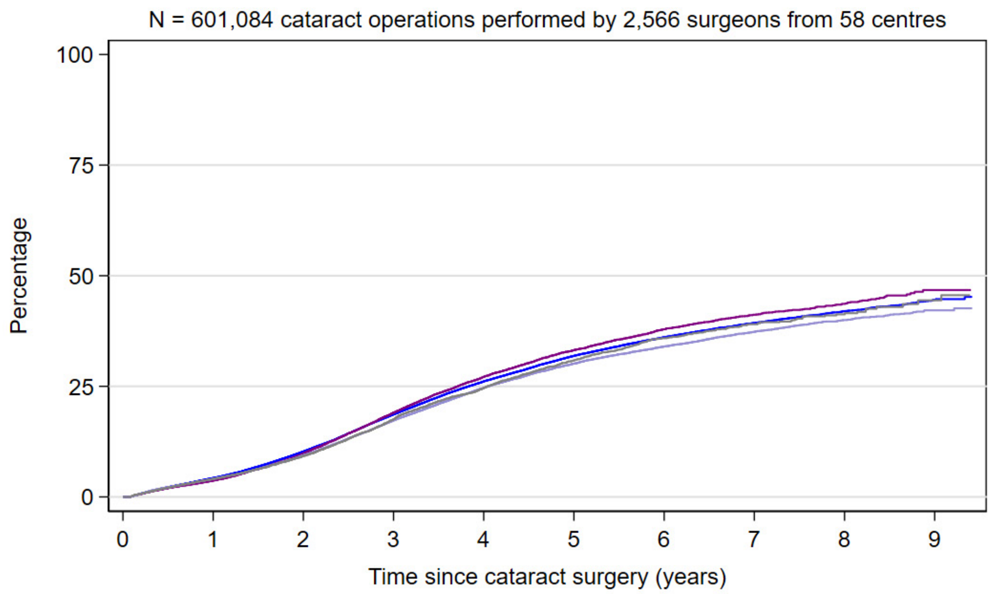


Number at risk

	0	1	2	3	4	5	6	7	8	9
Not Diabetic	475,614	207,247	143,976	93,710	59,917	37,214	21,516	11,067	4,399	857
Diabetic	125,470	69,726	48,724	31,751	20,447	12,859	7,381	3,785	1,449	271

Not Diabetic   Diabetic

Appendix 9 Figure 5: Kaplan-Meier failure curves for the time to post-cataract PCO by the grade of operating surgeon

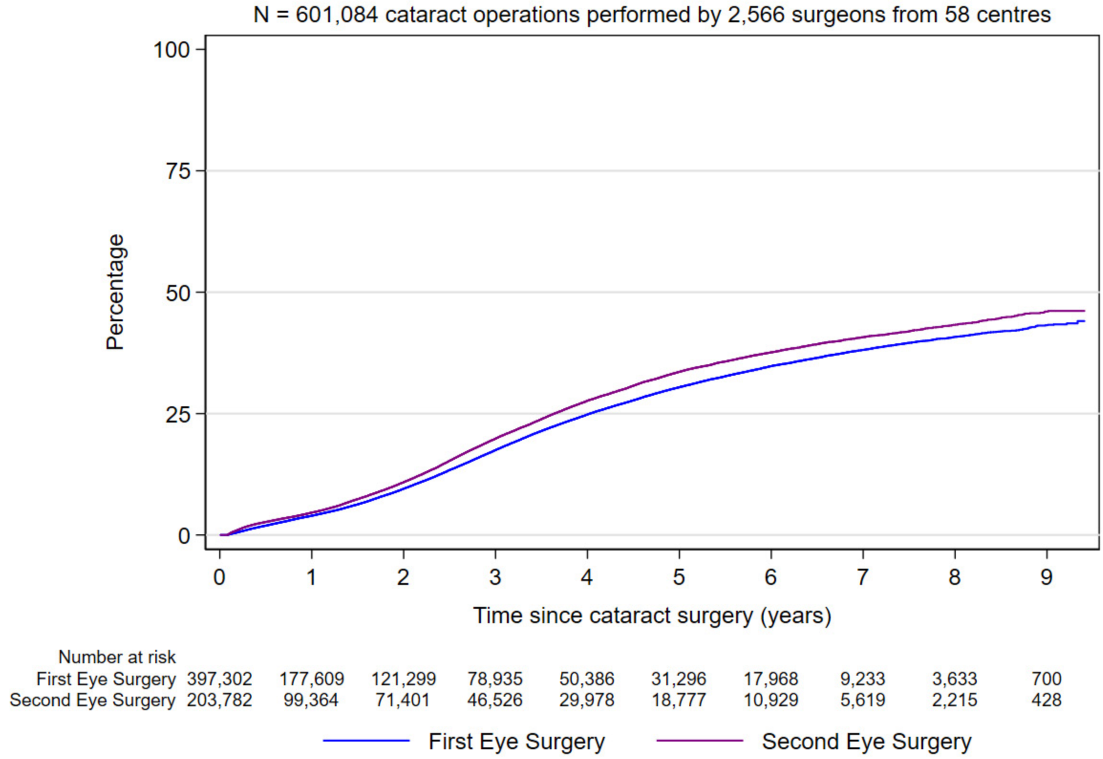


Number at risk

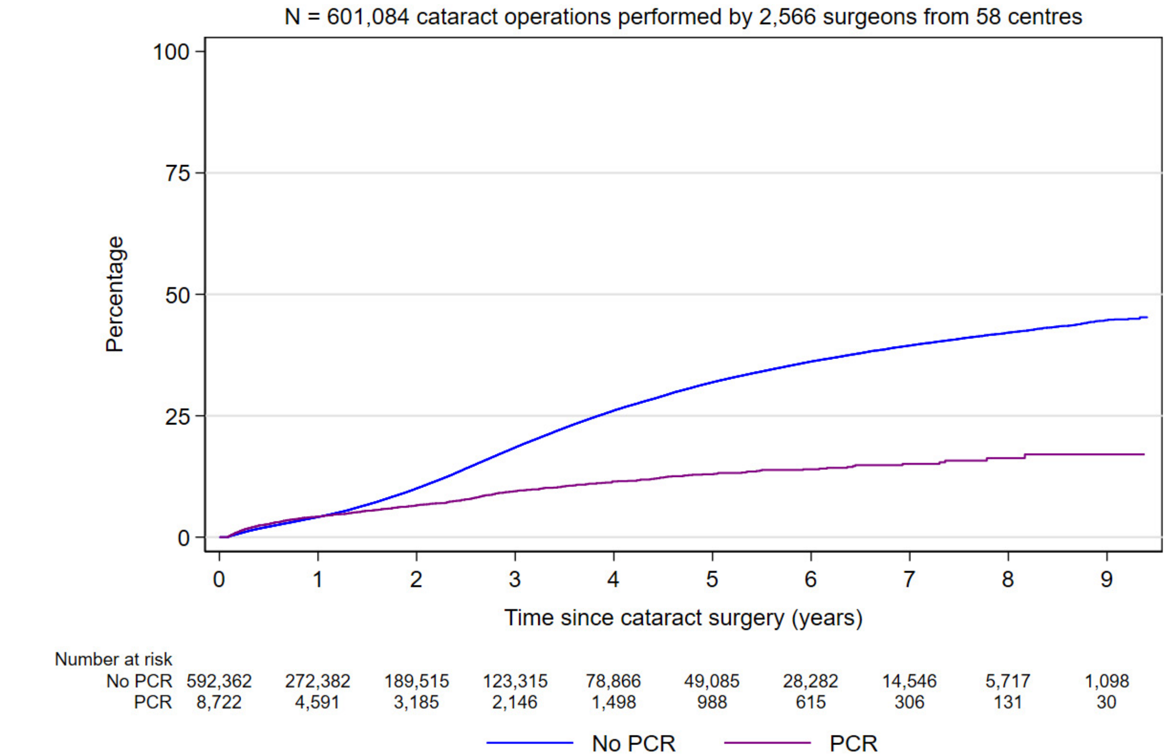
	0	1	2	3	4	5	6	7	8	9
Consultant	364,153	168,039	116,328	75,775	48,336	29,854	17,148	8,829	3,484	685
Career Grade	69,054	32,995	23,595	15,342	9,903	6,213	3,501	1,679	583	93
Experienced Trainee	143,478	64,854	45,130	29,478	19,021	12,094	7,209	3,811	1,560	299
Inexperienced Trainee	24,399	11,085	7,647	4,866	3,104	1,912	1,039	533	221	51

Consultant   Career Grade   Experienced Trainee   Inexperienced Trainee

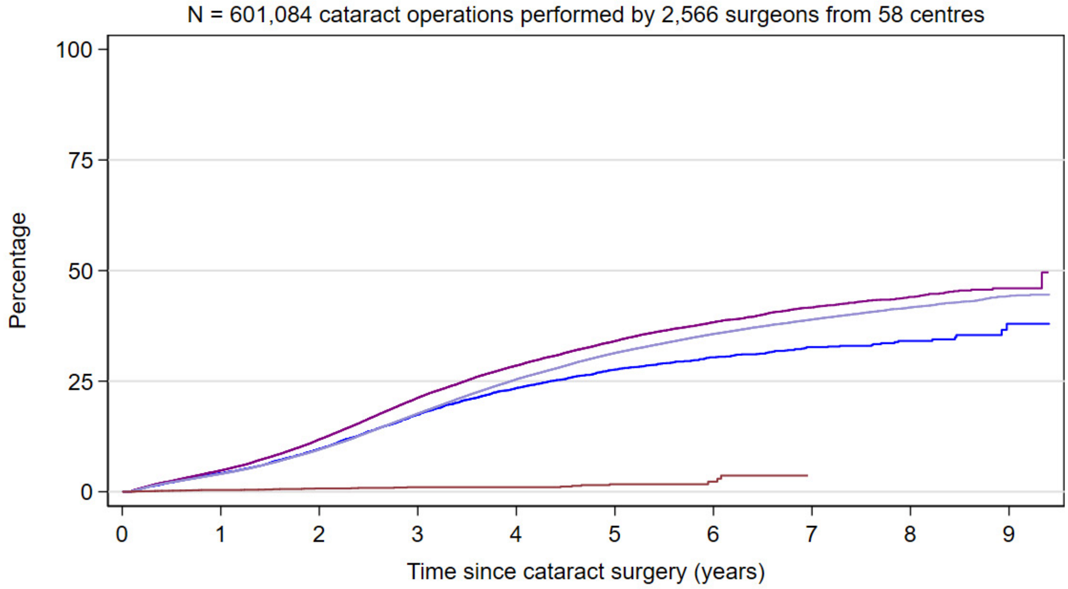
Appendix 9 Figure 6: Kaplan-Meier failure curves for the time to post-cataract PCO by first and second eye surgery



Appendix 9 Figure 7: Kaplan-Meier failure curves for the time to post-cataract PCO by posterior capsule rupture



