

National Ophthalmology Database Audit

Year 4 Annual Report – The Third Prospective Report
of the National Ophthalmology Database Audit

NHS Funded Cataract Surgery:
01 September 2017 to 31 August 2018

2019

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Date: May 2019

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Foreword

*“The time has come for everyone in the NHS to take clinical audit very seriously”
Dame Deirdre Hine and Sir Michael Rawlins 2002*

The need for clinical audit in the NHS was dramatically illustrated by the Kennedy inquiry into children’s heart surgery in Bristol. Following its publication in 2001, it became no longer acceptable, if it ever was, for doctors to presume that they were delivering high quality care. The Royal College of Ophthalmologists’ National Ophthalmology Database Audit (RCOphth NOD) demonstrates how systematic, repeated national audits can be a driver for change both at an individual surgeon and department level, leading to improved outcomes and enhanced patient safety.

This third prospective RCOphth NOD National Cataract Audit report, reviewed data from 217,875 cataract operations performed at 83 NHS Trusts in England and Wales and 18 independent treatment centres. No poorly performing hospitals or surgeons were identified. There was a further fall in the unadjusted posterior capsule rupture rate to 1.2%, down from 1.4% last year and 2.0% since data was first collected in 2010. This represents a major reduction in the number of people living with the consequences of cataract surgery complications, and a significant cost saving to the NHS.

The RCOphth NOD National Cataract Audit has now established itself as an essential tool for monitoring the quality of work of cataract surgeons. Previously published feasibility studies have shown that the scope of the RCOphth NOD Audit could be expanded to include other eye diseases such as age-related macular degeneration, retinal detachment and glaucoma. An NHS ophthalmology service underpinned by such an audit would give patients great confidence in their local eye department. It would also provide huge opportunities for clinical research.

For the last five years the RCOphth NOD Audit has been commissioned by the Healthcare Quality Improvement Partnership (HQIP) and funded by NHS England and the Welsh Government. This high-level support has greatly enhanced the scope and quality of the audit. Going forward, every effort will be made to attain financial sustainability of the NOD and the continuation of the delivery of benefits to people with eye diseases and savings to the NHS.

On behalf of College members, I would like to thank Professor John Sparrow and his team, Kathy Evans, Beth Barnes, Paul Donachie, Martina Olaitan, Lynne Sander and Peter Scanlon for the huge amount of work they have put into the production of this report.



Mr Michael Burdon

President, The Royal College of Ophthalmologists

Executive Summary

Background

Cataract surgery remains the most frequently undertaken NHS surgical procedure with approximately 414,000 cataract operations undertaken in England and 20,000 in Wales during 2017-2018. The Health Quality Improvement Partnership (HQIP) commissioned The Royal College of Ophthalmologists' National Ophthalmology Database (RCOphth NOD) to conduct the National Cataract Audit, in order to report on all NHS funded cataract surgery in England and Wales. The annual cost of cataract surgery to the NHS is estimated at around £450 million.

Aims of the audit

The current report documents prospectively collected cataract surgery data and reports results for named NHS centres. These include operations performed and recorded by all surgeons of all grades within centres. Outcomes for named consultant surgeons will be separately published on the NHS Choices and the RCOphth NOD Audit websites through the Clinical Outcomes Publication (COP) programme.

Audit measures

Two primary indicators of surgical quality are audited. These are, firstly, a complication that happens during surgery when the capsule that holds the lens is broken (the index surgical intraoperative complication of significant breach of the lens-zonule barrier through rupture of the posterior lens capsule or vitreous prolapse or both, abbreviated as PCR), and secondly Visual Acuity (VA) Loss (doubling or worse of the visual angle) related to surgery. These outcomes are presented as risk adjusted rates for centres, supported by relevant contextual information including surgical volumes, data completeness, case complexity, access to surgery and deprivation. The overall rates of 1.1% for PCR and 0.9% for VA Loss are based on the average rates for consultant surgeons. The risk indicators for

each of these adverse events were derived from earlier data collections. Case complexity is known to be an important determinant of outcome and a case complexity index is included to document the complexity of surgery being recorded. The vast majority of data were obtained through extraction from Electronic Medical Record (EMR) systems, with a small number of centres choosing to submit data from their pre-existing audit databases.

Posterior Capsule Rupture - PCR

As an adverse operative event PCR is relevant because it results in a significantly higher risk of harm to the eye and may impact recovery of vision. For example, there is an approximately 40-fold higher risk of a retinal detachment occurring following cataract surgery if PCR occurred. Retinal surgery, to correct the detachment, imposes additional risks, morbidity and cost.

Visual Acuity Loss – VA Loss

Since VA Loss from surgery is the opposite of the intended effect, these key primary outcomes together capture relevant safety elements of surgical quality. Determination of VA Loss depends on availability of VA measurements at both pre- and postoperative time points. Rates of missing VA data are thus important and are reported for centres.

The audit is intended to quality assure NHS cataract surgical services for patients whose vision is adversely affected by cataract to the point where they seek surgical intervention. Should performance fall short of what can reasonably be expected by NHS patients this will be highlighted. In addition, the audit serves as a powerful driver of quality improvement with year on year reductions in complication rates as evidenced in our series of annual reports available at www.nodaudit.org.uk

Results

Since the original proof of concept of a national cataract audit in 2010, there has been a 38% reduction in PCR complications in cataract surgery, (Table 1, page 7) equating to approximately 3,400 fewer complications annually across the NHS.

Participation

Included in this third prospective report are **operations undertaken between 01 September 2017 and 31 August 2018**. Reported operations for the current period were performed in 79 English and four Welsh NHS Trusts.



Approximately 70% of the 119 eligible NHS trusts in England and Wales are thus represented. In addition, three independent providers of NHS funded cataract surgery have supplied data for 18 individual sites. The audit received data

for 232,083 cataract operations which equates to approximately 53% of operations performed in England and Wales during the audit period. The lower overall percentage of operations compared with the percentage of trusts is mainly due to recent joiners reporting partial years.

Around 6% of cataract operations were excluded for a variety of reasons such as being done for



217,875

indications other than visual improvement or being combined with other significant intraocular surgery; **this left 217,875 eligible cataract operations available for analysis.**

Data Quality

Data completeness was excellent (around 100%) for the PCR outcome as this is a compulsory operative field in the EMRs.

An eligible preoperative distance VA was recorded for 91.9% of eyes and a postoperative VA for 76.0% of eyes; 72.1% of eyes had both a preoperative and a postoperative VA

measurement. There was significant variation between centres for completeness of VA data, reflecting variations in EMR use and patient pathways.

Findings

Overall, the audit findings are favourable indicating high quality surgery is being delivered to NHS patients. Specifically, among the contributors, no outlying centres or surgeons have been identified.

For all surgeons, 1.2% of operations were affected by PCR, slightly above the current consultant only based average rate of 1.1% used for risk adjustment.

A 'good' postoperative VA of 0.30 LogMAR (=6/12, required to drive) or better was achieved in 90.6% of eyes overall, 95.8% of eyes with no ocular co-pathology and 83.8% of eyes with a recorded co-pathology. The median preoperative VA was 0.50 LogMAR units (6/19 Snellen Equivalent); the median postoperative VA was 0.10 LogMAR units (6/7.5 Snellen); and the median change in VA was a 0.36 LogMAR gain.

Overall the VA Loss rate was 0.7%, close to the 0.9% rate used for risk adjustment and approximately 37% lower than in 2010. The samples used for the VA Loss results are smaller than those used for the PCR results due to missing presenting (pre-) and / or postoperative VA measurements as well as a shorter time period of 10 months to cater for postoperative recovery and VA reporting.

Conclusions

The findings are reassuring for the 101 participating centres. Whilst the audit can report on encouragingly large numbers of procedures, there remain a minority of centres that have not yet joined the audit (Appendix 3, page 34). Until all centres join there will remain uncertainty about outcomes overall. Many of the non-contributing centres have, however, indicated they recognise the value, quality assurance and quality improvement opportunities afforded by participation in the audit and wish to join in future audit cycles.

Table 1: Audit estimates for different years where each year represents the time period of 01 September to 31 August

	Prior to the prospective audit period					Prospective audit period		
	2010	2011	2012	2013	2014 (Legacy)	2015 (Year 1)	2016 (Year 2)	2017 (Year 3)
Number of centres	31	33	33	33	36	51	82	101
Number of eligible operations	60,449	73,777	78,959	84,360	85,877	122,757	182,758	217,875
Case ascertainment (%)*	–	–	–	–	–	84.4	85.7	84.5
Unadjusted PCR rate (%)	2.0	1.8	1.7	1.5	1.6	1.4	1.4	1.2
The percentage with valid preoperative VA data	95.0	94.8	94.6	94.5	94.6	92.1	91.6	91.9
Number of operations for postoperative VA results	50,008	60,944	65,406	69,973	71,272	96,974	148,246	177,380
The percentage with valid postoperative VA data	68.7	70.5	73.2	75.7	76.6	75.0	75.7	76.0
The percentage with change in VA data	65.5	67.3	69.9	72.1	73.2	71.6	71.7	72.0
Unadjusted VA loss rate (%)	1.0	1.0	1.0	0.9	0.8	0.7	0.7	0.7

Over the time period above, not all centres have contributed data in consecutive data extractions and some centres have merged. The first 5 years include the early EMR adopting centres, while the prospective audit years will include centres initiating data collection and not always submitting data for a complete year. *The estimate of the proportion of cases submitted to the audit is derived from the number of completed cataract operations supplied to NHS Digital or NWIS for the audit period. This estimation uses a pro rata calculation for a centre's denominator where the proportion of time during the audit cycle that a centre had been recording cataract operations was multiplied by the number of cataract operations supplied to NHS Digital or NWIS. The numerator was the number of operations a centre had supplied to the audit. Centres that had more operations submitted to the national audit than in the NHS Digital or NWIS data were all assumed to have a complete submission rate as the actual rate was not possible to estimate. The case ascertainment rates for the retrospective audit years have not been estimated as the audit was not receiving the NHS Digital or NWIS data for these years.

Recommendations

1. Recommendations for Patients



1.1 Patients, carers and those with an interest in cataract surgery are encouraged to access information about the quality of cataract surgery and their local services, and can view information online on the [National Ophthalmology Database Audit website](#), the [HQIP website](#) and the [NHS Choices website](#) (page 29, Summary Key Point 2, 5)

1.2 Patients should discuss and understand the risks and potential outcomes of any eye surgery with their surgeon

1.3 Patients interested in finding out more about cataract surgery, should access information online from their hospital trusts and health boards, as well as from charity organisations such as [Royal National Institute of Blind People](#) (RNIB)

2. Recommendations for Providers of cataract surgery



2.1 All providers of NHS cataract surgery should submit data to the audit to publicly demonstrate their commitment to high quality care and good professional practice through participation. Reviewing information and actioning requests sent by the audit provider will allow for ongoing participation in the audit (page 29, Summary Key Point 1)

2.2 Providers should submit complete data to ensure all relevant risk factors required to give credit for case complexity can be taken into account ([UK Minimum Cataract Dataset for National Audit](#)) (page 29, Summary Key Point 8)

2.3 In line with the NHS digital agenda, providers should use electronic data collection to improve data completeness and utilise EMR audit tools for continuous real time monitoring of results for early detection

and correction of possible issues (page 29, Summary Key Point 9)

2.4 Providers should review patient pathways to maximise the recording of both preoperative and postoperative VA data for every operation (page 29, Summary Key Point 7)

2.5 Providers should use the audit for quality improvement by comparing their results against other surgery providers and their past performance to identify and act on specific areas that may need improvement (page 29, Summary Key Point 5)

2.6 Providers should consider including Patient Reported Outcome Measures (PROMs) before and after surgery to quantify and validate patient benefit from surgery, as advised in the 2019 [NICE Quality standard for serious eye disorders \(QS180\)](#)

3. Recommendations for Commissioners



3.1 Service specification contracts should require quality assurance and improvement based on national audit outcomes and the 2017 [NICE cataract surgery guideline \(NG77\)](#) for management of cataracts in adults (page 29, Summary Key Point 4)

3.2 Commissioners should establish quality focused service specification contracts with providers which include submission of full data to the RCOphth NOD Audit, including pre- and postoperative VA for visual outcomes reporting (pages 29, Summary Key Points 1, 2, 6, 7, 8)

4. Recommendations for the Regulator



4.1 Regulators should expect NHS services to participate in national audits, with audit results made available to them when inspecting NHS organisations which either commission or deliver cataract surgery services (page 29, Summary Key Points 1, 6)

4.2 Regulators should ensure that all providers of care are positioned to provide quality assurance regardless of whether they are traditional NHS centres or independent providers (page 29, Summary Key Point 1)

1. Introduction

A cataract is a clouding of the lens in the eye. The lens 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 one or more 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 drops that can successfully treat cataracts; surgery is the only way to treat them. Information for patients and the public on cataracts is available on [The Royal College of Ophthalmologists'](#) website.