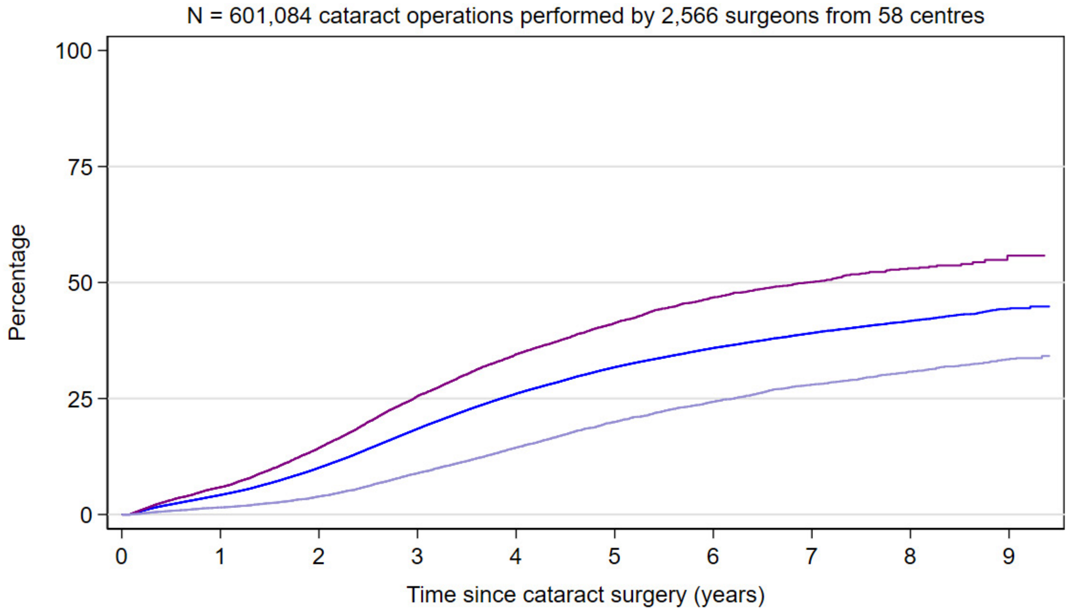
Appendix 9 Figure 8: Kaplan-Meier failure curves for the time to post-cataract PCO by pupil size



Number at risk										
Small	25,676	12,607	8,439	5,238	3,256	2,012	1,131	562	226	42
Medium	149,826	69,672	45,959	27,951	17,058	9,947	5,302	2,456	782	115
Large	404,266	190,432	136,295	91,085	59,202	37,627	22,307	11,834	4,840	971
Missing	21,316	4,262	2,007	1,187	848	487	157	0	0	0

Small Medium Large Missing

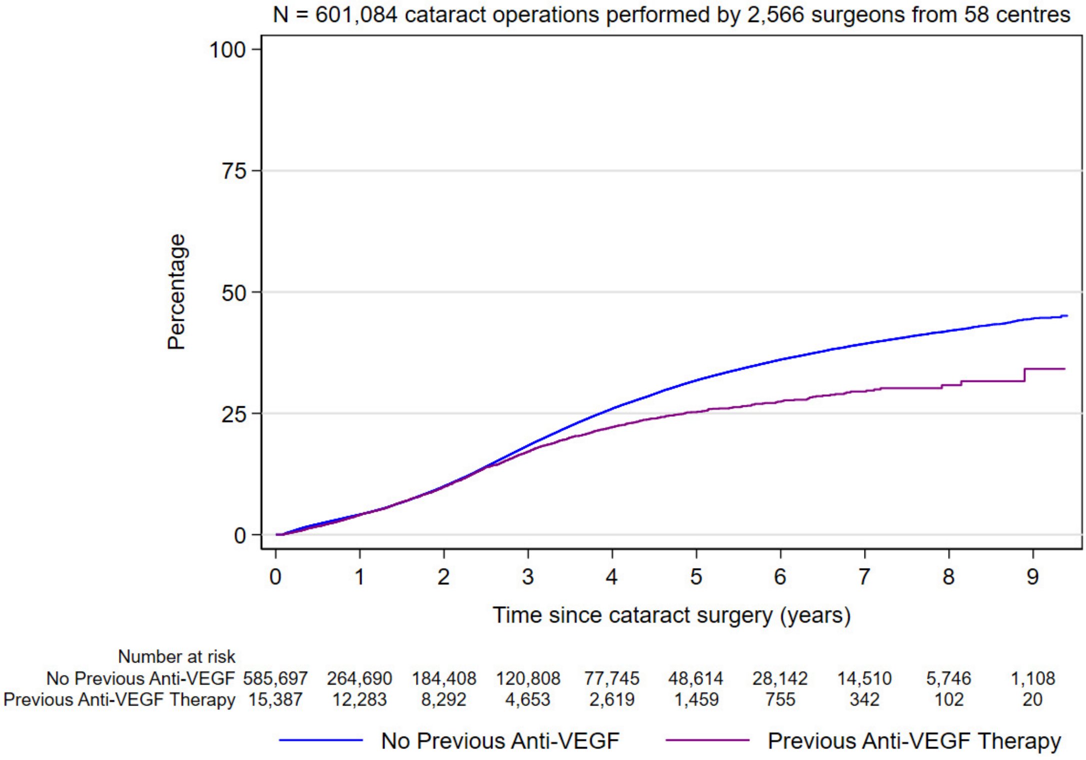
Appendix 9 Figure 9: Kaplan-Meier failure curves for the time to post-cataract PCO by axial length



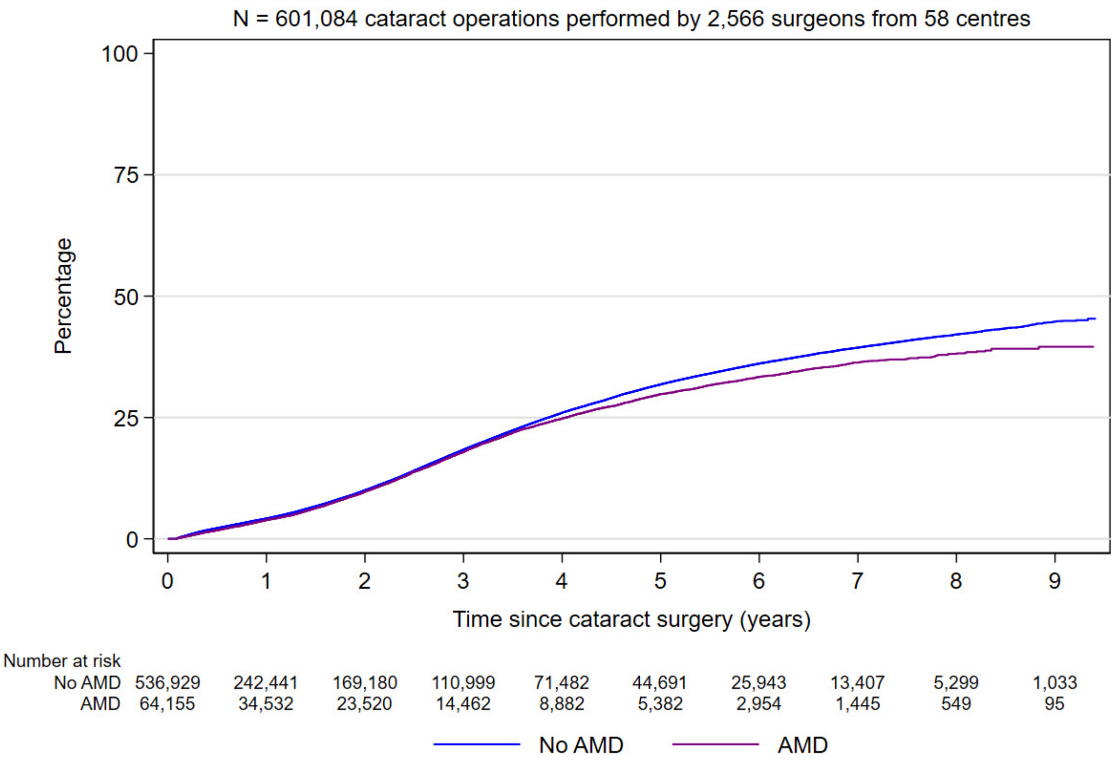
Number at risk										
<26 mm	533,467	248,868	171,722	110,453	69,803	42,802	24,026	11,849	4,144	542
26 to 39 mm	29,094	14,117	10,033	6,532	4,224	2,624	1,546	778	303	45
Missing	38,523	13,988	10,945	8,476	6,337	4,647	3,325	2,225	1,401	541

<26 mm 26 to 39 mm Missing

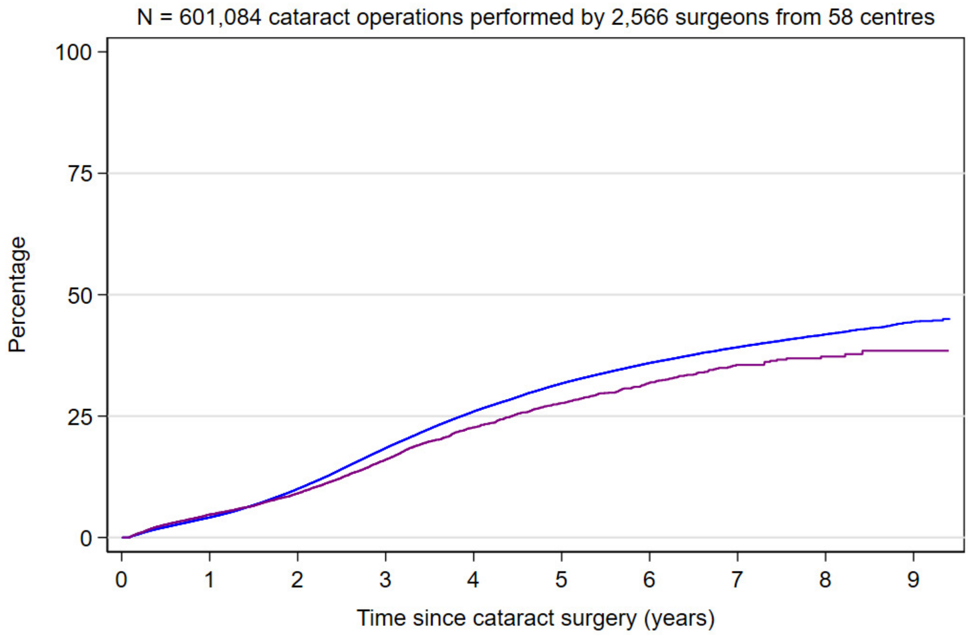
Appendix 9 Figure 10: Kaplan-Meier failure curves for the time to post-cataract PCO for previous Anti-VEGF therapy



Appendix 9 Figure 11: Kaplan-Meier failure curves for the time to post-cataract PCO for age-related macular degeneration



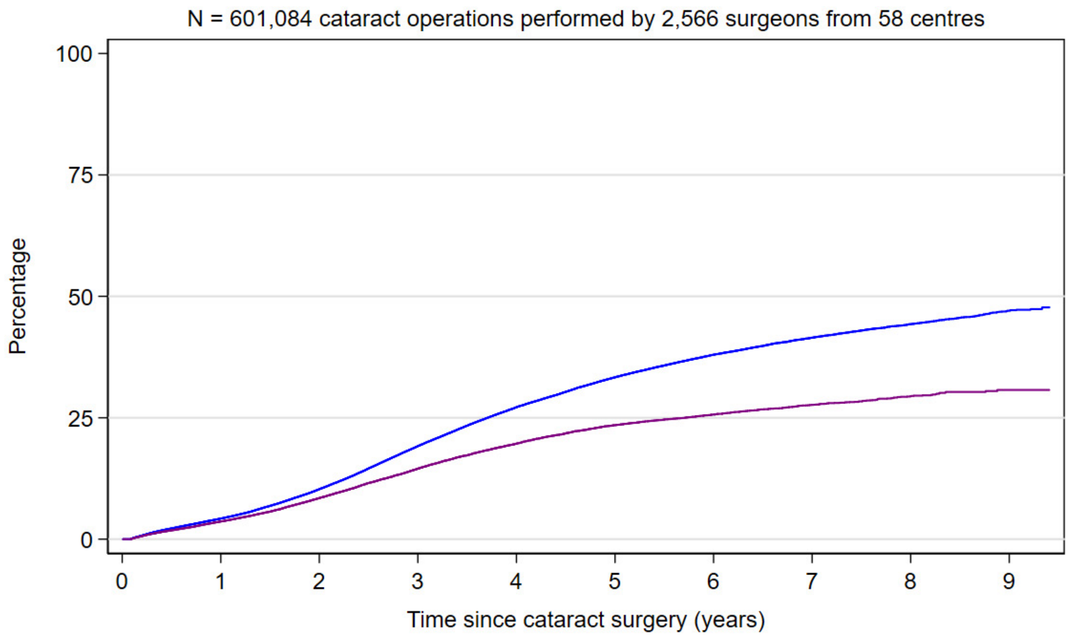
Appendix 9 Figure 12: Kaplan-Meier failure curves for the time to post-cataract PCO for brunescent / white / mature cataract



Number at risk										
No Brunescent Cataract	576,293	266,963	186,257	121,498	77,907	48,644	28,138	14,449	5,689	1,098
Brunescent Cataract	24,791	10,010	6,443	3,963	2,457	1,429	759	403	159	30

No Brunescent Cataract — Brunescent Cataract

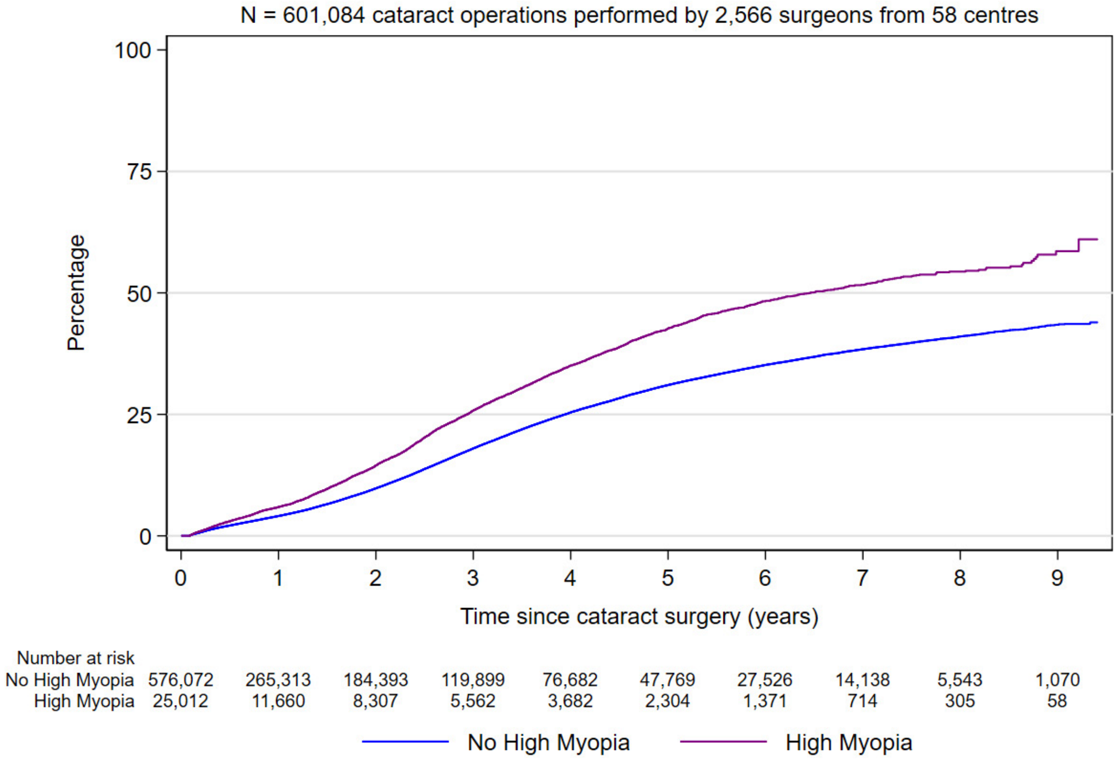
Appendix 9 Figure 13: Kaplan-Meier failure curves for the time to post-cataract PCO for glaucoma



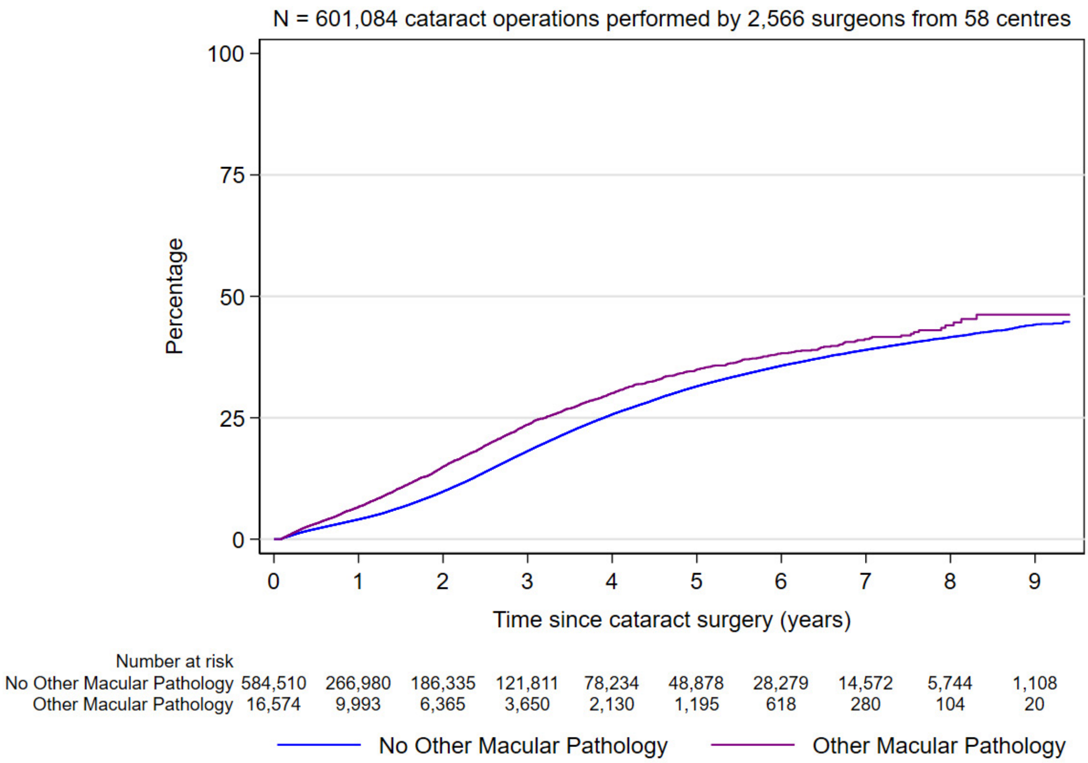
Number at risk										
No Glaucoma	534,279	227,822	157,170	101,980	65,003	40,273	23,212	11,879	4,656	900
Glaucoma	66,805	49,151	35,530	23,481	15,361	9,800	5,685	2,973	1,192	228

No Glaucoma — Glaucoma

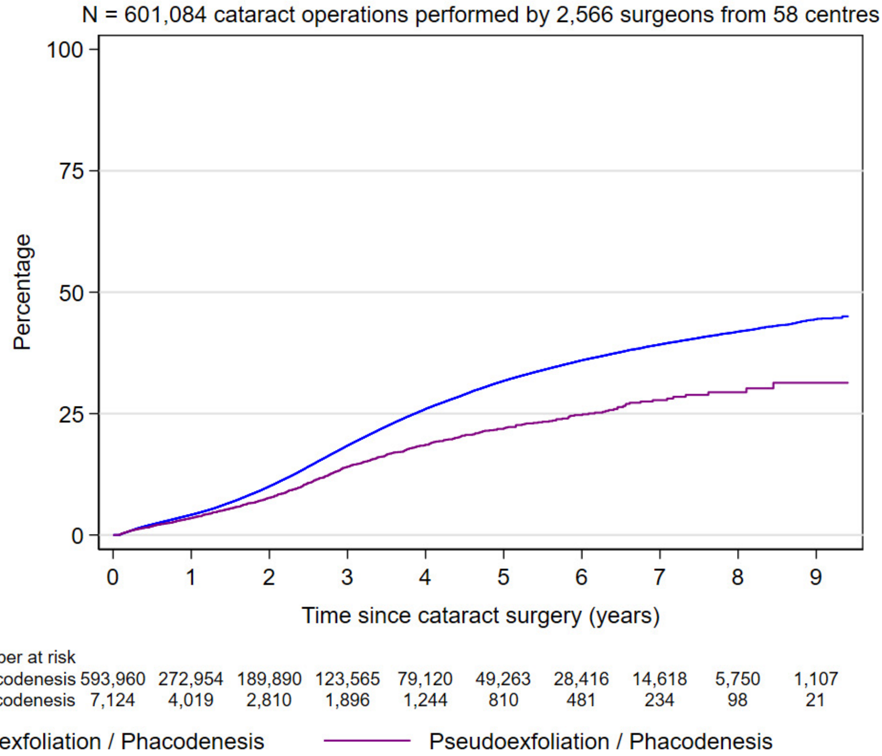
Appendix 9 Figure 14: Kaplan-Meier failure curves for the time to post-cataract PCO for high myopia



Appendix 9 Figure 15: Kaplan-Meier failure curves for the time to post-cataract PCO for other macular pathology

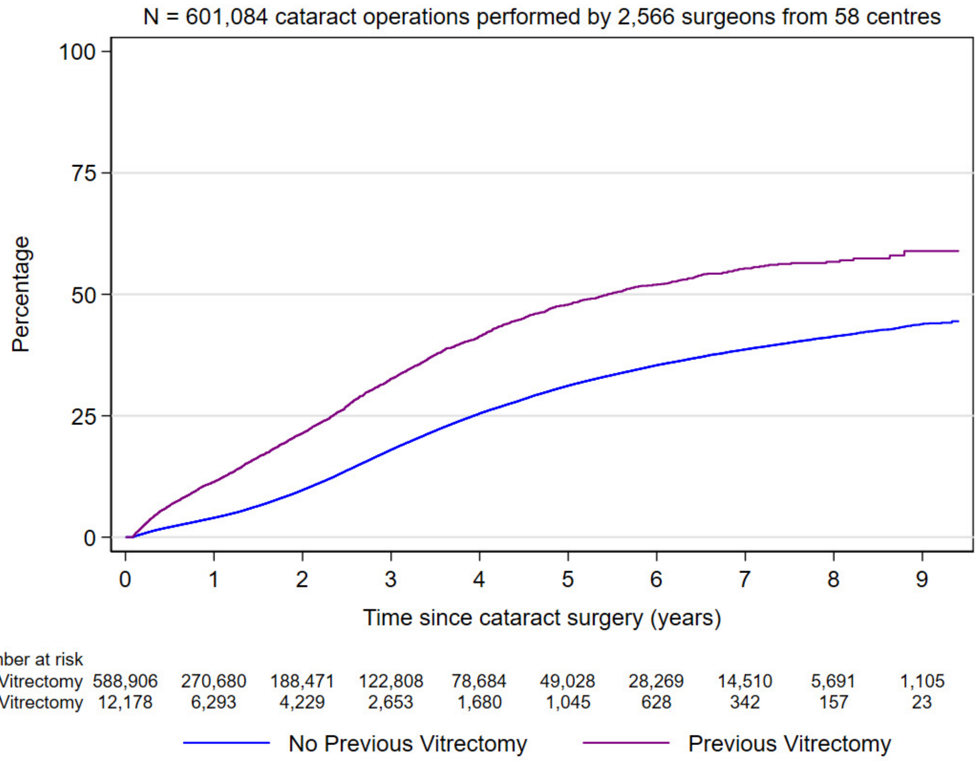


Appendix 9 Figure 16: Kaplan-Meier failure curves for the time to post-cataract PCO for pseudoexfoliation / phacodenesis