In the 2017-2018 NHS year, around 414,000 NHS cataract surgery procedures were undertaken in England and 20,000 in Wales. Cataract surgery is the most frequently performed surgical procedure in the UK. A widely accepted indicator of surgical quality is the frequency of significant breach of the lens-zonule barrier through posterior capsule rupture with or without vitreous prolapse, or zonule rupture with vitreous prolapse, events abbreviated here as PCR.

PCR is emphasised in the [NICE cataract surgery guideline \(NG77\)](#) in the context of surgical risk and is similarly used as a clinical outcome (adverse event) by the [International Consortium for Health Outcome Measurement \(ICHOM\)](#). This operative complication arises on average in approximately one operation in 80, but the risk of this event varies by as much as fifty-fold depending on preoperative risk factors associated with the patient (e.g. age) and their eye (e.g. how advanced the cataract is).

PCR is relevant as an adverse operative event because it results in a significantly higher risk of harm to the eye and may impact recovery of vision. For example, there is an approximately forty-fold higher risk of a retinal detachment occurring following cataract surgery if PCR occurred, and retinal surgery imposes additional risks, morbidity and cost. Importantly, when PCR occurs there is a six-fold higher chance of loss of vision from pre- to postoperatively in the eye undergoing surgery.

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. The results of this follow-up episode are currently inconsistently communicated back to the hospital to allow a definitive measure of visual acuity (VA) benefit from surgery. A web-based data return tool has been developed and initially offered as a free EMR software enhancement to audit centres to encourage and facilitate these data returns. Since VA Loss from surgery is the opposite of the intended effect, these key primary outcomes together capture relevant safety elements of surgical quality. VA Loss is emphasised in the [NICE cataract surgery guideline \(NG77\)](#) in the context of surgical risk.

Providing risk adjusted results for centres and surgeons enables them to benchmark their own performance against their peers and acts as a prompt to reviewing practice where outcomes are less good. Our experience indicates that showing individual surgeons their performance stimulates them to be more mindful of quality generally and to improve performance where needed.

Since safety is a key domain for the NHS, embodied in the oft quoted phrase from the Hippocratic Oath "First, do no harm", the audit is primarily focused on two chosen safety metrics. The EMR audit tools provided through the audit allow for real time local tracking of outcomes by surgeons and centres. This empowers them to monitor their results locally and to detect adverse signals early with a view to minimising patient harm through prompt action. The report includes additional contextual information which provides centres, surgeons and the wider NHS with secondary outcomes in terms of case complexity, access to surgery by centre and deprivation, and data completeness.

In the RCOphth NOD prospective cataract audit reports we show the case complexity adjusted rates of PCR and monocular visual acuity (VA) Loss for named centres (including all surgeons). On the RCOphth NOD website we present case complexity adjusted rates of PCR and VA Loss for participating centres and surgeons, and on the NHS Choices website will be risk adjusted outcomes for named consultant surgeons for both PCR and VA Loss. Incomplete data will be highlighted and where <40% of outcome data are available for a particular centre (e.g. for VA Loss) the rate will not be reported as deemed too unreliable.

2. Audit Framework

The National Cataract Audit data in this report covers all adult phacoemulsification cataract surgical operations recorded on:

- Medisoft EMR in use at 86 contributing centres
- OpenEyes EMR in use at three centres
- Medisoft and OpenEyes EMR used in one centre
- Epic patient record system in one centre
- In-house cataract data collection systems used in ten contributing centres

For the PCR outcome, the audit included all reported cataract operations performed in the period between 01 September 2017 and 31 August 2018. For the risk adjusted VA Loss outcome and postoperative complications and visual acuity results the reported period was between 01 September 2017 and 30 June 2018 in order to allow time for postoperative data to become available following recovery from surgery.

Excluded were:

- Cataract operations not done by phacoemulsification
- Operations done as combined procedures along with another significant intraocular procedure (e.g. a trabeculectomy or a pars plana vitrectomy combined with other vitreoretinal procedures)
- Operations done on eyes previously damaged by ocular trauma
- Operations done on eyes with significant congenital or developmental abnormalities
- Operations on individuals aged <18 years

Centres are identified by name and number in tables and graphical presentations.

3. Aims

This audit reports risk-adjusted rates for two primary patient safety outcomes: PCR and VA Loss in cataract surgery. PCR will have high levels of completeness for all participating centres as recording of the absence or presence of specified operative complications is mandatory in ophthalmology EMR systems. The preoperative risk indicator and follow up VA data are, however, expected to be less complete because of variations in patient pathways and use of the EMR in different settings.

The quality improvement aims of this report include:

- Reporting of the intraoperative risk adjusted complication rates, emphasising the need for careful risk profiling of cases in advance of surgery to anticipate and minimise avoidable surgical complications
- Reporting the rates of VA Loss, highlighting potentially avoidable visual harm where unwarranted variation is observed

There are several secondary aims developed throughout the life of the audit, for example the contextual information includes: case complexity metrics, rates of recorded valid VA data and access (preoperative VA) by centre and overall by deprivation.

4. NHS Trust / Health Board and Surgeon Participation

The audit brief is to include all NHS funded cataract surgery in England and Wales where Caldicott Guardians and Clinical Leads have given permission for inclusion of their data. In this report, the majority of centres were in England (97) with four centres in Wales. This report includes 91 currently EMR enabled centres and ten centres using an in-house data collection system. Of the 119 eligible NHS trusts, 83 (69.7%) NHS trusts are represented, plus data from three independent sector treatment providers of NHS funded services (18 sites). Results for 101 centres are reported.

5. Methodology

5.1 Context of the data collection

The audit data derive from routine data collection in NHS ophthalmology departments with no additional data collection effort required by NHS staff. Our approach aligns directly with, and powerfully supports, the NHS digital agenda and has catalysed a major shift towards electronic working in cataract services. Since the start of the HQIP commissioned period in 2014 the NOD Audit has driven an increase in the number of centres working electronically from around 30 to >100. Complications data depend on surgeons recording these faithfully. Unlike mortality figures there is no external validation of the reported complications, although cross-checks are undertaken within the extracted data.

The EMR requires the surgeon recording the operation note to specifically indicate a 'Yes / No' response to whether a surgical complication occurred. At all centres the EMR record (or its printed copy for the paper notes) constitutes the medicolegal document of the patient's operation record.

Data completeness for other aspects of care varies between centres for several reasons. Some centres only use the electronic data collection system in theatre which limits data completeness for items normally collected in the outpatient department at pre- and postoperative visits. Accurate follow up data on VA and refraction mostly depend on patients attending their optometrist for updating of spectacles following surgery and for this information to then be returned to the hospital EMR system. Although some centres have good paper-based systems in place for optometrists to return postoperative VA and refraction measurements, and for staff at the hospital to enter the data electronically, it is to be expected that this VA outcome will be incomplete in many centres. The NOD Audit team has taken steps to enhance returns from optometrists through encouraging proactive local engagement with community optometrists, an active programme of engagement with national optometric professional bodies, and provision of a web-based data return tool for the National Cataract Audit.

5.2 Case ascertainment

An estimate of the percentage of cataract operations submitted to the audit is based on the number reported centrally to NHS Digital or NHS Wales Informatics Service (NWIS). This is calculated pro rata for recent joiners, as reported in Appendix 6 (page 41).

As the National Cataract Audit has exclusion criteria, the estimate of case ascertainment is calculated using the number of operations submitted to the audit before the exclusion criteria are applied.

5.3 Data quality and completeness

Among the advantages of EMR data collection are compulsory collection of key data items (e.g. operative complications) and automatic range checking of variables (e.g. axial length) at the time of data entry. This improves data completeness and accuracy. In addition, the richness of EMR data provides a more complete picture of the patient and their state of health making it possible to infer important information through cross-checking. Completeness of preoperative VA and postoperative VA outcome remain variable and an area for improvement in many centres.

5.4 Small numbers policy

Centres with <50 operations have not been included in this report and the Clinical Outcomes Publication (COP) programme report for individual surgeon results will likewise not report results for surgeons who have undertaken <50 procedures.

5.5 Outliers policy

The audit outliers' policy has been developed directly from the HQIP outliers' policy and is available on the [RCOphth NOD Audit](http://RCOphthNODAudit.org.uk) website. An outlying centre or surgeon is identified where the risk-adjusted adverse event rate is above the national threshold set by the mean rate plus approximately three Standard Deviations (3SD).

6. Data Extraction, Cleaning and Statistical Methods

Centre participation was affirmed by agreement from the Trust Caldicott Guardian and Clinical Lead for Ophthalmology. There are 13 sources of data included in the prospective third year of the National Cataract Audit, 86 centres used the Medisoft EMR (Medisoft Ophthalmology www.medisoft.co.uk, three centres used the OpenEyes EMR www.openeyes.org.uk, one very large London NHS Trust used both the Medisoft and the OpenEyes EMR systems, one centre used the Epic patient record system www.epic.com, and ten centres used in-house data collection systems. Supplementary extractions/submissions were undertaken as necessary. Full details regarding eligibility and analysis criteria can be found on the RCOphth NOD Audit website following registration www.nodaudit.org.uk.

7. Results

7.1 Case ascertainment

In total, 232,083 operations were submitted to the audit by 102 centres, of which 230,632 (99.4%) were performed using phacoemulsification. The estimate of case ascertainment was made by comparison with data from NHS Digital and NWIS. Case ascertainment was not calculable for two centres. One centre was excluded from the cataract audit analysis due to supplying <50 eligible operations. The other centre did not have any data available from NHS Digital.

The overall case ascertainment for all centres combined was 84.5%, 72 (72.0%) centres had a case ascertainment rate of >80% and 59 (59.0%) centres >95%. The range in the percentage of cases submitted to the audit was 2.5% to 100%.

Of the 232,083 operations submitted during the audit period (01 September 2017 to 31 August 2018), 14,208 (6.1%) operations are excluded from analysis; the eligibility information is on the NOD Audit website [NOD Audit Eligibility Criteria](#). This left 217,875 operations performed in 101 participating centres eligible for analysis. The operations were performed on 107,406 (49.3%) left eyes and 110,469 (50.7%) right eyes from 176,019 patients. These operations were performed by 1,992 surgeons.

7.2 Patient characteristics – age and gender

Summary details of the 176,019 patients undergoing cataract surgery in the third year of the prospective audit were as follows:



- 176,019 patients with median age 76.3 years
- 74,980 (42.6%) patients were men with median age 75.9 years
- 100,813 (57.3%) patients were women with median age 76.6 years
- The gender was not recorded for 226 (0.1%) patients with median age 76.1 years
- The ethnicity was not recorded for 79,918 (45.4%) patients
- Patient characteristics were very similar for first treated and second treated eyes

7.3 Preoperative Visual Acuity (VA)

One centre (4,067 operations) requested that their visual acuity data was not reported after discovering a fault with the extraction of this data. Of the 213,808 operations from 100 centres considered for visual acuity analysis, a preoperative visual acuity was recorded for 196,465 (91.9%) eyes and missing for 17,343 (8.1%) eyes, of which 1,418 (0.7% of operations) had a Pin Hole Visual Acuity (PHVA) measured but no Corrected Distance Visual Acuity (CDVA) or Uncorrected Distance Visual Acuity (UDVA) measurement.

There was wide variation in the percentage of eyes with a preoperative VA by contributing centre, where for five (5.0%) centres <50% of eyes had a preoperative VA, for 86 (86.0%) centres more than 80% of eyes had a preoperative VA and for 52 (52.0%) centres more than 95% of eyes had a preoperative VA, details provided in Appendix 6 (page 41).

The overall percentages of eyes with a preoperative VA were 91.9%, 90.4% and 95.2% for the centres who joined the audit in year 1, year 2 and the recently joining centres respectively.

For the 196,465 eyes with a preoperative VA measurement, the measurement was CDVA in 136,952 (69.7%) eyes, UDVA in 56,780 (28.9%) eyes and in 2,733 (1.4%) eyes the CDVA measurement was the same as the UDVA measurement. The median preoperative VA was 0.50 LogMAR units for each grade of surgeon.

The median preoperative VA was 0.50 LogMAR units (range; -0.30 – NPL) (6/19 Snellen Equivalent); where 6,539 (3.3%) eyes were CF, 3,867 (2.0%) eyes were HM, 979 (0.5%) eyes were PL and 58 (<0.1%) eyes were NPL.