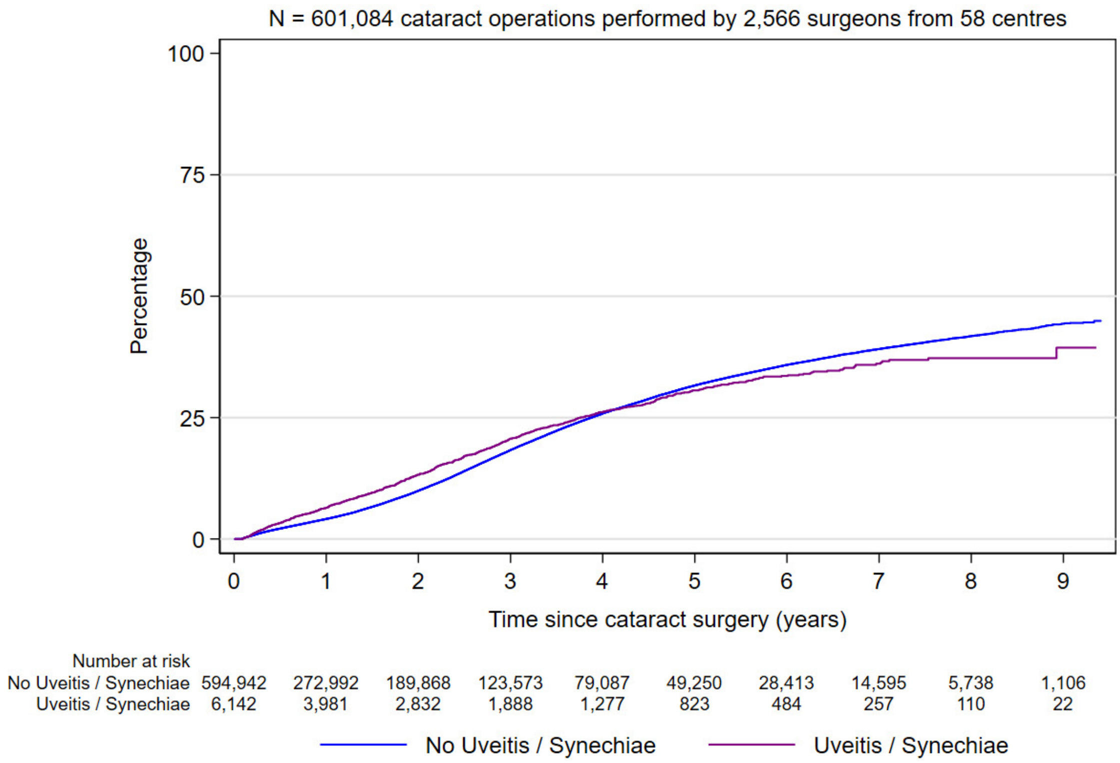
Number at risk										
No Pseudoexfoliation / Phacodenesis	593,960	272,954	189,890	123,565	79,120	49,263	28,416	14,618	5,750	1,107
Pseudoexfoliation / Phacodenesis	7,124	4,019	2,810	1,896	1,244	810	481	234	98	21

Appendix 9 Figure 17: Kaplan-Meier failure curves for the time to post-cataract PCO for previous vitrectomy surgery

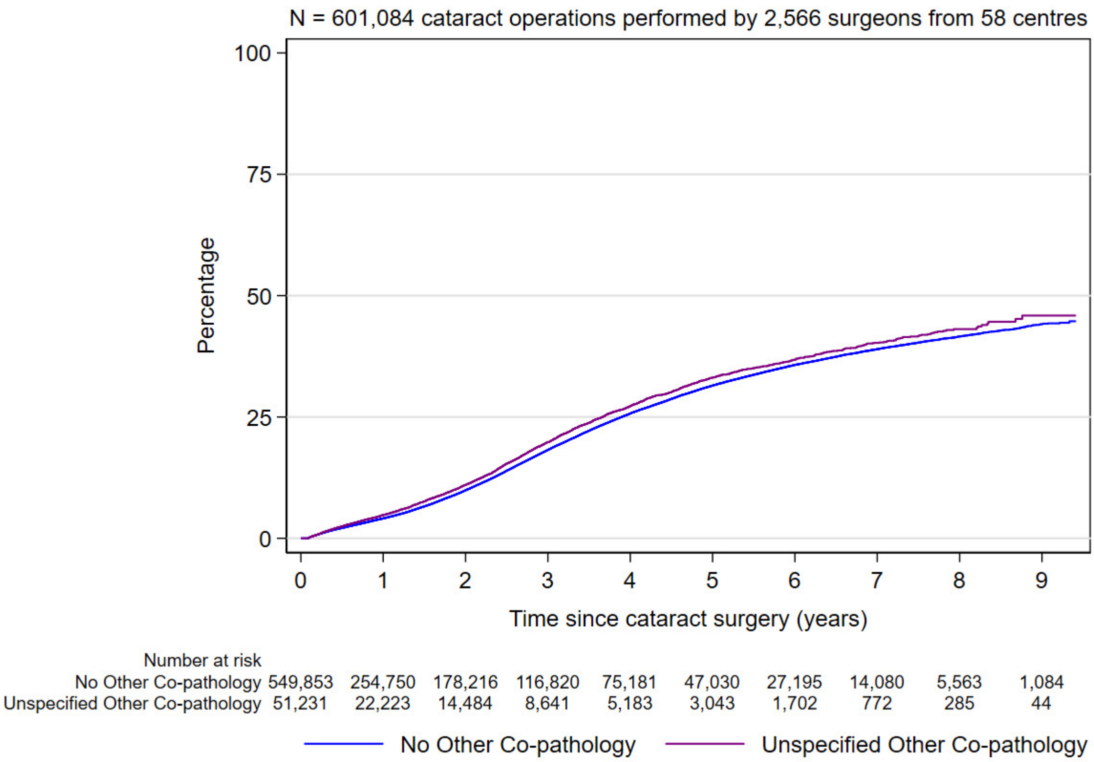


Number at risk										
No Previous Vitrectomy	588,906	270,680	188,471	122,808	78,684	49,028	28,269	14,510	5,691	1,105
Previous Vitrectomy	12,178	6,293	4,229	2,653	1,680	1,045	628	342	157	23

Appendix 9 Figure 18: Kaplan-Meier failure curves for the time to post-cataract PCO for uveitis / synechiae



Appendix 9 Figure 19: Kaplan-Meier failure curves for the time to post-cataract PCO for unspecified 'other' ocular co-pathology



Appendix 10: PCO risk factor model covariate percentages for IOL models

Appendix 10 table 1: For IOL Power, the percentage of operations where each IOL model was used

IOL model	Number of operations	IOL power (dioptres)			
Column percentage		<15	15 to 19.5	20 to 28.5	29 to 40
Number of operations		**37,845**	**117,360**	**433,489**	**12,390**
AcrySof IQ SN60WF	118,981	18.9	18.7	20.4	11.3
Tecnis ZCB00	117,126	17.3	15.8	20.5	27.0
Akreos Adapt	59,400	9.5	10.9	9.7	7.1
AcrySof SA60AT	58,400	9.6	10.6	9.3	15.7
Rayner Hydrophilic IOL's	53,750	9.6	9.6	8.8	7.4
Hoya ISERT	43,509	7.3	8.6	7.0	4.6
Lenstec Softec	33,338	5.2	6.9	5.2	6.2
Bausch + Lomb SofPort (Silicone)	28,399	5.0	5.1	4.6	4.8
AcrySof MA60AC (Multipiece)	21,069	6.0	3.6	3.3	2.5
EYECEE ONE	12,839	1.3	1.6	2.3	2.8
Bausch + Lomb Envista MX60	10,448	1.8	1.4	1.8	3.5
Tecnis Z9002 (Silicone)	8,086	1.8	1.4	1.3	0.7
Tecnis ZA9003 (Multipiece)	7,632	1.0	1.1	1.3	0.9
Zeiss CT Lucia	6,999	1.0	0.8	1.3	2.1
Bausch + Lomb Incise	5,371	0.9	0.9	0.9	0.5
Zeiss CT Asphina	5,070	1.0	1.2	0.8	0.6
Physiol A123	4,618	0.7	0.6	0.8	1.3
AMO Sensar (Multipiece)	1,852	1.1	0.3	0.3	0.3
Aaren Scientific EC1	1,828	0.3	0.3	0.3	0.3
AcrySof Toric	1,200	0.4	0.3	0.2	0.2
Rayner T-Flex Toric	1,169	0.7	0.4	0.1	0.1

Appendix 10 table 2: For Age at surgery, the percentage of operations where each IOL model was used

IOL model	Number of operations	Age at surgery (years)			
Column percentage		<40	40 to 49	50 to 89	≥90
Number of operations		**2,815**	**9,478**	**565,318**	**23,473**
AcrySof IQ SN60WF	118,981	21.7	20.7	19.8	19.2
Tecnis ZCB00	117,126	17.1	18.6	19.5	19.3
Akreos Adapt	59,400	7.7	9.0	9.9	10.0
AcrySof SA60AT	58,400	9.4	9.6	9.7	10.9
Rayner Hydrophilic IOL's	53,750	8.6	9.7	9.0	8.4
Hoya ISERT	43,509	5.5	6.4	7.3	6.2
Lenstec Softec	33,338	5.6	5.9	5.5	6.3
Bausch + Lomb SofPort (Silicone)	28,399	2.8	3.6	4.7	5.1
AcrySof MA60AC (Multipiece)	21,069	7.9	5.4	3.5	3.2
EYECEE ONE	12,839	1.8	1.7	2.1	2.1
Bausch + Lomb Envista MX60	10,448	1.5	1.7	1.8	1.4
Tecnis Z9002 (Silicone)	8,086	1.6	1.8	1.3	1.3
Tecnis ZA9003 (Multipiece)	7,632	2.3	1.1	1.3	1.6
Zeiss CT Lucia	6,999	0.7	0.9	1.2	1.4
Bausch + Lomb Incise	5,371	1.5	0.9	0.9	0.9
Zeiss CT Asphina	5,070	0.7	0.6	0.8	0.9
Physiol A123	4,618	0.8	0.7	0.8	0.8
AMO Sensar (Multipiece)	1,852	0.9	0.7	0.3	0.2
Aaren Scientific EC1	1,828	0.2	0.2	0.3	0.4
AcrySof Toric	1,200	0.9	0.5	0.2	0.2
Rayner T-Flex Toric	1,169	0.5	0.4	0.2	0.2

Appendix 10 table 3: For the patients Gender and Diabetic status, the percentage of operations where each IOL model was used

IOL model	Number of operations	Gender		Diabetic Status	
Column percentage		Females	Males	Not diabetic	Diabetic
Number of operations		**350,298**	**250,786**	**475,614**	**125,470**
AcrySof IQ SN60WF	118,981	19.8	19.8	20.1	18.5
Tecnis ZCB00	117,126	19.5	19.4	19.2	20.4
Akreos Adapt	59,400	10.0	9.8	10.1	9.0
AcrySof SA60AT	58,400	9.7	9.7	9.8	9.3
Rayner Hydrophilic IOL's	53,750	8.8	9.1	8.4	11.0
Hoya ISERT	43,509	7.2	7.2	7.3	6.9
Lenstec Softec	33,338	5.5	5.6	5.4	6.1
Bausch + Lomb SofPort (Silicone)	28,399	4.7	4.7	4.8	4.3
AcrySof MA60AC (Multipiece)	21,069	3.5	3.6	3.5	3.5
EYECEE ONE	12,839	2.1	2.2	2.0	2.5
Bausch + Lomb Envista MX60	10,448	1.7	1.7	1.7	1.9
Tecnis Z9002 (Silicone)	8,086	1.3	1.4	1.5	0.6
Tecnis ZA9003 (Multipiece)	7,632	1.3	1.2	1.3	1.1
Zeiss CT Lucia	6,999	1.2	1.1	1.2	1.1
Bausch + Lomb Incise	5,371	0.9	0.9	0.8	1.1
Zeiss CT Asphina	5,070	0.8	0.8	0.8	0.9
Physiol A123	4,618	0.8	0.7	0.8	0.8
AMO Sensar (Multipiece)	1,852	0.3	0.3	0.3	0.3
Aaren Scientific EC1	1,828	0.3	0.3	0.3	0.3
AcrySof Toric	1,200	0.2	0.2	0.2	0.1
Rayner T-Flex Toric	1,169	0.2	0.2	0.2	0.2

Appendix 10 table 4: For the Grade of operating Surgeon, the percentage of operations where each IOL model was used