The preoperative VA was 0.30 LogMAR units (6/12) or better for 67,944 (34.6%) eyes, 0.60 LogMAR units (6/24) or better for 140,142 (71.3%) eyes and 1.0 LogMAR units (6/60) or better for 176,326 (89.8%) eyes.

There was variability in the preoperative VA between contributing centres, where for 62 (62.0%) centres the median preoperative VA was 0.50 LogMAR and the range in the centres median preoperative VA was 0.20 – 0.60 LogMAR, Figures 1a and 1b (page 16).

Deprivation is recognised as an influence on the ability of individuals to access care for a variety of conditions. Here we have used preoperative VA as a proxy for cataract severity to assess whether deprivation is (or is not) related to timely access to surgery before symptoms of vision loss become advanced. On this basis, with some exceptions at the extremes, access to surgery appeared to be reasonably uniform across the Index of Multiple Deprivation (IMD) national deciles, Figure 2 (page 17). There was, however, some observed variation as demonstrated in Table 2 (page 17), where there was a statistically significant association ($p < 0.001$) between higher levels of deprivation and worse preoperative VA, for example 23.5% of the patients in the most deprived decile (decile 1) had a preoperative VA of ≥ 1.00 LogMAR, compared to 11.8% of patients in the least deprived decile (decile 10). Consistent with slightly worse access amongst the most deprived, is the observation that there were proportionally fewer operations than expected undertaken in the more deprived deciles than in the less deprived deciles (Table 2, page 17), though this result might be due to bias in socioeconomic status of contributing centres (i.e. there may have been more centres serving less deprived communities).

For 37,346 patients who had both eyes undergo cataract surgery during the audit period and had a preoperative VA measurement for both eyes (excluding immediate simultaneous bilateral surgery), the mean presenting VA was 0.11 LogMAR worse (95% CI: 0.10 to 0.12 LogMAR) for the first treated eye than for the second treated eye (means = 0.57 (6/22) and 0.46 LogMAR (6/17) respectively, $p < 0.001$).

Figure 1a: Box and whisker plots of preoperative VA by participating centre
Established centres with data in the first year audit report (Centres 1 – 56)

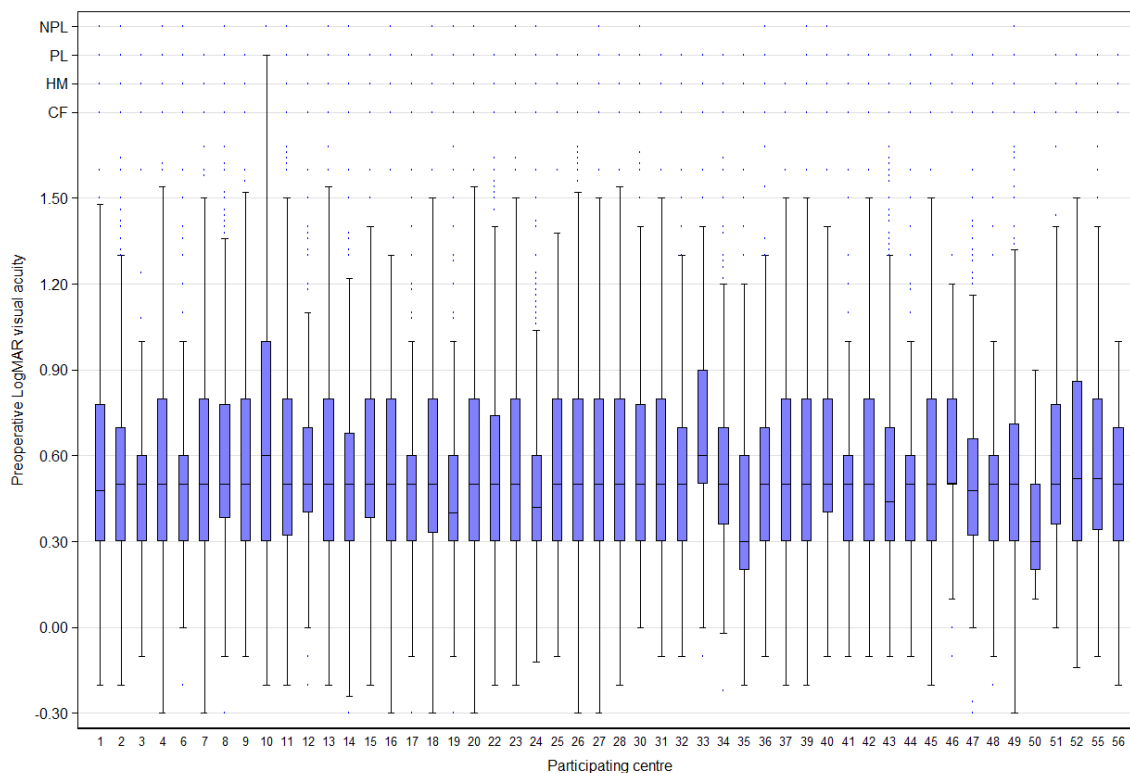


Figure 1b: Box and whisker plots of preoperative VA by participating centre
Centres joining in audit year 2 (Centres 57 – 87) and audit year 3 (Centres 88 – 108)

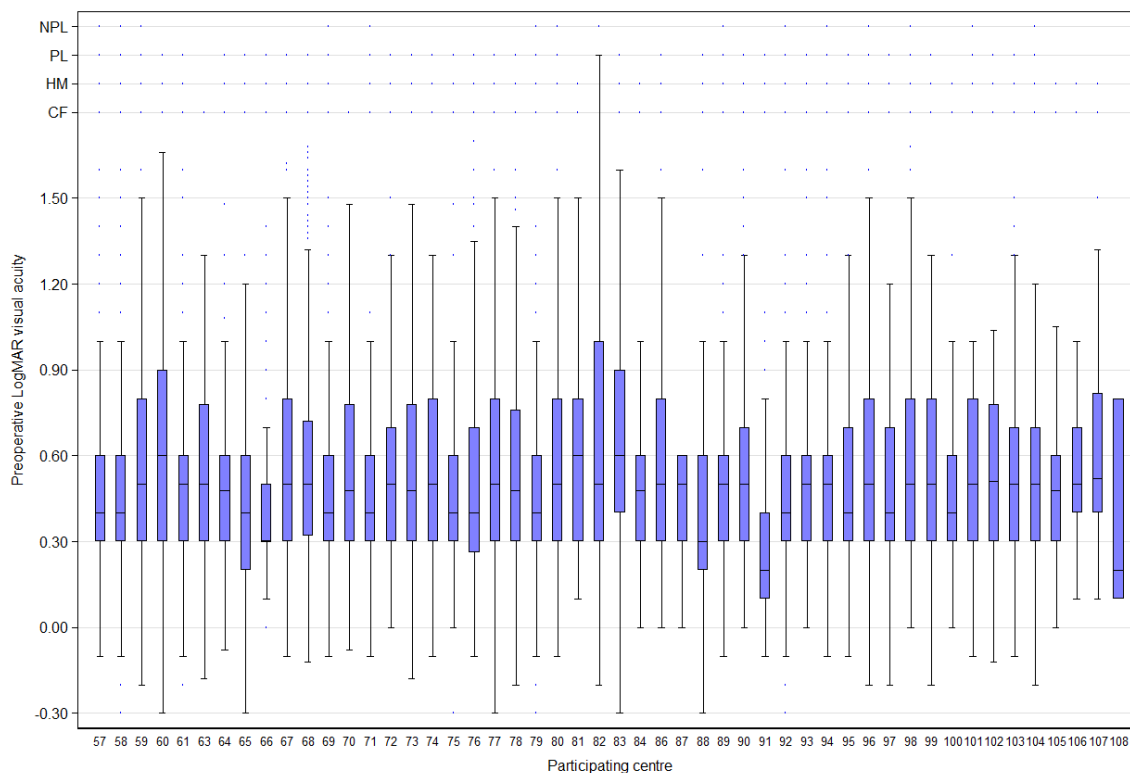
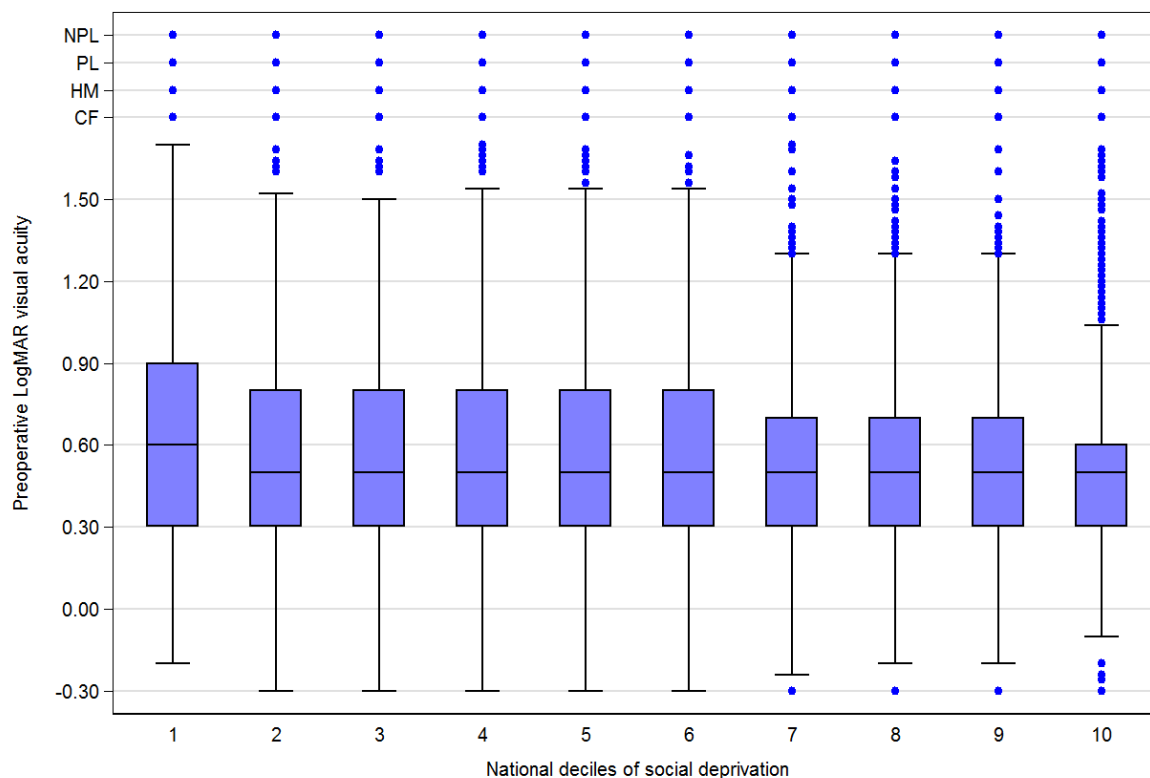


Figure 2: Box and whisker plots of preoperative VA by national deciles of social deprivation



The third prospective year of the national cataract audit ran from 01 September 2017 to 31 August 2018

Table 2: Preoperative visual acuity and social deprivation where decile 1 is the most deprived decile and decile 10 the least deprived

Decile of social deprivation	N	Preoperative LogMAR visual acuity			
		<0.30	0.30 - <0.60	0.60 - <1.00	≥1.00
1	12,838	10.9	38.4	27.2	23.5
2	12,553	12.0	40.2	26.6	21.2
3	12,787	12.7	41.9	26.3	19.1
4	13,325	12.9	43.0	26.9	17.2
5	13,742	14.0	44.3	25.4	16.2
6	14,403	13.0	45.7	25.6	15.7
7	14,258	14.2	46.8	25.2	13.9
8	14,304	15.0	47.5	24.4	13.2
9	14,601	15.2	48.1	24.4	12.4
10	14,331	14.7	50.2	23.3	11.8
Overall	137,142	13.5	44.8	25.5	16.2

7.4 Ocular co-pathologies and risk indicators

The presence or absence of an ocular co-pathology or known risk indicator was recorded for 97.4% of operated eyes and was not recorded for 2.6% of eyes. Assuming that the not recorded ocular co-pathology or known risk indicators are 'none', then an ocular co-pathology or known risk indicator was present in 90,707 (41.6%) eyes and recorded as absent (or not recorded) for 127,168 (58.4%) eyes.

The percentage of eyes with ocular co-pathology or known risk indicator data recorded (any, none or not recorded) varied between centres, where the percentage of eyes reported to have any ocular co-pathology ranged between centres from 8.0% to 100.0%, and 36 (36.0%) centres had >50% of operated eyes with an ocular co-pathology.