IOL model	Number of operations	Surgeon Grade			
Column percentage		Consultant	Career grade	Experienced trainee	Inexperienced trainee
Number of operations		**364,153**	**69,054**	**143,478**	**24,399**
AcrySof IQ SN60WF	118,981	19.1	23.3	20.7	15.3
Tecnis ZCB00	117,126	21.0	13.8	18.6	18.2
Akreos Adapt	59,400	9.3	12.2	10.8	7.2
AcrySof SA60AT	58,400	9.4	8.7	11.1	8.9
Rayner Hydrophilic IOL's	53,750	9.2	6.7	9.1	10.2
Hoya ISERT	43,509	6.5	6.6	8.6	12.2
Lenstec Softec	33,338	7.1	3.3	2.9	4.5
Bausch + Lomb SofPort (Silicone)	28,399	5.0	5.6	3.6	5.5
AcrySof MA60AC (Multipiece)	21,069	3.4	5.0	3.1	3.8
EYECEE ONE	12,839	2.1	1.8	1.8	5.6
Bausch + Lomb Envista MX60	10,448	1.4	3.3	1.5	3.9
Tecnis Z9002 (Silicone)	8,086	0.7	3.2	2.2	0.6
Tecnis ZA9003 (Multipiece)	7,632	1.3	0.2	1.7	1.1
Zeiss CT Lucia	6,999	1.2	1.8	0.8	0.9
Bausch + Lomb Incise	5,371	1.0	0.4	0.9	0.8
Zeiss CT Asphina	5,070	0.7	2.7	0.4	0.8
Physiol A123	4,618	0.8	0.7	0.9	0.1
AMO Sensar (Multipiece)	1,852	0.3	0.1	0.4	0.1
Aaren Scientific EC1	1,828	0.4	0.1	0.3	<0.1
AcrySof Toric	1,200	0.2	0.1	0.3	<0.1
Rayner T-Flex Toric	1,169	0.2	0.1	0.3	0.3

Appendix 10 table 5: For First or Second eye surgery and Axial Length, the percentage of operations where each IOL model was used

IOL model	Number of operations	First or second eye surgery		Axial Length (mm)		
Column percentage		First	Second	<26	≥26	Missing
Number of operations		**397,302**	**203,782**	**533,467**	**29,646**	**37,971**
AcrySof IQ SN60WF	118,981	21.1	17.3	17.1	15.9	60.1
Tecnis ZCB00	117,126	19.5	19.5	20.5	20.4	3.9
Akreos Adapt	59,400	9.4	10.9	10.0	9.4	8.1
AcrySof SA60AT	58,400	9.6	10.0	10.1	9.9	4.7
Rayner Hydrophilic IOL's	53,750	8.8	9.3	9.5	9.1	0.8
Hoya ISERT	43,509	7.3	7.2	7.7	7.2	0.3
Lenstec Softec	33,338	5.2	6.1	5.7	4.7	4.3
Bausch + Lomb SofPort (Silicone)	28,399	4.5	5.1	4.7	4.9	5.3
AcrySof MA60AC (Multipiece)	21,069	3.6	3.3	3.3	6.1	5.0
EYECEE ONE	12,839	2.0	2.4	2.3	1.6	0.1
Bausch + Lomb Envista MX60	10,448	1.7	1.9	1.8	2.2	<0.1
Tecnis Z9002 (Silicone)	8,086	1.5	1.1	1.3	1.9	1.4
Tecnis ZA9003 (Multipiece)	7,632	1.2	1.4	1.3	1.1	1.6
Zeiss CT Lucia	6,999	1.4	0.7	1.2	1.1	1.2
Bausch + Lomb Incise	5,371	0.9	0.9	1.0	0.9	<0.1
Zeiss CT Asphina	5,070	0.8	0.9	0.9	0.8	<0.1
Physiol A123	4,618	0.7	0.9	0.8	0.7	0.5
AMO Sensar (Multipiece)	1,852	0.3	0.3	0.2	1.3	0.9
Aaren Scientific EC1	1,828	0.3	0.3	0.3	0.3	<0.1
AcrySof Toric	1,200	0.2	0.1	0.1	0.2	1.7
Rayner T-Flex Toric	1,169	0.2	0.2	0.2	0.4	<0.1

Appendix 10 table 6: For PCR and Previous Anti-VEGF therapy, the percentage of operations where each IOL model was used

IOL model	Number of operations	Posterior Capsule Rupture		Previous Anti-VEGF therapy	
Column percentage		No PCR	PCR	No previous Anti-VEGF therapy	Previous Anti-VEGF therapy
Number of operations		**592,362**	**8,722**	**585,697**	**15,387**
AcrySof IQ SN60WF	118,981	19.9	11.0	19.8	18.1
Tecnis ZCB00	117,126	19.6	9.1	19.5	20.3
Akreos Adapt	59,400	9.9	5.3	9.8	11.1
AcrySof SA60AT	58,400	9.8	5.5	9.7	9.8
Rayner Hydrophilic IOL's	53,750	9.0	6.1	8.9	9.3
Hoya ISERT	43,509	7.3	5.3	7.2	8.1
Lenstec Softec	33,338	5.6	3.7	5.6	3.8
Bausch + Lomb SofPort (Silicone)	28,399	4.7	7.7	4.8	3.1
AcrySof MA60AC (Multipiece)	21,069	3.1	29.9	3.5	4.1
EYECEE ONE	12,839	2.2	0.8	2.1	2.3
Bausch + Lomb Envista MX60	10,448	1.8	0.6	1.7	1.9
Tecnis Z9002 (Silicone)	8,086	1.3	3.6	1.4	0.6
Tecnis ZA9003 (Multipiece)	7,632	1.2	6.6	1.3	0.8
Zeiss CT Lucia	6,999	1.2	0.5	1.2	1.6
Bausch + Lomb Incise	5,371	0.9	0.6	0.9	1.4
Zeiss CT Asphina	5,070	0.9	0.4	0.8	0.8
Physiol A123	4,618	0.8	1.3	0.7	2.2
AMO Sensar (Multipiece)	1,852	0.3	1.5	0.3	0.4
Aaren Scientific EC1	1,828	0.3	0.4	0.3	0.1
AcrySof Toric	1,200	0.2	0.1	0.2	0.1
Rayner T-Flex Toric	1,169	0.2	0.1	0.2	0.1

Appendix 10 table 7: For Pupil Size, the percentage of operations where each IOL model was used

IOL model	Number of operations	Pupil Size			
Column percentage		Small	Medium	Large	Missing
Number of operations		**25,676**	**149,826**	**404,266**	**21,316**
AcrySof IQ SN60WF	118,981	16.8	17.2	18.2	72.2
Tecnis ZCB00	117,126	18.7	18.5	20.9	0.0
Akreos Adapt	59,400	12.2	12.9	8.7	8.1
AcrySof SA60AT	58,400	8.6	7.4	11.1	1.2
Rayner Hydrophilic IOL's	53,750	9.7	14.2	7.4	<0.1
Hoya ISERT	43,509	9.1	8.6	7.0	0.0
Lenstec Softec	33,338	6.3	3.4	6.6	0.0
Bausch + Lomb SofPort (Silicone)	28,399	5.7	3.1	5.5	0.2
AcrySof MA60AC (Multipiece)	21,069	3.0	3.6	3.5	3.1
EYECEE ONE	12,839	1.9	2.1	2.3	0.1
Bausch + Lomb Envista MX60	10,448	1.4	1.1	2.1	<0.1
Tecnis Z9002 (Silicone)	8,086	1.6	1.9	1.2	0.0
Tecnis ZA9003 (Multipiece)	7,632	1.2	0.9	1.5	0.0
Zeiss CT Lucia	6,999	0.6	0.4	0.9	12.7
Bausch + Lomb Incise	5,371	1.0	1.3	0.8	0.0
Zeiss CT Asphina	5,070	0.8	1.3	0.7	0.1
Physiol A123	4,618	0.7	1.1	0.7	0.0
AMO Sensar (Multipiece)	1,852	0.3	0.1	0.4	0.0
Aaren Scientific EC1	1,828	0.2	0.5	0.2	0.0
AcrySof Toric	1,200	<0.1	0.1	0.1	2.4
Rayner T-Flex Toric	1,169	0.1	0.2	0.2	0.0

Appendix 10 table 8: For the presence of Age-related Macular Degeneration and a Brunescent / White / Mature Cataract, the percentage of operations where each IOL model was used

IOL model	Number of operations	Age-related Macular Degeneration		Brunescent /White / Mature Cataract	
Column percentage		Absent	Present	Absent	Present
Number of operations		**536,929**	**64,155**	**576,293**	**24,791**
AcrySof IQ SN60WF	118,981	19.9	18.9	19.9	18.5
Tecnis ZCB00	117,126	19.4	20.2	19.6	16.9
Akreos Adapt	59,400	9.9	10.0	10.0	8.2
AcrySof SA60AT	58,400	9.7	9.7	9.7	9.6
Rayner Hydrophilic IOL's	53,750	9.0	8.1	8.8	11.8
Hoya ISERT	43,509	7.3	6.6	7.2	7.1
Lenstec Softec	33,338	5.4	6.5	5.4	7.8
Bausch + Lomb SofPort (Silicone)	28,399	4.7	5.2	4.8	4.0
AcrySof MA60AC (Multipiece)	21,069	3.5	3.2	3.4	4.8
EYECEE ONE	12,839	2.0	2.9	2.1	2.0
Bausch + Lomb Envista MX60	10,448	1.7	2.2	1.8	1.3
Tecnis Z9002 (Silicone)	8,086	1.4	0.9	1.3	1.5
Tecnis ZA9003 (Multipiece)	7,632	1.3	1.3	1.3	1.4
Zeiss CT Lucia	6,999	1.2	1.2	1.2	1.4
Bausch + Lomb Incise	5,371	0.9	0.9	0.9	1.2
Zeiss CT Asphina	5,070	0.9	0.6	0.8	0.8
Physiol A123	4,618	0.7	1.0	0.8	0.6
AMO Sensar (Multipiece)	1,852	0.3	0.3	0.3	0.6
Aaren Scientific EC1	1,828	0.3	0.3	0.3	0.1
AcrySof Toric	1,200	0.2	0.1	0.2	0.1
Rayner T-Flex Toric	1,169	0.2	0.1	0.2	0.1

Appendix 10 table 9: For the presence of Glaucoma and High Myopia, the percentage of operations where each IOL model was used

IOL model	Number of operations	Glaucoma		High Myopia	
Column percentage		Absent	Present	Absent	Present
Number of operations		**534,279**	**66,805**	**576,072**	**25,012**
AcrySof IQ SN60WF	118,981	20.1	17.3	20.0	14.9
Tecnis ZCB00	117,126	19.4	19.9	19.5	20.2
Akreos Adapt	59,400	9.8	10.3	9.9	9.6
AcrySof SA60AT	58,400	9.6	10.7	9.7	9.0
Rayner Hydrophilic IOL's	53,750	8.9	9.3	8.9	10.4
Hoya ISERT	43,509	7.4	5.8	7.3	6.5
Lenstec Softec	33,338	5.4	6.9	5.5	6.3
Bausch + Lomb SofPort (Silicone)	28,399	4.8	4.4	4.7	5.5
AcrySof MA60AC (Multipiece)	21,069	3.5	3.9	3.4	6.1
EYECEE ONE	12,839	2.1	2.7	2.2	1.5
Bausch + Lomb Envista MX60	10,448	1.7	1.8	1.7	2.0
Tecnis Z9002 (Silicone)	8,086	1.4	1.2	1.3	1.8
Tecnis ZA9003 (Multipiece)	7,632	1.2	1.6	1.3	1.0
Zeiss CT Lucia	6,999	1.2	0.9	1.2	0.8
Bausch + Lomb Incise	5,371	0.9	0.8	0.9	0.8
Zeiss CT Asphina	5,070	0.8	1.0	0.8	0.8
Physiol A123	4,618	0.8	0.5	0.8	0.7
AMO Sensar (Multipiece)	1,852	0.3	0.3	0.3	1.4
Aaren Scientific EC1	1,828	0.3	0.5	0.3	0.2
AcrySof Toric	1,200	0.2	0.1	0.2	0.1
Rayner T-Flex Toric	1,169	0.2	0.2	0.2	0.2

Appendix 10 table 10: For the presence of Other Macular Pathology and Pseudoexfoliation / Phacodenesis, the percentage of operations where each IOL model was used

IOL model	Number of operations	Other Macular Pathology		Pseudoexfoliation / Phacodenesis	
Column percentage		Absent	Present	Absent	Present
Number of operations		**584,510**	**16,574**	**593,960**	**7,124**
AcrySof IQ SN60WF	118,981	19.8	20.6	19.8	16.5
Tecnis ZCB00	117,126	19.4	21.7	19.5	16.9
Akreos Adapt	59,400	9.9	8.8	9.9	10.5
AcrySof SA60AT	58,400	9.7	11.0	9.7	10.2
Rayner Hydrophilic IOL's	53,750	8.9	9.7	8.9	9.1
Hoya ISERT	43,509	7.3	5.9	7.2	6.4
Lenstec Softec	33,338	5.6	5.4	5.5	8.1
Bausch + Lomb SofPort (Silicone)	28,399	4.8	3.0	4.7	6.8
AcrySof MA60AC (Multipiece)	21,069	3.5	3.5	3.5	4.7
EYECEE ONE	12,839	2.1	2.5	2.1	2.2
Bausch + Lomb Envista MX60	10,448	1.7	1.5	1.7	1.3
Tecnis Z9002 (Silicone)	8,086	1.4	1.1	1.3	1.8
Tecnis ZA9003 (Multipiece)	7,632	1.3	1.0	1.3	1.2
Zeiss CT Lucia	6,999	1.2	1.1	1.2	0.5
Bausch + Lomb Incise	5,371	0.9	1.3	0.9	0.7
Zeiss CT Asphina	5,070	0.8	0.8	0.8	0.8
Physiol A123	4,618	0.8	0.4	0.8	0.9
AMO Sensar (Multipiece)	1,852	0.3	0.3	0.3	0.7
Aaren Scientific EC1	1,828	0.3	0.2	0.3	0.3
AcrySof Toric	1,200	0.2	0.1	0.2	0.1
Rayner T-Flex Toric	1,169	0.2	0.1	0.2	0.1

Appendix 10 table 11: For Previous Vitrectomy Surgery and the presence of Uveitis / Synechiae and Unspecified 'Other' Ocular Co-pathology, the percentage of operations where each IOL model was used

IOL model	Number of operations	Previous Vitrectomy Surgery		Uveitis / Synechiae		Unspecified 'Other' Ocular Co-pathology	
Column percentage		Absent	Present	Absent	Present	Absent	Present
Number of operations		**588,906**	**12,178**	**594,942**	**6,142**	**549,853**	**51,231**
AcrySof IQ SN60WF	118,981	19.8	19.3	19.8	17.1	18.6	32.5
Tecnis ZCB00	117,126	19.4	24.2	19.5	19.1	19.8	16.0
Akreos Adapt	59,400	9.9	10.8	9.9	9.0	10.1	7.6
AcrySof SA60AT	58,400	9.7	11.6	9.7	12.4	9.8	8.9
Rayner Hydrophilic IOL's	53,750	9.0	7.8	8.9	9.8	9.0	8.5
Hoya ISERT	43,509	7.3	5.2	7.3	5.7	7.4	5.0
Lenstec Softec	33,338	5.6	2.6	5.5	5.9	5.5	5.7
Bausch + Lomb SofPort (Silicone)	28,399	4.8	3.3	4.7	4.4	4.9	3.3
AcrySof MA60AC (Multipiece)	21,069	3.5	5.3	3.5	4.9	3.5	3.6
EYECEE ONE	12,839	2.1	1.5	2.1	1.8	2.1	2.0
Bausch + Lomb Envista MX60	10,448	1.7	1.6	1.7	1.6	1.8	1.3
Tecnis Z9002 (Silicone)	8,086	1.3	1.9	1.3	1.8	1.4	0.5
Tecnis ZA9003 (Multipiece)	7,632	1.3	2.0	1.3	1.3	1.3	1.0
Zeiss CT Lucia	6,999	1.2	0.5	1.2	0.7	1.2	1.1
Bausch + Lomb Incise	5,371	0.9	0.9	0.9	1.3	0.9	0.9
Zeiss CT Asphina	5,070	0.9	0.2	0.8	0.7	0.9	0.3
Physiol A123	4,618	0.8	0.3	0.8	1.1	0.8	0.5
AMO Sensar (Multipiece)	1,852	0.3	0.4	0.3	0.6	0.3	0.2
Aaren Scientific EC1	1,828	0.3	0.1	0.3	0.4	0.3	0.2
AcrySof Toric	1,200	0.2	0.3	0.2	0.1	0.1	0.9
Rayner T-Flex Toric	1,169	0.2	0.2	0.2	0.2	0.2	0.2

Appendix 11: IOL model allocation

Each contributing centre could record the details for the IOL model in different ways, for example abbreviations, different order of words and numbers. For this reason the submitted IOL information has been allocated to a specific IOL model, and from this to an IOL material and IOL type. In Appendix table 11 are the IOL model, IOL material and IOL type used in this analysis.

Appendix 11 table: IOL model, material and type allocation

IOL model	IOL material	IOL type
AcrySof IQ SN60WF	Hydrophobic	Monofocal Single Piece
Tecnis ZCB00	Hydrophobic	Monofocal Single Piece
Akreos Adapt	Hydrophilic	Monofocal Single Piece
AcrySof SA60AT	Hydrophobic	Monofocal Single Piece
Rayner Hydrophilic IOL's	Hydrophilic	Monofocal Single Piece
Hoya ISERT	Hydrophobic	Monofocal Single Piece
Lenstec Softec	Hydrophilic	Monofocal Single Piece
Bausch + Lomb SofPort (Silicone)	Silicone	Monofocal Single Piece
AcrySof MA60AC (Multipiece)	Hydrophobic / PMMA	Monofocal Multipiece
EYCEE ONE	Hydrophobic	Monofocal Single Piece
Bausch + Lomb Envista MX60	Hydrophobic	Monofocal Single Piece
Tecnis Z9002 (Silicone)	Silicone	Monofocal Single Piece
Tecnis ZA9003 (Multipiece)	Hydrophobic / PMMA	Monofocal Multipiece
Zeiss CT Lucia	Hydrophobic	Monofocal Single Piece
Bausch + Lomb Incise	Hydrophilic	Monofocal Single Piece
Zeiss CT Asphina	Hydrophobic / Hydrophilic	Monofocal Single Piece
Physiol A123	Hydrophilic	Monofocal Single Piece
AMO Sensar (Multipiece)	Hydrophobic / PMMA	Monofocal Multipiece
Aaren Scientific EC1	Hydrophobic	Monofocal Single Piece
AcrySof Toric	Hydrophobic	Monofocal Toric
Rayner T-Flex Toric	Hydrophilic	Monofocal Toric

Listed below is the supplied text for the IOL and the IOL category each has been allocated to.

AcrySof IQ SN60WF

- ACRYSERT C SN6CWS
- ACRYSOF® IQ INTRAOCULAR LENS
- ACRYSOF IQ ULTRASERT
- ACRYSOF IQ
- ACRYSOF IQ SN6CWS
- ACRYSOF NATURAL
- ALCON ACRYSOF IQ
- ALCON ACRYSOF IQ SN60WF (NATURAL)
- ALCON ACRYSOF IQ SN60WF ULTRASERT
- ALCON ACRYSOF IQ SN60WF
- ALCON IQ AIREDALE
- ALCON IQ (SN60WF/ULTRASERT)
- ALCON IQ SN60WF/AU00TO
- ALCON SN6CWS
- ALCON ULTRASERT ACU0T0
- AU00T0/SN60WF (OPTIMISED)
- SN60WF
- ULTRASERT AU00T0

Tecnis ZCB00

- ABBOTT TECNIS PCB00
- AMO PCB00
- AMO TECNIS ACRYLIC 1 PIECE
- AMO TECNIS 1 PCB00
- AMO TECNIS 1 ZCB00
- AMO TECNIS 1-PC ZCB00
- AMO TECNIS 1-PIECE

- AMO TECNIS 1-PIECE ZCB00
- AMO TECNIS PCB00
- AMO TECNIS ZCB00
- PCB00
- PCB00/ABBOTT
- TECNIS 1 ZCB00
- TECNIS PCB00

Akreos Adapt

- ADAPT AO B&L AKREOS
- ADAPT-AO
- AKREOS.A
- AKREOS ADAPT (INJECTABLE)
- AKREOS ADAPT AO
- AKREOS AO MI60
- B&L AKREOS ADAPT ADVANCED OPTICS
- B&L ADAPT AO
- B&L AKREOS ADAPT
- B&L AKREOS ADAPT AO
- B&L AKREOS ADAPT AO - OLD
- B&L AKREOS AO
- B&L AKREOS AO MI60
- B&L AKREOS MI60
- B&L AKREOS MICS
- B&L AKREOS MICS MI60
- B&L AKREOS MICS MI60 - OLD
- B&L MI60
- B&L MI60 IOL MASTER
- B&L MI60 ULTRASOUND

- BAUSCH & LOMB AKREOS ADAPT-AO
- BAUSCH&LOMB AKREOS ADAPT-AO
- BAUSCH & LOMB AKREOS AO60
- BAUSCH&LOMB AKREOS AO MI60
- MI60

AcrySof SA60AT

- ACRYSOF SA60AT (ALCON)
- ALCON A-SCAN SA60AT:A-SCAN
- ALCON ACRYSOF SA60AT
- ALCON SA60AT (+31 TO +40)
- ALCON SA60AT CLEAR
- SA60
- SA60AT
- SA60AT/ALCON

Rayner Hydrophilic IOL's

- 570C
- RAYNER - C-FLEX ASPHERIC
- RAYNER 970C
- RAYNER C-FLEX
- RAYNER C-FLEX 570C
- RAYNER C-FLEX 970C (HIGH D)
- RAYNER C-FLEX ASPHERIC
- RAYNER C-FLEX ASPHERIC 970C
- RAYNER C-FLEX ASPHERIC ADV970
- RAYNER CENTREFLEX
- RAYNER CENTREFLEX 570H
- RAYNER 620H
- RAYNER 920H

- RAYNER SUPERFLEX
- RAYNER SUPERFLEX 620H
- RAYNER SUPERFLEX 920H
- RAYNER SUPERFLEX 920H (LOW D)
- RAYNER SUPERFLEX ASPHERIC
- RAYNER SUPERFLEX ASPHERIC 920H
- RAYNER SUPERFLEX ASPHERIC C920H
- RAO600C
- RAYNER RAYONE
- RAYNER RAYONE ASPHERIC
- RAYNER RAYONE ASPHERIC RAO600C
- RAYONE ASPHERIC

Hoya ISERT

- 250
- HOYA
- HOYA 250
- HOYA 250 CLEAR
- HOYA 251 YELLOW
- HOYA AF-1 (UV)
- HOYA AF-1 (UY)
- HOYA AF-1 VA-60BB
- HOYA ASPHERIC YELLOW FY-60AD
- HOYA CLEAR VA-60BB NOT PRELOADED
- HOYA CLEAR YA-60BB
- HOYA ISERT 150 HYDROPHOBIC
- HOYA ISERT 250
- HOYA ISERT 251
- HOYA ISERT 254

- HOYA ISERT 254 HYDROPHOBIC ACRYLIC
- HOYA ISERT 255
- HOYA ISERT ONE PIECE
- HOYA ISERT PC-60AD
- HOYA ISERT PC-60AD (SULCUS)
- HOYA MODEL 250
- HOYA MODEL 251
- HOYA MODEL 254
- HOYA PC60AD
- HOYA PC/PY 60AD
- HOYA PS AF-1 PC60AD
- HOYA PS AF-1 PRE LOADED DEFAULT
- HOYA PY60AD (YELLOW PRE LOADED)
- HOYA VA60BB
- HOYA VA65BB
- HOYA YELLOW
- ISERT HOYA PRELOADED
- YELLOW AF-1 PRELOADED
- YELLOW HOYA YA-60BB