The most commonly recorded ocular co-pathologies were age-related macular degeneration, glaucoma and diabetic retinopathy which were recorded for 10.5%, 8.5% and 5.8% of operations respectively.

7.5 Operation characteristics

Phacoemulsification ± IOL was performed in all eligible cataract operations and for 205,153 (94.2%) operations was the only operative procedure performed. Phacoemulsification ± IOL was combined with one other procedure in 11,488 (5.3%) operations, with ≥2 other procedures in 1,234 (0.5%) operations.

The most frequently performed operative procedures that were combined with phacoemulsification ± IOL were insertion of pupil ring expander and anterior vitrectomy, which were performed in 0.9% and 0.7% of operations respectively.

7.6 Operative complications

One or more intraoperative complication was recorded for 6,020 (2.8%) operations, with the most frequently recorded being PCR which was reported for 2,684 (1.2%) operations. The 'any' intraoperative complication rates were higher for the less experienced grade of surgeons, while the rates for individual intraoperative complications were similar across the grades of surgeon except for PCR, which were higher for the less experienced grades, Table 3, page 19.

Table 3: Recorded intraoperative complications for cataract operations for the third year of the National Cataract Audit by grade of surgeon

Intraoperative complications N (column %)	Consultant surgeons (N = 148,409)	Career grade non-consultant surgeons (N = 17,804)	More experienced trainee surgeons (N = 43,808)	Less experienced trainee surgeons (N = 7,854)	Total (N = 217,875)
Eyes with no complications	145,011 (97.7)	17,307 (97.2)	42,038 (96.0)	7,499 (95.5)	211,855 (97.2)
Eyes with ≥1 complication	3,398 (2.3)	497 (2.8)	1,770 (4.0)	355 (4.5)	6,020 (2.8)
Recorded intraoperative complications*					
Posterior capsular rupture	1,466 (1.0)	209 (1.2)	835 (1.9)	174 (2.2)	2,684 (1.2)
Zonule rupture – no vitreous loss	426 (0.3)	62 (0.3)	231 (0.5)	38 (0.5)	757 (0.3)
Corneal epithelial abrasion	309 (0.2)	59 (0.3)	92 (0.2)	40 (0.5)	500 (0.2)
Torn iris / damage from the phaco	268 (0.2)	32 (0.2)	115 (0.3)	18 (0.2)	433 (0.2)
Lens exchange required / other IOL problems	128 (<0.1)	16 (<0.1)	61 (0.1)	12 (0.2)	217 (0.1)
Anterior capsular tear	64 (<0.1)	19 (<0.1)	95 (0.2)	14 (0.2)	192 (<0.1)
Endothelial damage / Descemet's tear	111 (<0.1)	17 (<0.1)	49 (0.1)	7 (<0.1)	184 (<0.1)
Iris prolapse	88 (<0.1)	10 (<0.1)	84 (0.2)	1 (<0.1)	183 (<0.1)
Corneal oedema	81 (<0.1)	10 (<0.1)	45 (0.1)	15 (0.2)	151 (<0.1)
Iris trauma	86 (<0.1)	17 (<0.1)	43 (0.1)	2 (<0.1)	148 (<0.1)
Hyphaema	77 (<0.1)	11 (<0.1)	38 (<0.1)	2 (<0.1)	128 (<0.1)
Phaco burn / wound problems	38 (<0.1)	9 (<0.1)	15 (<0.1)	5 (<0.1)	67 (<0.1)
Choroidal / suprachoroidal haemorrhage	33 (<0.1)	5 (<0.1)	12 (<0.1)	3 (<0.1)	53 (<0.1)
Unspecified other**	540 (0.4)	72 (0.4)	242 (0.6)	45 (0.6)	899 (0.4)

Posterior capsular rupture (PCR) is defined for the purposes of the National Clinical Audit as “posterior capsule rupture with or without vitreous prolapse or zonule rupture with vitreous prolapse” and abbreviated simply as PCR. Retained lens fragments in the vitreous implies PCR.

*Each operation can have more than one intraoperative complication recorded.

**The unspecified other included one IOP spike, one wound leak, three corneal burns, three vitreous haemorrhages, 12 instances when the operation was cancelled and 23 decentred IOLs.

7.7 Postoperative complications

In order to submit postoperative complication data to the audit there needs to be enough time after the operation for patients to receive a postoperative follow-up. Therefore, the audit reports on operations performed before 30 June 2018 for this aspect of the audit. This allows the potential for two months' follow-up.

Of the 217,875 eligible cataract operations submitted to the audit, 180,664 (82.9%) operations from 100 centres were performed before 30 June 2018 and had the potential for two months' follow-up. One recently joining centre had all operations in July or August 2018 and is not included in postoperative complications results. 96,481 (53.4%) operations had no postoperative complication data recorded, 74,198 (41.1%) had 'none' recorded as the postoperative complication, and 9,985 (5.5%) had at least one postoperative complication recorded. The variation in data likely reflects differences in cataract surgery patient pathways across centres.

The most frequently recorded postoperative complications were postoperative uveitis, corneal oedema / striae and cystoid macular oedema which were the only individual postoperative complications recorded for >1.0% of operations.

The percentage of operations with a postoperative complication record (none or a complication), or no postoperative complication record, varied significantly between the participating centres, with 11 centres having no records of any specific postoperative complications.

7.8 Postoperative visual acuity

One centre (4,067 operations) requested that their visual acuity data was not reported after discovering a fault with the extraction of this data. From the 213,808 operations from 100 centres considered for visual acuity analysis, 177,380 (83.0%) operations were performed before 30 June 2018 and had the potential for two months' follow-up. These results are from 99 centres as one centre (50 operations) had none of their operations in this qualifying period. Of these, a postoperative visual acuity was recorded for 134,758 (76.0%) eyes and missing for 42,622 (24.0%) eyes (including all operations from one centre with no postoperative VA data). The year 3 percentages of eyes with a postoperative VA were 77.0%, 73.7% and 75.2% for centres who first participated in audit year 1, audit year 2 and the recently joining year 3 centres respectively. Eligible for postoperative VA analysis are 134,758 operations from 99 contributing centres, which includes one centre with >100 operations and no postoperative VA data.

There was wide variation in the percentage of eyes with postoperative VA by contributing centre; for 16 (16.2%) centres <50% of eyes had a postoperative VA, for 55 (55.5%) centres >80% of eyes had a postoperative VA and for 14 (14.1%) centres >95% of eyes had a postoperative VA; details provided in Appendix 6 (page 41). Influencing this result are operations performed in the latter part of the audit period where not all patients could have sufficient follow-up for all postoperative results to be available. Another factor is discharge to the community for the postoperative refraction and visual acuity assessments, as these measurements are not always sent back to the hospitals for recording on the hospital's EMR system.

Overall, the percentage of first and second treated eyes with postoperative VA data was 77.5% for first treated eyes and 73.8% for second treated eyes. The percentage of first and second treated eyes with postoperative VA data varied between centres, where 82 (82.8%) centres had a higher percentage of first treated eyes with postoperative VA data than second treated eyes, for 18 centres this difference was >10% points and for two centres >25% points.

For the 134,758 eyes eligible for postoperative VA assessment, the best measurement was CDVA in 42,322 (31.4%) eyes, UDVA in 40,238 (29.9%) eyes, PHVA in 27,872 (20.7%) eyes; the best measurement was the same for two of the assessment methods for 22,444 (16.7%) eyes and the same for all three methods in 1,882 (1.4%) eyes.

The median postoperative VA was 0.10 LogMAR units (range; -0.30 – NPL) (6/7.5 Snellen equivalent); where 437 (0.3%) eyes were CF, 273 (0.2%) eyes were HM, 57 (<0.1%) eyes were PL and 9 (<0.1%) eyes were NPL.

The postoperative VA was 0.30 LogMAR units (6/12) or better for 121,729 (90.3%) eyes, 0.60 LogMAR units (6/24) or better for 130,062 (96.5%) eyes and 1.0 LogMAR units (6/60) or better for 133,103 (98.8%) eyes.

The postoperative VA was fairly stable across participating centres, although there was some variation where the median postoperative VA was 0.00 LogMAR for 22 (22.4%) centres, 0.10 LogMAR for 47 (48.0%) centres and 0.20 LogMAR for 13 (13.3%) centres. The overall median postoperative VA from all centres was 0.10 LogMAR with a range in the centres median postoperative VA of 0.00 – 0.35 LogMAR, Figures 3a and 3b (page 22).

Overall, VA outcomes were as expected, though data completeness remains an area for improvement and results for centres with small numbers will be subject to significant statistical uncertainty and potential bias.

Figure 3a: Box and whisker plots of postoperative VA by participating centre
Established centres with data in the first year audit report (Centres 1 – 56)

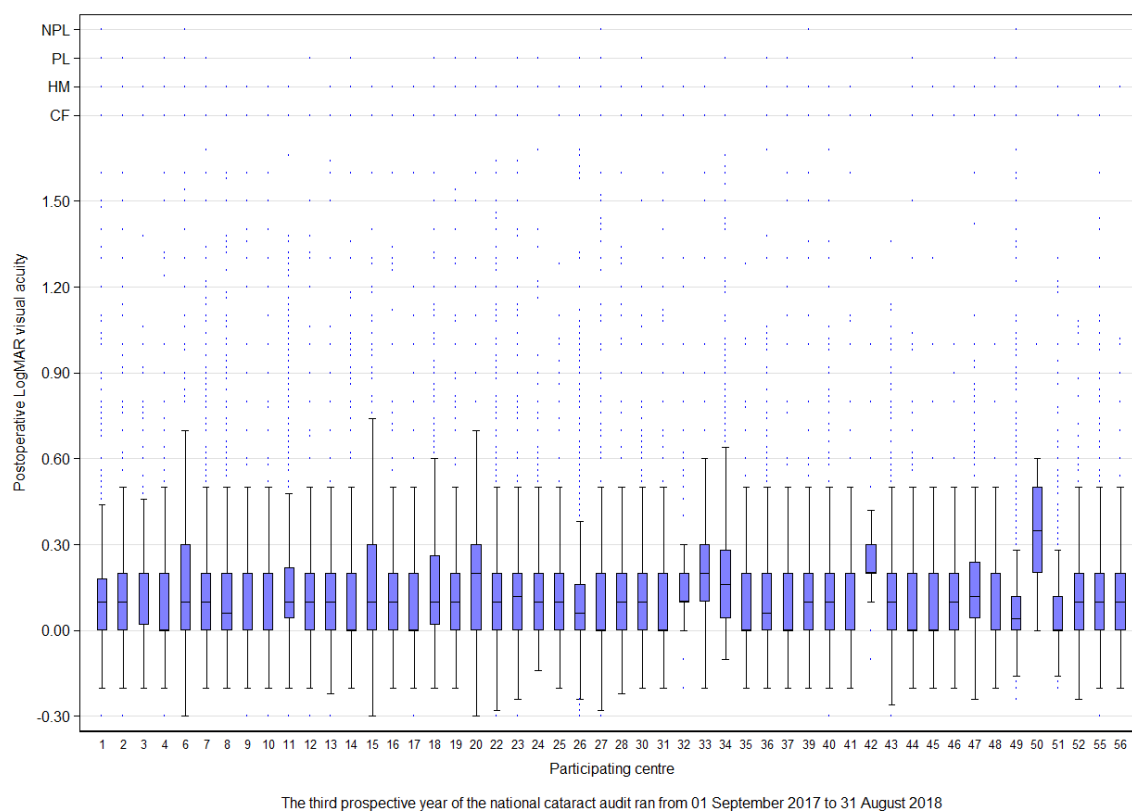
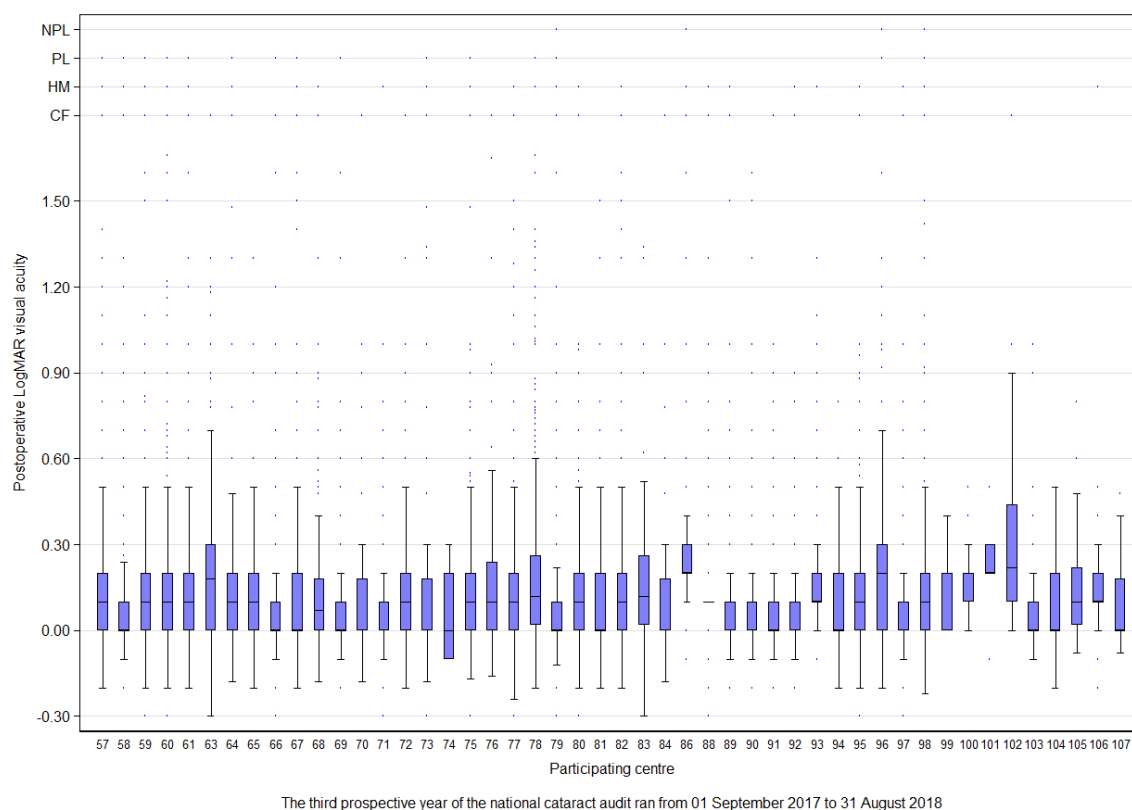