Lenstec Softec

- LENSTEC SOFTEC
- LENSTEC SOFTEC HD
- LENSTEC SOFTEC HD PLI
- LENSTEC SOFTEC HD3
- LENSTEC SOFTEC HDM
- LENSTEC SOFTEC HP1
- LENSTEC SOFTEC I
- LENSTEC SOFTEC III

- SOFTEC HD
- SOFTEC HD (SRKT)
- SOFTEC HP1
- SOFTECHD
- SOFTECHD3

Bausch + Lomb SofPort (Silicone)

- B&L L161AO IOL MASTER
- B&L L161AO ULTRASOUND
- B&L L161SE
- B&L LI61 SOFPORT AQ
- B&L LI61AO SOFPORT [SULCUS]
- B&L SOFLEX 2
- B&L SOFLEX LI61SE
- B&L SOFPORT
- B&L SOFPORT AO
- B&L SOFPORT AO LI61AO
- B&L SOFPORT LI61AO
- L161AO
- L161AOV
- SOFLEX SE L161SE

AcrySof MA60AC (Multipiece)

- ACRYSOF (OLD STOCK)MA60BM
- ACRYSOF EXPAND MA60MA
- ACRYSOF EXPAND MA60MA (+DIOPTRES)
- ALCON EXPAND SERIES
- ALCON ACRYSOF MA50BM - OLD
- ACRYSOF MA 60 MA
- ACRYSOF MA50BM (118.90)

- ACRYSOF MA60AC
- ACRYSOF MA60BM
- ALCON A-SCAN MA60AC:A-SCAN
- ALCON ACRYSOF (FROSTED) MA60AC
- ALCON ACRYSOF (FROSTED) MA60MA +DIOPTRES
- ALCON ACRYSOF MA50BM
- ALCON ACRYSOF MA60BM
- ALCON ACRYSOF MA60MA
- ALCON ACRYSOF MA60MA (EXPAND SERIES)
- ALCON ACRYSOF MA60MA (+DIOPTRES)
- ALCON ACRYSOF MA60MA (-DIOPTRES)
- ALCON ACRYSOF MA60MA +VE
- ALCON ACRYSOF MA60MA -VE
- ALCON ACRYSOF MN60MA
- ALCON ACRYSOF MA60AC
- ALCON MA60 MA (EXPAND SERIES)
- ALCON MA60AC
- ALCON MA60AC 3-PIECE (+6 TO +30)
- ALCON MA60MA (+DIOPTERS)
- ALCON MA60MA (-DIOPTERS)
- ALCON MA60MA (0 TO +5)
- ALCON MA60MA FOLDABLE
- ALCON MC50BD
- ALCON MC50BD PMMA
- MA50
- MA60AC
- MA60AC/ALCON
- MA60BM

- MA60BM MA60AC
- MA60MA
- MA60MA +VE DIOPTRES (OPTIMISED)
- ZALCON ACRYSOF MA60MA (+DIOPTRES)
- ZALCON ACRYSOF MA60MA (-DIOPTRES)

EYCEE ONE

- B&L EYECEE 1 NS-60YG (NOT PRE-LOADED)
- B&L EYECEE 1 SZ-1 (PRE-LOADED)
- B&L EYECEE ONE
- B&L EYECEE ONE CRYSTAL
- B&L EYECEE ONE PRELOADED
- B&L EZE 60
- B&L EZE-60 PMMA ECCE
- B&L EZE-65 PCIOL
- EYECEE ONE
- EYECEE ONE CRYSTAL
- EZE-70 STORZ 1 PIECE

Bausch + Lomb Envista MX60

- B&L ENVISTA TORIC MX60T
- B&L ENVISTA MX60
- B&L ENVISTA MX60T
- B&L MS60
- B&L MX60
- B&L MX60T
- MX 60 B+L

Tecnis Z9002 (Silicone)

- AMO TECNIS CL Z9002
- AMO TECNIS SILICONE Z9002
- AMO TECNIS Z9002
- AMO TECNIS Z9002 CL SILICONE IOL
- TECNIS CL Z9002
- TECNIS Z9002

Tecnis ZA9003 (Multipiece)

- AMO TECNIS 3 PIECE ZA9003
- AMO TECNIS ACRYLIC 3-PART LENS ZA9003
- AMO TECNIS Z9000
- AMO TECNIS ZA9003
- AMO ZA9003
- AMO ZA9003 TECNIS IOL
- TECNIS ACRYLIC IOL
- TECNIS ACRYLIC ZA9003
- ZA9003

Zeiss CT Lucia

- 601 MP PMMA
- 611P/PY
- CT LUCIA
- CT LUCIA 611
- ZEISS CT LUCIA
- ZEISS CT LUCIA 202
- ZEISS CT LUCIA 202 (OPTIMISED)
- ZEISS CT LUCIA 601P
- ZEISS CT LUCIA 601P/PY
- ZEISS CT LUCIA 611P

- ZEISS CT LUCIA 611P (OPTIMISED)
- ZEISS CT LUCIA 611P (NOMINAL)
- ZIESS CT LUCIA 611PY (YELLOW)
- ZEISS CT LUCIA 611P/PY
- ZEISS LUCIA
- ZEISS LUCIA 601 P/PY
- ZEISS LUCIA 611P
- ZEISS NEW CT LUCIA 611P/Y

Bausch + Lomb Incise

- B&L INCISE MJ14
- INCISE

Zeiss CT Asphina

- (ACRI.LYC 44LC)
- (ACRI.SMART 46LC)
- 409M (ACRI.SMART 46LC)
- ASPHINA 404
- CT ASPHINA
- CT ASPHINA 404
- ZEISS ASPHINA 409M
- ZEISS CT ASPHINA 404
- ZEISS CT ASPHINA 404 (ACRI.LYC 44LC)
- ZEISS CT ASPHINA 404 (MINUS & PLUS LENS)
- ZEISS ASPHINA 409 (SRK/T OPTIMISED)
- ZEISS CT ASPHINA 409M
- ZEISS CT ASPHINA 409M (ACRI.SMART 46LC)
- ZEISS CT ASPHINA 409MP

Physiol A123

- MICRO - A123
- MICRO - AY
- MICRO F
- PHYSIOL MICRO A 123
- PHYSIOL MICRO+ A 123
- PHYSIOL MICRO AY
- PHYSIOL MICRO+ AY 123
- PHYSIOL POLY A 123
- PHYSIOL POLY AY
- POLY - A123
- POLY - AY

AMO Sensar (Multipiece)

- AMO AR40 SENSAR
- AR40
- AR40E
- AMO SENSAR
- AMO SENSAR AR40
- AMO SENSAR AR40E
- AMO SENSAR AR40E ACRYLIC
- AMO SENSAR AR40M
- SENSAR AR40
- SENSOR AR40M

Aaren Scientific EC1

- AAREN SCIENTIFIC AC60
- AAREN SCIENTIFIC EC-1H PAL
- AAREN SCIENTIFIC EC-1R PAL
- AAREN SCIENTIFIC EC1

- AAREN SCIENTIFIC EC3

AcrySof Toric

- ACRYSOF IQ TORIC SN6AT
- ACRYSOF TORIC
- ACRYSOF TORIC SN60T3
- ACRYSOF TORIC SN60T4
- ACRYSOF TORIC SN60T5
- ACRYSOF TORIC SN60T6
- ACRYSOF TORIC SN60T7
- ACRYSOF TORIC SN60T8
- ACRYSOF TORIC SN60T9
- ALCON ACRYSOF IQ SN6AT4
- ALCON ACRYSOF IQ SN6AT5
- ALCON ACRYSOF IQ SN6AT6
- ALCON ACRYSOF IQ SN6AT7
- ALCON ACRYSOF IQ SN6AT8
- ALCON ACRYSOF IQ SN6AT9
- ALCON ACRYSOF IQ TORIC SN6AT(2-9)
- ALCON ACRYSOF IQ TORIC SN6AT3-9
- ALCON ACRYSOF IQ TORIC SN6AT4
- ALCON ACRYSOF IQ TORIC SN6AT5
- ALCON ACRYSOF IQ TORIC SN6AT6
- ALCON ACRYSOF IQ TORIC SN6AT7
- ALCON ACRYSOF IQ TORIC SN6AT8
- ALCON ACRYSOF IQ TORIC SN6AT9
- ALCON ACRYSOF TORIC SN60T
- ALCON ACRYSOF SN60AT
- ALCON SN60 TORIC

- ALCON SN6AD1
- ALCON SN6AT2-9
- ALCON TORIC SN6AT
- ALCON TORIC SN6AT(2-9)
- NATURAL SN 60 AT
- SN6AT2
- SN6AT3
- SN6AT4
- SN6AT5
- SN6AT6
- SN6AT7
- SN6AT8
- SN6AT9
- SN6AT9 ACRYSOF IQ TORIC
- SN6AT9 TORIC
- SN60AT
- SN60T8
- SN60WS
- SN6AD1
- SN6AT2 6.0 - 30.0D TORIC
- SN6AT3 6.0 - 30.0D TORIC
- SN6AT4 6.0 - 30.0D TORIC
- SN6AT5 6.0 - 30.0D TORIC
- SN6AT6 6.0 - 30.0D TORIC
- SN6AT7 6.0 - 30.0D TORIC
- SN6AT8 6.0 - 30.0D TORIC
- SN6AT9 6.0 - 30.0D TORIC

Rayner T-Flex Toric

- RAYNER 623T
- RAYNER CENTERFLEX TORIC IOL
- RAYNER RAYONE TORIC
- RAYNER T - TORIC
- RAYNER T FLEX 623T STD
- RAYNER T FLEX TORIC 623T
- RAYNER T-FLEX
- RAYNER T FLEX 623T
- RAYNER T-FLEX (TORIC LENS)
- RAYNER T-FLEX 573T
- RAYNER T-FLEX 573T (TORIC)
- RAYNER T-FLEX 623T
- RAYNER T-FLEX 623T STD
- RAYNER T-FLEX ASPHERIC
- RAYNER T-FLEX ASPHERIC 573T
- RAYNER T-FLEX TORIC
- RAYNER T-FLEX TORIC ASPHERIC
- RAYNER TORIC
- RAYNER TORIC 623T
- T-FLEX

The following two IOL model groups are not included in this current analysis due to <1,000 eligible operations with these recorded, and many of these have been recorded in the latter part of the study time period. It is possible that in a future update of this analysis with more recently performed operations, that these groups would have sufficient numbers for inclusion.

AcrySof IQ SA60WF – (IOL material = Hydrophobic, IOL type = Monofocal Single Piece)

- ALCON ACRYSOF IQ SA60WF
- ALCON ACRYSOF IQ SA60WF CLEAR
- ALCON SA60WF
- ALCON SA60WF STANDARD (+6 TO +30)
- ACU0T0/SA60WF (OPTIMISED)
- ACU0T0/SA60WF ALCON ACRYSOF (NOMINAL)
- SA60WF

Lentis Mplus/Tplus LS-313 – (IOL material = Hydrophobic / Hydrophilic, IOL type = Multifocal Toric)

- LENTIS L-313
- LENTIS MPLUS
- LENTIS MPLUS LS-313 MF15
- LENTIS MPLUS LS-313 MF20
- LENTIS MPLUS LS-313 MF30
- LENTIS MPLUS LS-313 PLATE HAPTIC
- LENTIS MPLUS TORIC LS-313 MF20T
- LENTIS MPLUS TORIC LU-313
- LENTIS MPLUS TORIC LU-313 MF30T
- LENTIS TPLUS LS-313 T1
- LENTIS TPLUS LS-313 T1-T6
- LENTIS TPLUS LS-313 T2
- LENTIS TPLUS LS-313 T3
- MPLUS
- OCULENTIS L-313
- OCULENTIS M-PLUS MF20/30

Unmatchable IOL's

Unsure – Clariflex/Superflex

- CLARIFLEX
- CLARIFLEX/SUPERFLEX
- RAYNER CLARIFLEX/SUPERFLEX

Note the Unsure – Clariflex/Superflex group is excluded from analysis due to the vague nature of the IOL model specification and the majority of instances when recorded being in one centre on a historic database that has not data recorded since November 2016. All data from this site is excluded along with operative records from elsewhere with these IOL models recorded.

The following supplied IOL's are the IOL models that could not be matched to the analysis IOL model categories. These should be reviewed in any future analysis with more recently performed operations, as it is possible that the frequency of use could increase to the extent that analysable groups could be created.

Not Matched

- 118.00 ST
- 118.4 YHA
- 119.0 OLD KS
- 119.4
- 6842B
- 85F
- 911A (AMO)
- 91A
- AARIS
- A/C LENS
- AC IOL
- AC IOL MTA3U0 ALCON
- AC IOL STORZ L122UV
- AC51L
- AC51L (AMO)
- ACR6D
- ACR6D (3)

- ACR6DSE
- ACR6D SE (4)
- ACRI.SIL 73N <25MM
- ACRILISA 117.8
- ACRIVA MFM 611
- AJL RIGID IOL A601250
- ALCON A-SCAN ACIOL:A-SCAN
- ALCON A/C LENS
- ALCON AC
- ALCON AC (OLD)
- ALCON ACRYSOF
- ALCON ACRYSOF IQ RESTOR
- ALCON ACRYSOF IQ RESTOR MULTIFOCAL TORIC
- ALCON ACRYSOF MA30AC
- ALCON ACRYSOF MA30AC ‘FOLDABLE’
- ALCON ACRYSOF MTA3/4U0
- ALCON ACRYSOF RESTOR SA60D3
- ALCON CLAREON
- ALCON CLAREON CNA0T0
- ALCON CLAREON SY60WF
- ALCON CR70BU
- ALCON CZ70BD
- ALCON EXPAND MZ60PD
- ALCON EXPAND PMMA MZ60PD
- ALCON IQ LENS
- ALCON MA30BA
- ALCON MTA 3
- ALCON MTA 4

- ALCON MTA 4U0
- ALCON MTA 5
- ALCON MTA ACIOL
- ALCON MTA-U0
- ALCON MTA3U0 AC IOL
- ALCON MTA3UO
- ALCON MTA4U0 AC IOL
- ALCON MTA4UO
- ALCON MTA5UO
- ALCON MTA5UO AC IOL
- ALCON MZ30BD
- ALCON MZ60BD
- ALCON MZ60MD
- ALCON PANOPTIX
- ALCON PMMA CZ70BD
- ALCON PMMA MZ60BD
- ALCON SA30AL
- ALCON SUTURE IOL CZ70BD (118.8)
- AMO AC51L
- AMO AC51L AC IOL (114.5)
- AMO ACIOL
- AMO APHAKIC INTRAOCULAR LENS
- AMO CLARIFLEX
- AMO CLARIFLEX CLRFLXB
- AMO DL60
- AMO DURALENS II AC51L
- AMO DURALENS II DL60
- AMO DURALENS II DL60 - OLD

- AMO DURALENS II MODEL 60
- AMO DURALENSII AC
- AMO HSM60
- AMO NXG1
- AMO REZOOM
- AMO REZOOM NXG1
- AMO SI40NB
- AMO TECNIS MONOFOCAL
- AMO TECNIS MULTIFOCAL ASPHERIC
- AMO TECNIS MULTIFOCAL ZMB00
- AMO TECNIS SYMFONY TORIC ZXT
- AMO TECNIS SYMFONY ZXR00
- AMO TECNIS TORIC MULTIFOCAL ZMT00
- AMO TECNIS TORIC ZCT
- AMO TECNIS TORIC ZCT1
- AMO TECNIS TORIC ZCT150
- AMO TECNIS TORIC ZCT225
- AMO TECNIS TORIC ZCT300
- AMO TECNIS TORIC ZCT375
- AMO TECNIS TORIC ZCT400
- AMO TECNIS TORIC ZCT450
- AMO TECNIS TORIC ZCT525
- AMO TECNIS TORIC ZCT600
- AMO TECNIS TORIC ZCT700
- AMO TECNIS TORIC ZCT800
- AMO TECNIS ZKB00
- AMO TECNIS ZLB00
- AMO VERISEYE APHAKIC

- AMO VERISYSE 50 APH.RETROPUP
- AMO VERISYSE APHAKIC
- AMO VERISYSE APHAKIC RETROPUP.
- AMO VERISYSE APHAKIC VRSA54"
- AMO VERISYSE APHAKIC VRSA54 RETROPUP
- ARIS
- ARTISAN
- ARTISAN (SULCUS)
- ARTISAN 205 ANTERIOR
- ARTISAN 205 POSTERIOR
- ARTISAN 205 RETROPUP
- ARTISAN AC 205
- ARTISAN APHAKIA
- ARTISAN APHAKIA – AC
- ARTISAN APHAKIA RETROPUPILLARY
- ARTISAN IRIS CLIP
- ASPIRA
- AT 809M
- AT LISA TORIC 909M
- AT LISA TRI 839MP
- AT LISA TRI TORIC 939
- AT LISA TRIFOCAL
- AT TORBI 709M
- AT TORBI 709MP
- B & L H60M
- B&L (PMMA) AC LENS L122 UV
- B&L (PMMA) AC LENS S122 UV
- B&L AC IOL

- B&L AC IOL L122UV
- B&L AC IOL S122UV
- B&L AKREOS FIT
- B&L FOCUSFORCE ASPHERIC AS60
- B&L L122UV
- B&L L122UV AC LENS
- B&L L122UV ACIOL
- B&L S122 UK
- B&L S122UV
- B&L TEK-LENS
- B&L VERSARIO
- B&L VERSARIO CLASSIC
- BAUSCH AND LOMB
- CANONSTAAR KS-3I
- CANONSTAAR KS-I ASPHERIC PRELOADED
- CARLEVALE IOL
- CORNEAL QUATRIX
- CROMA EYE-CEE ONE
- CROMA EYE-CEE ONE – TRIAL
- CROMA QUATRIX ASPHERIQUE EVOLUTIVE
- CROMA VERSARIO
- CRYSTAL (ACCOM)
- CRYSTALENS AO
- CRYSTALENS HD
- CT13A
- CT13A ANTERIOR CHAMBER
- CTR: LR-1400
- CUTTING EDGE SYNTHESIS

- CZ70BD
- CZ70BD AC NON-FOLDABLE SUTURED
- D STAAR
- EC-3
- EXETER LENS
- FOCUS FORCE
- H60M
- HAIGIS
- HD
- HSM60 (AMO)
- HUMAN OPTICS 1CU
- HUMAN OPTICS ASPIRA -AA
- HUMAN OPTICS MARFAN
- HUMAN OPTICS MPVK400
- HUMANOPTICS AKKOMM PC ACRYLIC
- ICL
- KESTREL SYNTHESIS
- L-302-1
- L122UV
- LA-AC IOL
- LENSTEC LA-501
- LENSTEC LA-501 12.5MM
- LENSTEC LA-502
- LENSTEC LA-502 13.0MM
- LENSTEC LH-3000
- LENSTEC LOW D
- LENSTEC LS-106
- LENSTEC SBL-3 DUAL OPTIC

- LENSTEC TETRAFLEX
- LENSTEC TETRAFLEX HD
- LENSTEC TETRAFLEX KH3500
- LENTIS
- LENTIS COMFORT
- LENTIS L-312
- LENTIS - MF20
- LH1000
- LS3112 MULTIFOCAL
- MA30AC/ALCON
- MC50BD PC ECCE
- MEDICONTUR 91A (10 TO 34 D)
- MEDICONTUR BI-FLEX 677ABY (+VE)
- MEDICONTUR Z-FLEX 690AB (+VE)
- MEDICONTUR Z-FLEX 690AB (NEGATIVE RANGE)
- MICROSIL TORIC PC IOL
- MISS HOLLICK 103.8
- MORCHER
- MORCHER ANIRIDIA TYPE 68
- MORCHER TYPE 68
- MORCHER TYPE 90S
- MORCHER TYPE 67
- MPVK 400 AC IOL
- MTA3U0
- MTA3U0 AC LENS
- MTA4U0
- MTAU
- MZ60PD AC FOLDABLE

- OPHTEC 310
- OPHTEC AC260T
- OPHTEC ARTISAN
- OPHTEC ARTISAN 205
- OPHTEC ARTISAN 205 APHAKIA AC
- OPHTEC ARTISAN 205 APHAKIA RETROPUPILLARY
- OPHTEC ARTISAN 205 BACK
- OPHTEC ARTISAN AC 205
- OPHTEC ARTISAN AC 205 (ANTERIOR)
- OPHTEC ARTISAN AC 205 (POSTERIOR)
- OPHTEC ARTISAN APHAKIA
- OPHTEC ARTISAN APHAKIA 205
- OPHTEC ARTISAN APHAKIA AC 205 RETROPUP
- OPHTEC PRECIZON 565
- OPHTEC PRECIZION TORIC
- OPHTEC PRECIZON TORIC 565
- OPHTEC PRECIZON TORIC (OLD)
- PC-60AD (CLEAR PRE-LOADED)
- PHYSIOL FINEVISION HP POD F GF
- PHYSIOL SLIMFLEX
- PMMA
- POLYTECH EC-1
- POLYTECH EC-1 HPI
- PRECISION TORIC MODEL 565
- QUATRIX
- QUATRO
- RAYONE HYDROPHOBIC
- RAYNER

- RAYNER 276U
- RAYNER 600S
- RAYNER 604A
- RAYNER 752U
- RAYNER 755U
- RAYNER 870U
- RAYNER 870U AC
- RAYNER AC IOL
- RAYNER M-FLEX 630F
- RAYNER M-FLEX 630N
- RAYNER PMMA
- RAYNER PMMA 752U
- RAYNER SULCOFLEX ASPHERIC 653L
- RAYNER TEK-LENS
- RESTOR
- RESTOR ALCON
- S140 NB (ALLERGAN)
- SA60WF/SN60WF
- SLIMFLEX
- SRK/T
- STAAR KS-3AI
- STORZ S122UV
- (SULCUS)
- SYMFONY AMO
- TECNIC ITEC
- TECNIS CL
- TECNIS SYMFONY MULTIFOCAL
- TECNIS TORIC-IOLM

- TECNIS TORIC-U/SOUND
- TECNIS ZMA00
- TEKIA TEK-LENS II 618
- TEKIA TEK-LENS II 6118
- THE LENS - IC-8
- TORIC AMO TECNIS ZCT
- TORIC IOL MICROSIL MS6116TU (KESTREL)
- TORIC LENS ISERT MODEL 351
- TRIAL AAREN IOL
- US IOL 860 UV
- VERISYSE VRSH50W
- VERSARIO
- VERSARIO P33D
- VISION MATRIX 677P
- VISION MATRIX ARTISAN
- VISION MATRIX BI-FLEX 877FAB
- Z-FLEX
- Z-FLEX (NEGATIVE RANGE)
- Z-FLEX POSITIVE
- ZCT 150 TORIC
- ZCT 200 TORIC
- ZCT 300 TORIC
- ZCT 400 TORIC
- ZEISS
- ZEISS AT TORBI 709M
- ZEISS CT 13A
- ZEISS CT 53N
- ZEISS CT53N IOL

- ZEISS EC3 (SULCUS)
- ZEISS TORIC AT TORBI 709M
- ZEISS ZEISS CT13A
- ZEISS ZEISS EC3 (SULCUS)
- ZKB00
- ZLB00
- ZMB00
- ZMT00 TORIC MULTIFOCAL
- ZXR00
- ZXR00 SYMFONY TECNIS

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