Figure 3b: Box and whisker plots of postoperative VA by participating centre
Centres joining in audit year 2 (Centres 57 – 87) and audit year 3 (Centres 88 – 108)



7.9 Change in visual acuity

Of the 177,380 eligible cataract operations submitted to the audit performed before 30 June 2018 (excluding the centre who requested that its VA data was not reported), 127,794 (72.1%) eyes had both a preoperative VA and a postoperative VA measurement. The year 3 percentages of eyes with change in VA were 73.0%, 69.4% and 72.7% for centres who first participated in audit year 1, audit year 2 and the recently joining year 3 centres respectively. Eligible for change in VA analysis are 127,794 operations from 98 participating centres. Data completeness for this measure remains stable, averaging around 70%. The audit will continue to encourage centres to collect and record both preoperative and postoperative VA to allow for determination of this measure.

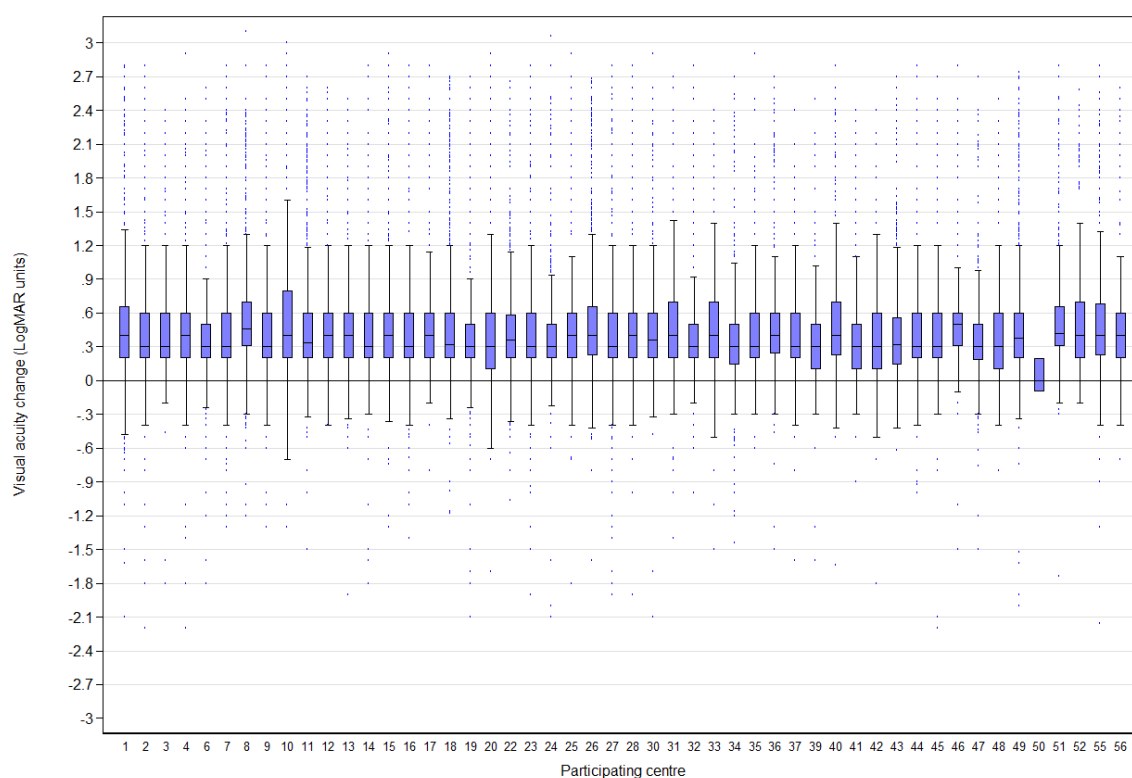
The median change in VA from baseline was a 0.36 LogMAR gain (IQR; 0.20 – 0.60 gain). A loss of >0.10 LogMAR (-1 line) was experienced by 3,505 (2.7%) eyes, a change of ± 0.10 LogMAR (± 1 line) by 11,302 (8.8%) eyes and a gain of >0.10 LogMAR (+1 line) by 112,987 (88.4%) eyes. The change in VA was fairly stable between the participating centres, Figures 4a and 4b (page 24). Overall, the majority of cataract surgery operations resulted in a significant improvement in visual acuity for patients.

75% of eyes with a preoperative VA of 0.00 LogMAR or better had a postoperative VA of 0.00 LogMAR or better and 97% of eyes with a preoperative VA of 0.30 LogMAR or better had a postoperative VA of 0.30 LogMAR or better.

Eyes that had an ocular co-pathology or experienced an intraoperative complication or PCR during surgery had worse postoperative VA than eyes that did not have any of these problems. >90% of eyes without these problems had a postoperative VA of 0.30 LogMAR (6/12 Snellen) or better, Table 4 (page 25).

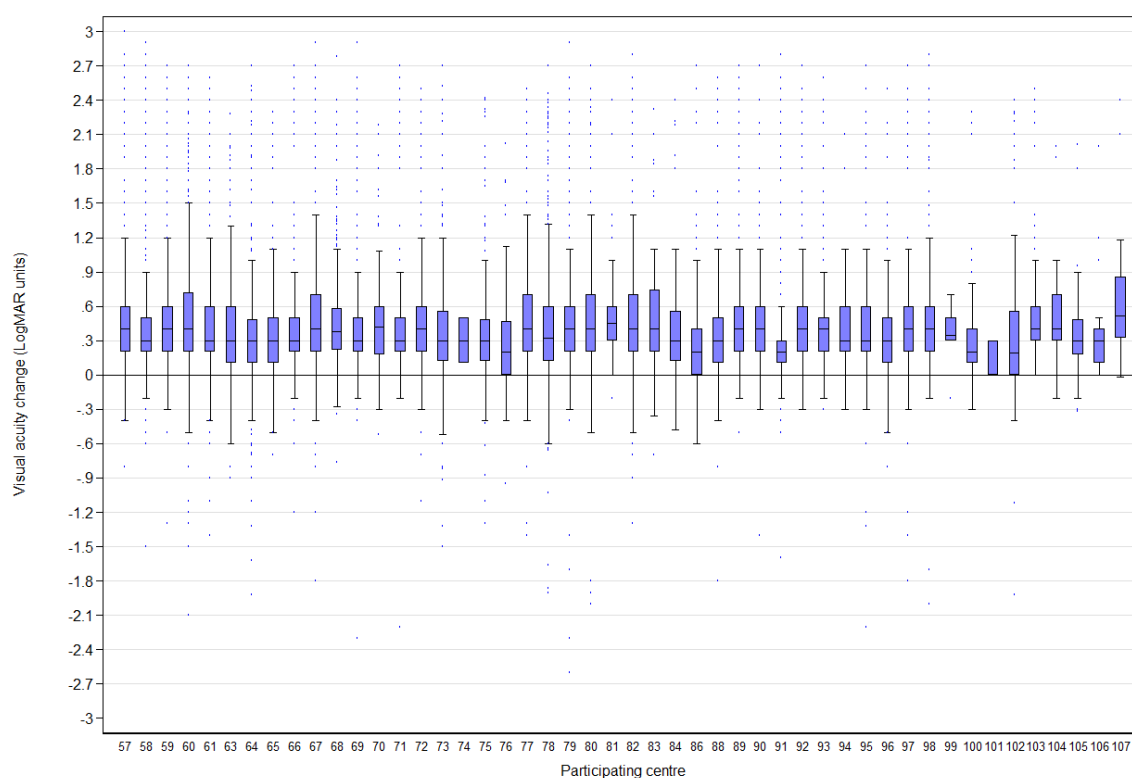
The percentage of operations from each participating centre with preoperative VA, postoperative VA and both pre- and postoperative VA data varied between participating centres, Appendix 6 (page 41).

Figure 4a: Box and whisker plots of change in VA by participating centre
Established centres with data in the first year audit report (Centres 1 – 56)



The third prospective year of the national cataract audit ran from 01 September 2017 to 31 August 2018

Figure 4b: Box and whisker plots of change in VA by participating centre
Centres joining in audit year 2 (Centres 57 – 87) and audit year 3 (Centres 88 – 108)



The third prospective year of the national cataract audit ran from 01 September 2017 to 31 August 2018

Table 4: Postoperative VA by preoperative VA, ocular co-pathology / known risk indicator and intraoperative complications

	Postoperative LogMAR visual acuity				
Percentages are row % (Approximate Snellen)	≤0.00 (6/6 or better)	≤0.18 (6/9 or better)	≤0.30 (6/12 or better)	≤0.60 (6/24 or better)	≤1.00 (6/60 or better)
All eyes (N = 127,794)	41.7	66.0	90.6	96.6	98.8
Preoperative LogMAR VA (Snellen)					
≤0.00 (N = 2,640)	75.5	88.8	98.8	99.7	99.9
≤0.18 (N = 7,655)	62.2	89.0	98.4	99.6	99.9
≤0.30 (N = 43,975)	50.8	75.7	97.6	99.6	99.9
≤0.60 (N = 91,210)	44.5	70.3	95.0	99.4	99.8
≤1.00 (N = 114,806)	43.0	67.9	92.7	98.3	99.7
Ocular co-pathology / risk indicator					
No (N = 71,659)	49.0	74.1	95.8	99.1	99.7
Yes (N = 56,135)	32.6	55.6	83.8	93.5	97.7
Intraoperative complications					
No (N = 124,457)	42.1	66.4	90.9	96.8	98.9
Yes (N = 3,337)	28.5	49.3	79.1	90.2	95.2
PCR					
No (N = 126,245)	41.9	66.3	90.7	96.7	98.9
Yes (N = 1,549)	24.9	42.6	74.8	86.8	92.6

7.10 Case complexity adjusted PCR results

Unadjusted for case complexity PCR rates for the 101 participating centres are shown in Figure 5 (page 27) and an adjusted for case complexity graph in Figure 6 (page 27). None of the participating centres were outliers in the third year of the audit. Details of the unadjusted and adjusted for case complexity PCR results for the 101 participating centres can be found in Appendix 7 (page 46), along with a case complexity index which is the overall predicted probability of PCR for all the cases reported for each centre.

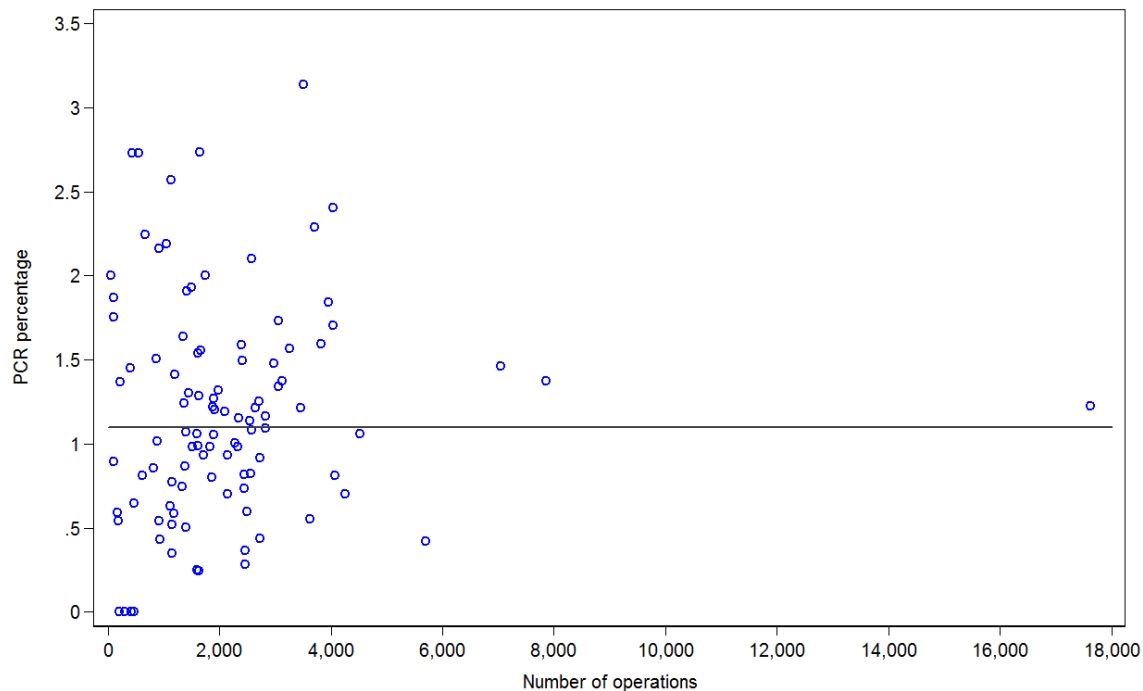
7.11 Case complexity adjusted visual loss results

Of the 217,875 eligible operations, 177,380 operations were performed up to 30 June 2018 and had the potential for two months' follow-up (excluding the centre who requested their VA data was not reported). Of these, 112,690 (63.5%) operations from 67 centres were performed in centres where a preoperative and postoperative VA was recorded for at least 40% of the operations and at least 50 operations.

An unadjusted for case complexity funnel plot of VA Loss is shown in Figure 7 (page 28) and an adjusted for case complexity funnel plot in Figure 8 (page 28). Details of the unadjusted and adjusted for case complexity VA Loss results can be found in Appendix 7 (page 46), along with a case complexity index which is the overall predicted probability of VA Loss for the cases reported by each centre. Centres with <40% operations or <50 operations with both a preoperative and postoperative VA have not been reported as the estimates would be too unreliable.

The percentage rate used in the case complexity adjusted results for VA loss was lowered from 1.5% to 0.9% for audit year 2 to reflect the observed VA loss rate for consultant and career grade surgeons whose results are published in the public domain. The actual observed VA loss rate for the year 3 VA loss sample was 0.7%, which is slightly lower than the percentage rate used for complexity adjustment. These changes in the VA Loss rate are not an unexpected finding as there is variation between centres in the percentage of reported operations, percentage of operations with a preoperative VA, and percentage of operations with a postoperative VA, all of which are necessary for visual loss estimation.

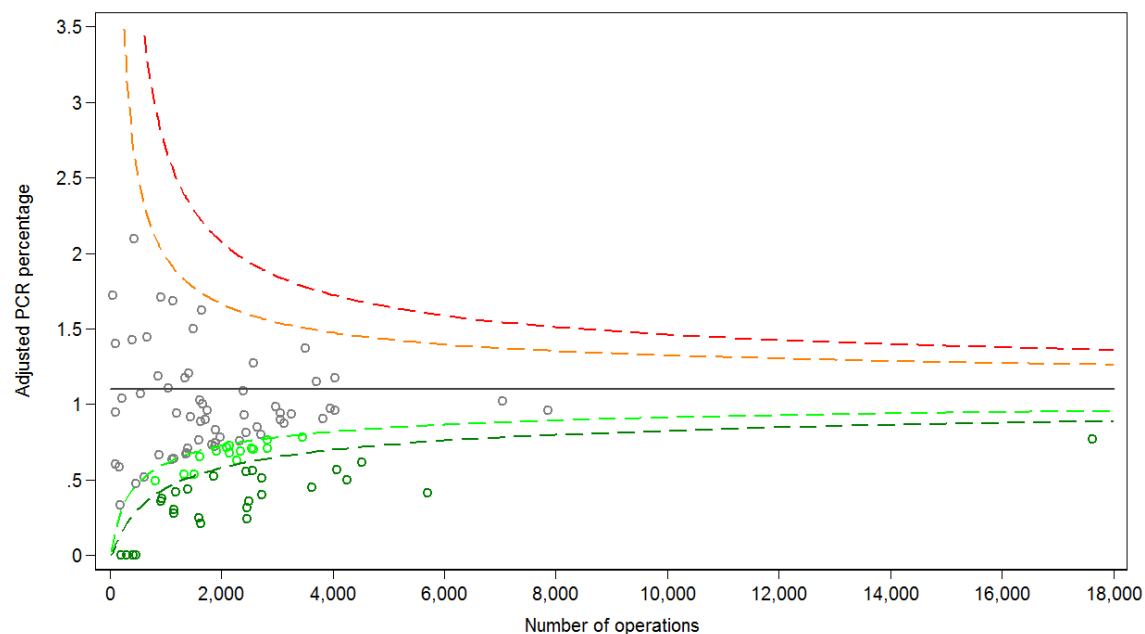
Figure 5: Unadjusted for case complexity PCR funnel plot for participating centres



○ Participating centres unadjusted PCR rate — Overall Consultant surgeon PCR rate = 1.1%

The third prospective year of the national cataract audit ran from 01 September 2017 to 31 August 2018

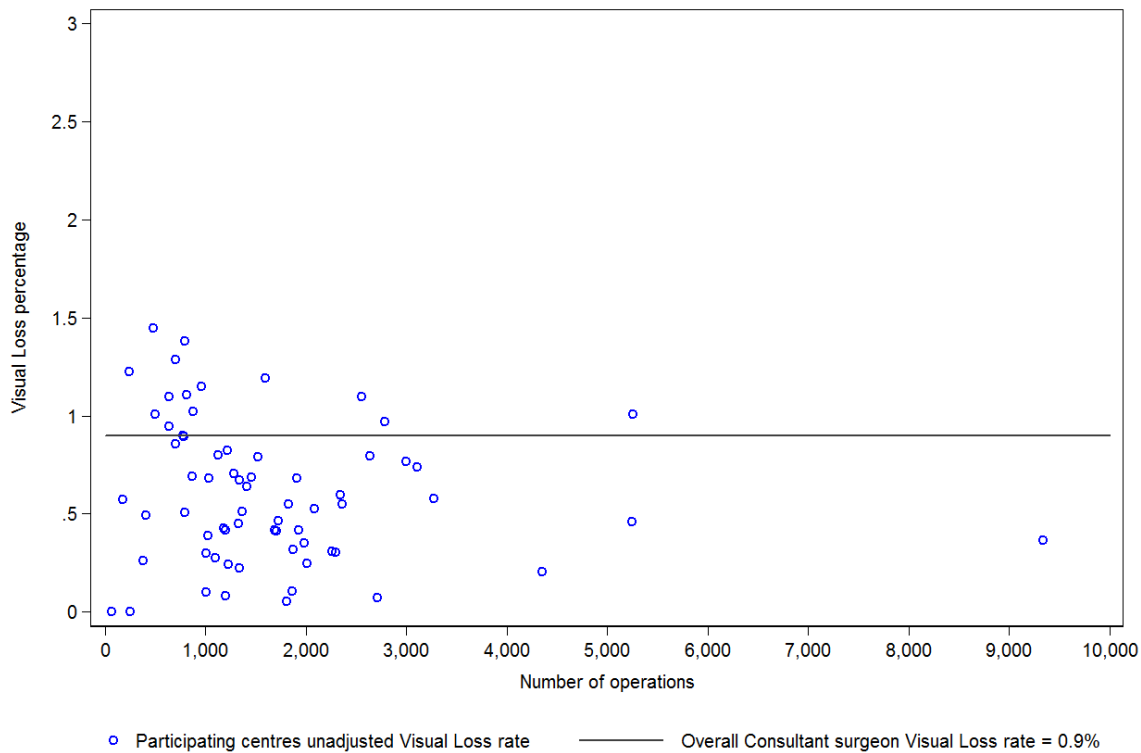
Figure 6: Adjusted for case complexity PCR funnel plot for participating centres



● Centres above upper 99.8% CI ● Centres between upper 95% and 99.8% CI
 ○ Centres within 95% CI ● Centres between lower 95% and 99.8% CI
 ● Centres below lower 99.8% CI — Overall Consultant surgeon PCR rate = 1.1%

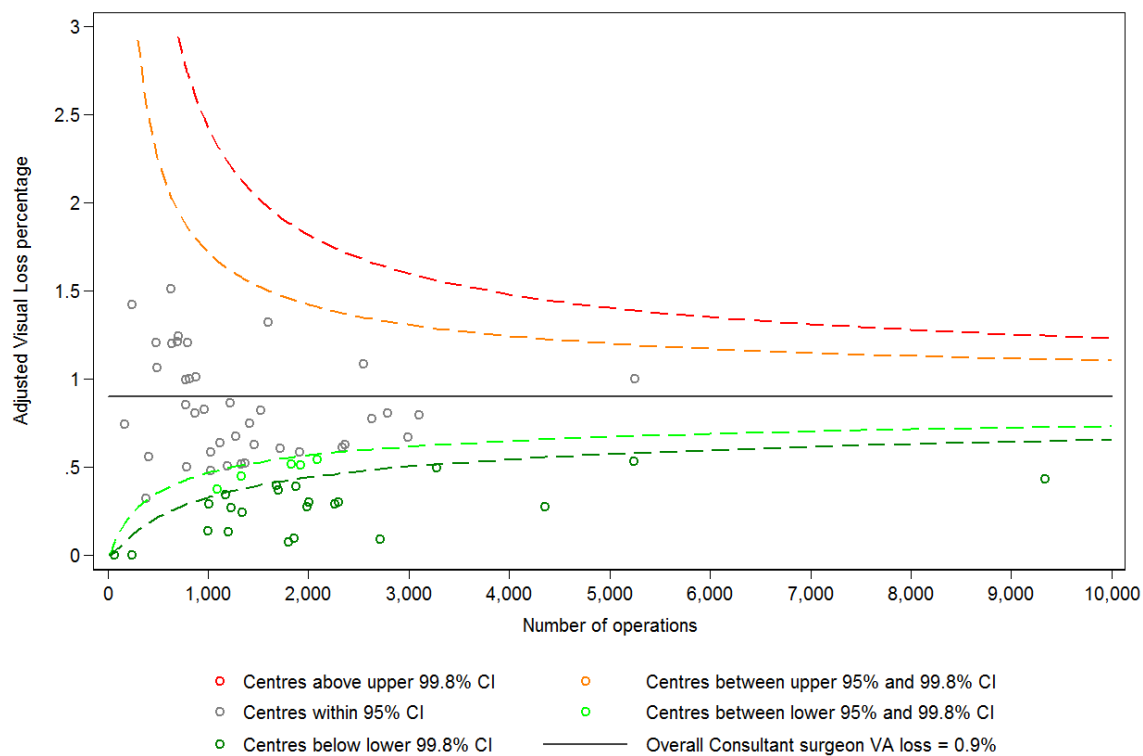
The third prospective year of the national cataract audit ran from 01 September 2017 to 31 August 2018; CI = Confidence Interval

Figure 7: Unadjusted for case complexity VA Loss funnel plot for participating centres



The third prospective year of the national cataract audit ran from 01 September 2017 to 31 August 2018

Figure 8: Adjusted for case complexity VA Loss funnel plot for participating centres



The third prospective year of the national cataract audit ran from 01 September 2017 to 31 August 2018; CI = Confidence Interval

8. Summary of Key Points

This third annual report from The Royal College of Ophthalmologists' National Ophthalmology Database Audit is the third to report prospectively collected data on cataract surgery for a one-year period.

1. Good progress has been made in terms of expanding the number of centres from around 30, when HQIP funding commenced, to 101 centres (83 NHS trusts and three independent sector treatment providers reporting 18 sites) in this report. Looking ahead, 109 of 119 traditional NHS cataract providers have indicated that they wish to participate in future audit cycles.
2. Named surgeon and centre results are available on the [NOD Audit website](#).
3. Established markers of surgical quality – PCR and VA Loss – are used as metrics for risk-adjusted outcomes. PCR is the most frequent intraoperative complication and is associated with increased postoperative loss of vision. VA Loss is intended to capture all eyes where there has been an adverse outcome, whether or not associated with PCR.
4. Overall, PCR and VA loss have reduced by 38% for PCR and 37% for VA Loss since 2010, Table 1 (page 7). The reduction in PCR complications in cataract surgery since 2010 equates to approximately 3,400 fewer complications annually across the NHS. Cost savings from avoided PCR complications are estimated at approximately £2 million per annum and the avoidance of VA Loss can have multiple benefits for a patient due to the importance of vision in daily life.
5. This is the third cataract audit report to include the reporting of named centre results for all submitted operations with results for named consultant surgeons, shortly to be published as part of the Clinical Outcomes Publication (COP) programme. For the 101 centres included in this report, outcomes have been found to be within the standard HQIP expectation, i.e. risk adjusted outcomes within 3SD of the consultant average. This reflects the high-quality outcomes for patients at participating centres.
6. Case ascertainment overall at most contributing centres, is high although there remain some notable exceptions (Appendix 6, page 41).
7. Data completeness of reported surgery is excellent for PCR (100%), though less so for VA, particularly for postoperative VA. This is an area where many centres could do better, with a few centres having rather poor VA data returns following surgery. The collection of this important postoperative data could be improved (Appendix 6, page 41).
8. Quality improvement drivers in this audit take the form of risk-adjusted results for surgical complications and vision loss from before to after surgery. These key measures are risk-adjusted to acknowledge case complexity and provide credit to surgeons and centres undertaking complex work. Without conscientious completion of risk indicator data, surgeons and centres run the risk of not being given credit for the complexity of the work undertaken. An important message for participants to take on board both when planning surgery and when recoding their patient notes.
9. The RCOphth NOD Audit is aligned to, and is driving, the NHS digital agenda in the move toward electronic working in ophthalmology. It has catalysed a major shift from an initial 30 or so centres to over 100 centres now able to submit data electronically. The majority of these centres collect their data as part of routine clinical activity with no additional effort required for submission of data to the audit. Furthermore, the EMR audit tools allow for real time tracking of adverse surgical events locally which facilitates monitoring of complications by centres and surgeons. In the event of an adverse signal becoming apparent, timely corrective action can be taken to avoid unnecessary harm to patients and avoid centres or surgeons being identified as outliers in national audit reports going forward.

9. Conclusions

- The current report provides assurance that delivery of NHS cataract surgery in the 101 participating centres is of good quality
- It is encouraging to note that since 2010, when this work feeding back cataract surgical results to centres and surgeons began, there has been a 38% overall reduction in PCR complications and a 37% overall reduction in VA Loss. Progress with quality improvement thus far is providing obvious benefits to over 3,000 patients annually in terms of reduced morbidity as well as significant NHS cost savings from avoided complications of around £2 million annually
- In the forthcoming period it is planned to further extend the audit coverage to include all traditional NHS centres, and more of the independent providers of cataract surgical care. All providers of NHS funded care are accountable to the public for the quality of services they provide. It is pleasing to note that three independent sector treatment providers with 18 sites have joined the audit and are included in the current report
- Further outcomes are being considered in order to provide a broader, more patient focused and more easily interpreted assessment of NHS service quality in cataract care

10. Acknowledgements

The Royal College of Ophthalmologists' National Ophthalmology Database Audit is commissioned by the Healthcare Quality Improvement Partnership (HQIP) and is part of the National Clinical Audit and Patient Outcomes Programme (NCAPOP) and the Clinical Outcomes Publication (COP) programme.

We would like to acknowledge the support and guidance we have received from the NOD Steering Committee (see Appendix 2, page 33, for list of members) which includes professional members, ophthalmologists and optometrists, and patient and public representatives with individual lay members as well as patient support groups being represented. We are particularly grateful to our Patient and Public Representatives who have engaged fully with discussion relating to the design of the audit and the primary and secondary outcomes. Their guidance has helped us to ensure that the audit has relevance for not only the professional readership but also patients, their relatives and carers. We thank all the members of the steering committee for 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 data collection. All participating centres are acknowledged in Appendix 3 (page 34) and on the RCOphth NOD Audit website **www.nodaudit.org.uk**

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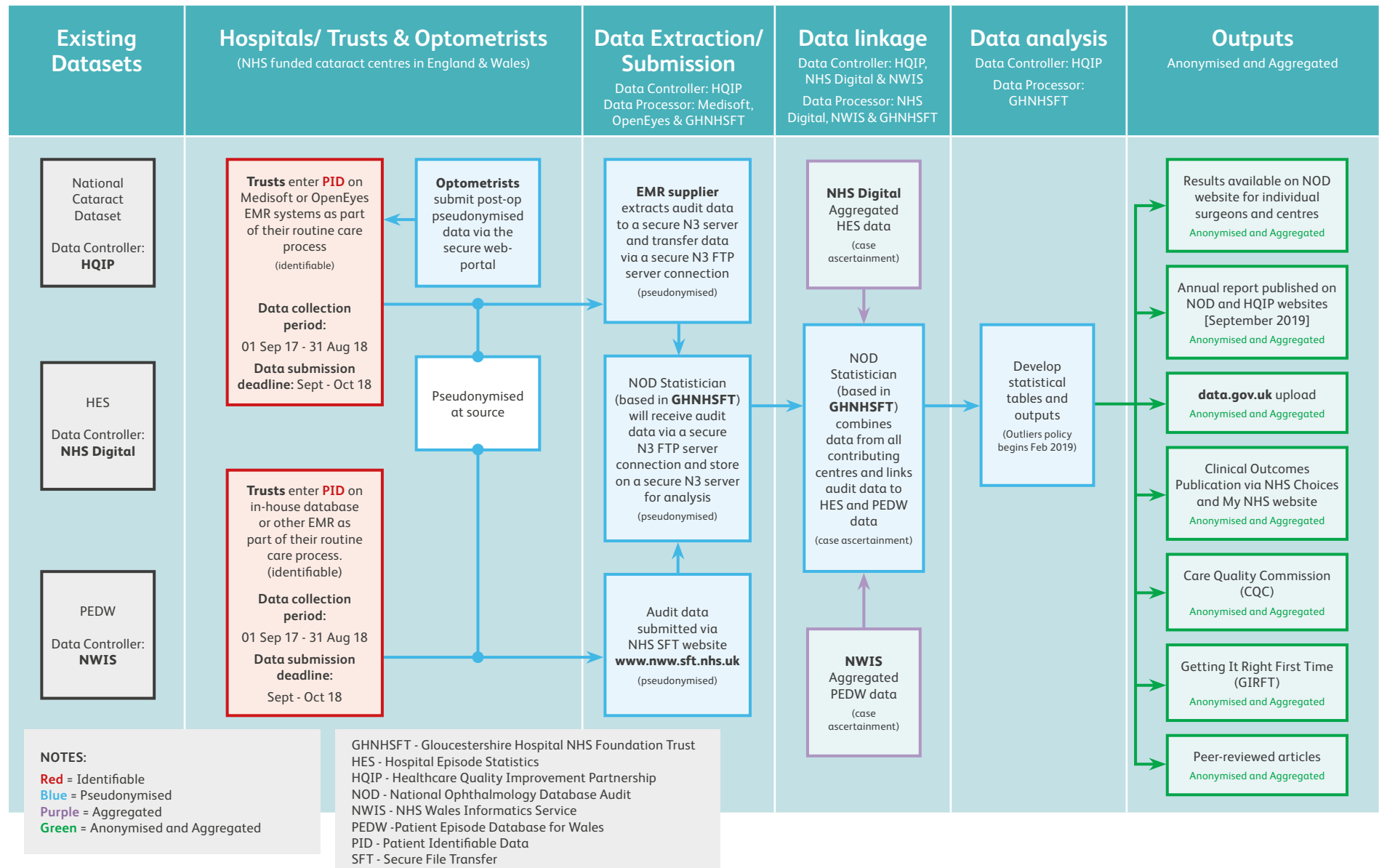
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It is with deep regret that we note the death of our friend and colleague Robert Johnston, who sadly died in September 2016. Without his inspirational vision, determination and career long commitment to quality improvement in ophthalmology this work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

Appendix 1: Data Flow

National Ophthalmology Database Audit – Data Flow



Appendix 2: National Ophthalmology Database Audit Project Steering Group Membership

Name	Designation
Andrew Frost	Cataract Representative The Royal College of Ophthalmologists
Anthony King	Cataract Representative The Royal College of Ophthalmologists
Beth Barnes	Head of Professional Support The Royal College of Ophthalmologists
Chris Rogers	Independent Statistician The University of Bristol
David Parkins	Past President The College of Optometrists
David Yorston	Cataract Representative The Royal College of Ophthalmologists
Helen Lee	Policy and Campaigns Manager Royal National Institute of Blind People
Janet Bax	Patient Representative The Patients Association
John Sparrow	Chairman Clinical Lead for RCOphth National Ophthalmology Database Audit
Kathy Evans	Chief Executive The Royal College of Ophthalmologists
Matt Broom	Lay Group Representative The Royal College of Ophthalmologists and Vision UK
Melanie Hingorani	Cataract Representative The Royal College of Ophthalmologists
Raghu Ram	Wales Representative The Royal College of Ophthalmologists
Sasha Hewitt	Associate Director of Quality and Development Healthcare Quality Improvement Partnership (HQIP)
Tasneem Hoosain	Project Manager Healthcare Quality Improvement Partnership (HQIP)

Appendix 3: Eligible cataract surgical centres in England and Wales

Category	Organisation name	Data collection system
Centres first included in the year 1 report	Aintree University Hospital NHS Foundation Trust	Medisoft
	Barking, Havering and Redbridge University Hospitals NHS Trust	Medisoft
	Barnsley Hospital NHS Foundation Trust	In-house
	Barts Health NHS Trust	Medisoft
	Bedford Hospital NHS Trust – Moorfields ¹	Medisoft
	Blackpool Teaching Hospitals NHS Foundation Trust ⁷	Medisoft
	Bradford Teaching Hospitals NHS Foundation Trust ²	Medisoft
	Calderdale and Huddersfield NHS Foundation Trust	Medisoft
	Cardiff and Vale University Health Board	Medisoft
	Chesterfield Royal Hospital NHS Foundation Trust	Medisoft
	Croydon Health Services NHS Trust – Moorfields ¹	Medisoft
	Epsom and St Helier University Hospitals NHS Trust	Medisoft
	Frimley Health NHS Foundation Trust	Medisoft
	Gloucestershire Hospitals NHS Foundation Trust	Medisoft
	Hampshire Hospitals NHS Foundation Trust	Medisoft
	Harrogate and District NHS Foundation Trust	Medisoft
	Isle of Wight NHS Trust	Medisoft
	King's College Hospital NHS Foundation Trust	Medisoft
	Leeds Teaching Hospitals NHS Trust	Medisoft
	London North West University Healthcare NHS Trust	In-house
	Manchester University NHS Foundation Trust	Medisoft
	Mid Cheshire Hospitals NHS Foundation Trust	Medisoft
	Mid Essex Hospital Services NHS Trust	Medisoft
	Moorfields Eye Hospital NHS Foundation Trust ¹	OpenEyes
	Norfolk and Norwich University Hospitals NHS Foundation Trust	Medisoft
	Northern Devon Healthcare NHS Trust	Medisoft
	North West Anglia NHS Foundation Trust ³	Medisoft
	Nottingham University Hospitals NHS Trust	Medisoft
	Oxford University Hospitals NHS Trust	Medisoft
	University Hospitals Plymouth NHS Trust	Medisoft
	Royal Berkshire NHS Foundation Trust	Medisoft
	Royal Cornwall Hospitals NHS Trust	Medisoft
	Royal Free London NHS Foundation Trust	Medisoft

Appendix 3 continued: Eligible cataract surgical centres in England and Wales

Category	Organisation name	Data collection system
Centres first included in the year 1 report	Royal United Hospital Bath NHS Trust	Medisoft
	Salisbury NHS Foundation Trust	Medisoft
	Sandwell and West Birmingham Hospitals NHS Trust	Medisoft
	Sheffield Teaching Hospitals NHS Foundation Trust	Medisoft
	Shrewsbury and Telford Hospital NHS Trust	Medisoft
	South Tees Hospitals NHS Foundation Trust	Medisoft
	South Warwickshire NHS Foundation Trust	Medisoft
	St Helens and Knowsley Hospitals NHS Trust	Medisoft
	The Hillingdon Hospitals NHS Foundation Trust	Medisoft
	The Mid Yorkshire Hospitals NHS Trust	Medisoft
	The Newcastle Upon Tyne Hospitals NHS Foundation Trust	Medisoft
	The Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust	Medisoft
	University Hospital Southampton NHS Foundation Trust	Medisoft
	University Hospitals Birmingham NHS Foundation Trust ⁴	Medisoft
	University Hospitals Bristol NHS Foundation Trust	Medisoft
	University Hospitals Coventry and Warwickshire NHS Trust	Medisoft
	University Hospitals of Morecambe Bay NHS Foundation Trust ⁸	Medisoft
	Warrington and Halton Hospitals NHS Foundation Trust	Medisoft
	Wirral University Teaching Hospital NHS Foundation Trust	Medisoft
	Wrightington, Wigan and Leigh NHS Foundation Trust	Medisoft
	Yeovil District Hospital NHS Foundation Trust	Medisoft
	York Teaching Hospital NHS Foundation Trust	In-house
Centres first included in the year 2 report	Bolton NHS Foundation Trust	OpenEyes
	Cambridge University Hospitals NHS Foundation Trust	EPIC
	County Durham and Darlington NHS Foundation Trust	Medisoft
	Cwm Taf University Health Board	Medisoft
	East Kent Hospitals University NHS Foundation Trust	OpenEyes
	East Lancashire Hospitals NHS Trust ⁹	Medisoft
	East Sussex Healthcare NHS Trust ⁶	Medisoft
	Great Western Hospitals NHS Foundation Trust	Medisoft
	Imperial College Healthcare NHS Trust	Medisoft
	James Paget University Hospitals NHS Foundation Trust	Medisoft

Appendix 3 continued: Eligible cataract surgical centres in England and Wales

Category	Organisation name	Data collection system
Centres first included in the year 2 report	Kingston Hospital NHS Trust	Medisoft
	Northampton General Hospital NHS Trust	In-house
	Northern Lincolnshire and Goole Hospitals NHS Foundation Trust	In-house
	Portsmouth Hospitals NHS Trust	Medisoft
	Royal Surrey County Hospital NHS Foundation Trust	In-house
	Sherwood Forest Hospitals NHS Foundation Trust	Medisoft
	Southport and Ormskirk Hospital NHS Trust	Medisoft
	SpaMedica – Bolton	Medisoft
	SpaMedica – Liverpool	Medisoft
	SpaMedica – Manchester	Medisoft
	SpaMedica – Newton-le-willows	Medisoft
	SpaMedica – Wakefield	Medisoft
	SpaMedica – Wirral	Medisoft
	Stockport NHS Foundation Trust	Medisoft
	East Suffolk and North Essex NHS Foundation Trust ⁵	Medisoft
	The Princess Alexandra Hospital NHS Trust	Medisoft
	The Rotherham NHS Foundation Trust	In-house
	Torbay and South Devon NHS Foundation Trust	Medisoft
	United Lincolnshire Hospitals NHS Trust	In-house
	Wye Valley NHS Trust	Medisoft
Centres first included in the year 3 report	Abertawe Bro Morgannwg University Health Board	OpenEyes
	Aneurin Bevan University Health Board	In-house
	Brighton and Sussex University Hospitals NHS Trust	Medisoft
	Care UK (Emersons Green NHS Treatment Centre)	Medisoft
	Care UK (North East London NHS Treatment Centre)	Medisoft
	Care UK (Peninsula NHS Treatment Centre)	Medisoft
	Care UK (Rochdale Ophthalmology Clinical Assessment and Treatment Service)	Medisoft
	Care UK (SH Devises NHS Treatment Centre)	Medisoft
	Care UK (Shepton Mallet NHS Treatment Centre)	Medisoft
	Care UK (Southampton NHS Treatment Centre)	Medisoft
	Care UK (St. Mary's NHS Treatment Centre)	Medisoft
	Care UK (Will Adams NHS Treatment Centre)	Medisoft

Appendix 3 continued: Eligible cataract surgical centres in England and Wales

Category	Organisation name	Data collection system
Centres first included in the year 3 report	East Cheshire NHS Trust	Medisoft
	North Cumbria University Hospital NHS Trust	Medisoft
	North Middlesex University Hospital NHS Trust	Medisoft
	Royal Liverpool and Broadgreen University Hospitals NHS Trust	Medisoft
	SpaMedica (Birmingham)	Medisoft
	SpaMedica (Sheffield)	Medisoft
	St Stephens Gate Medical Practice	In-house
	Surrey and Sussex Healthcare NHS Trust	Medisoft
	The Dudley Group NHS Foundation Trust	Medisoft
Submitted data, but for <50 eligible cases	SpaMedica (Skelmersdale)	Medisoft
	Taunton and Somerset NHS Foundation Trust ¹⁰	Medisoft
	The Royal Wolverhampton NHS Trust ¹⁰	Medisoft
	Queen Victoria Hospital NHS Foundation Trust ¹⁰	Medisoft
Signed up to participate in the audit, but yet to submit data	Ashford and St Peter's Hospitals NHS Foundation Trust	TBC
	Buckinghamshire Healthcare NHS Trust	Medisoft
	City Hospitals Sunderland NHS Foundation Trust	TBC
	Dorset County Hospital NHS Foundation Trust	TBC
	George Eliot Hospital NHS Trust	Medisoft
	Guy's and St Thomas' NHS Foundation Trust	OpenEyes
	Hull and East Yorkshire Hospitals NHS Trust	TBC
	Hywel Dda University Health Board	Medisoft
	Kettering General Hospital NHS Foundation Trust	TBC
	Luton and Dunstable Hospital NHS Foundation Trust	TBC
	Maidstone and Tunbridge Wells NHS Trust	TBC
	Milton Keynes Hospital NHS Foundation Trust	TBC
	Pennine Acute Hospitals NHS Trust	TBC
	Powys Teaching Health Board	TBC
	Royal Devon and Exeter NHS Foundation Trust	TBC
	Southend University Hospital NHS Foundation Trust	TBC
	The Queen Elizabeth Hospital King's Lynn NHS Foundation Trust	TBC
	University Hospitals of Leicester NHS Trust	TBC
	University Hospitals of North Midlands NHS Trust	TBC
	West Hertfordshire Hospitals NHS Trust	TBC

Appendix 3 continued: Eligible cataract surgical centres in England and Wales

Category	Organisation name	Data collection system
Yet to sign up or declined participation	Betsi Cadwaladr University Health Board	TBC
	Chelsea and Westminster Hospital NHS Foundation Trust	TBC
	Countess of Chester Hospital NHS Foundation Trust	TBC
	Doncaster and Bassetlaw Hospitals NHS Foundation Trust	TBC
	East and North Hertfordshire NHS Trust	TBC
	Lancashire Teaching Hospitals NHS Foundation Trust	TBC
	University Hospitals of Derby and Burton NHS Foundation Trust	TBC
	West Suffolk NHS Foundation Trust	OpenEyes
	Worcestershire Acute Hospitals NHS Trust	Medisoft
	Western Sussex Hospitals NHS Trust	OpenEyes

1: Data combined and reported as Moorfields Eye Hospital NHS Foundation Trust.

2: Includes patients from Airedale NHS Foundation Trust.

3: This is a new NHS Trust formed from a merger of two participating NHS Trusts that both had data in the year 1 prospective report, these NHS Trusts were Peterborough and Stamford Hospitals NHS Foundation Trust and Hinchingbrooke Health Care NHS Trust.

4: This is a new NHS Trust formed from a merger of two participating NHS Trusts, University Hospitals Birmingham NHS Foundation Trust who have contributed to the audit since year 1 and Heart of England NHS Foundation Trust who first contributed in year 2.

5: This is a new NHS Trust formed from a merger of two NHS Trusts, The Ipswich Hospital NHS Trust who first contributed to year 2 and Colchester Hospital University NHS Foundation Trust who did not contribute data while a separate entity.

6: This centre participated in the year 1 prospective audit, but due to a data extraction problem the data from this centre could not be included in the year 1 report.

7: This centre had sufficient eligible cases for inclusion in the year 1 report, but did not submit ≥50 eligible operations for year 2 and did not have any data extracted for year 3.

8: This centre had sufficient eligible cases for inclusion in both the year 1 and 2 report, but did not have any data extracted for year 3 due to non-use of the centres EMR during the third year of the audit.

9: This centre had sufficient eligible cases for inclusion in the year 2 report, but did not have any data extracted for year 3 due to non-use of the centres EMR during the third year of the audit.

10: These centres have signed up to participate and have the EMR in use in their centre, but due to <50 operations being recorded on the EMR their data was not extracted.

TBC – To be confirmed.

Appendix 4: Interpreting the graphs

Among the results there are two types of graphs. The labelling of centres is a ranking of the total number of operations contributed by each centre and calculated for the number of operations eligible in the first year the centre has sufficient operations for reporting. Centres 1 – 56 are the centres that were included in the first audit year report, where centre 1 had the most operations and centre 56 the fewest. Centres 57 – 87 are the centres first appearing in the second audit year report, where centre 57 had the most operations and centre 87 the fewest. Centres 88 – 108 are the centres first appearing in the third audit year report, where centre 88 had the most operations and centre 108 the fewest. Some centre numbers have become redundant due to mergers of NHS Trusts or one NHS Trust taking over the ophthalmology service in another NHS Trust.

- Box and Whisker plots – the spread for the variable of interest is shown for each of the contributing centres. The central line is the median or ‘middle’ value. The box outlines the inter quartile range (25% and 75% centiles), and the horizontal lines above and below the inter quartile range display either the position of the furthest value or a value at a ‘reasonable’ stretch from the middle. Extreme values are the dots beyond that. Figure 1a (page 16) is an example of a Box and Whisker plot
- Funnel plots – the spread of dots on these looks like a funnel going from left to right. Each dot represents a result for a centre as read off the vertical axis (proportion or rate). The funnel effect results from increasing statistical precision as the numbers get higher going along the horizontal axis, for example Figure 5 (page 27). Some of the plots have lines on them showing what is expected. A result above the top line (three standard deviations) would be deemed unacceptably high, for example Figure 6 (page 27)

Appendix 5: Glossary

Abbreviation	Description
CDVA	Corrected distance visual acuity
CF	The ability to count fingers
CI	Confidence Interval
COP	Clinical Outcomes Publication
EMR	Electronic Medical Record
HM	The ability to distinguish hand movements
HQIP	Healthcare Quality Improvement Partnership
IMD	Index of Multiple Deprivation is the measure of relative deprivation for small areas in England
IOL	Intraocular lens is an artificial lens generally inserted into the capsule of the lens after cataract removal
IQR	Inter Quartile Range
NCAPOP	National Clinical Audit and Patient Outcomes Programme
NHS	National Health Service
NOD	National Ophthalmology Database
NPL	No perception of light
NWIS	National Wales Information Service
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
PHVA	Pinhole visual acuity. The pinhole is an eye shield with several small holes which allow light rays to reach the retina without the interference of optical problems of the eye. It is used to test visual acuity
PL	Perception light
RCOphth	The Royal College of Ophthalmologists
UDVA	Uncorrected distance visual acuity
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
Yes / No	Yes or No

Appendix 6: Preoperative, postoperative and change in VA percentages

Appendix 6 table: The percentage of eyes with preoperative VA, postoperative VA and change in VA data for participating centres in the audit

Centre name	Centre number	Estimate of cases submitted to the audit (%)*	Number of eligible operations**	% with preoperative VA data	Number of operations eligible for postoperative VA results	% with postoperative VA data	% with change in VA data
Moorfields Eye Hospital NHS Foundation Trust	1	96.2	17,621	73.6	14,362	71.8	65.0
The Newcastle upon Tyne Hospitals NHS Foundation Trust	2	98.4	7,863	94.2	6,610	83.5	79.4
Norfolk and Norwich University Hospitals NHS Foundation Trust	3	99.1	4,263	94.5	3,467	14.0	13.6
Leeds Teaching Hospitals NHS Trust	4	98.6	4,520	97.2	3,769	89.4	86.9
Oxford University Hospitals NHS Foundation Trust	6	98.8	3,717	92.4	3,107	31.1	29.1
University Hospitals Bristol NHS Foundation Trust	7	99.2	3,958	98.3	3,209	88.0	86.8
Gloucestershire Hospitals NHS Foundation Trust	8	100.0	3,453	92.8	2,985	82.7	78.4
Sheffield Teaching Hospitals NHS Foundation Trust	9	100.0	3,260	97.6	2,770	97.2	95.1
Sandwell and West Birmingham Hospitals NHS Trust	10	96.5	4,038	94.2	3,560	92.4	87.2
University Hospital Southampton NHS Foundation Trust	11	87.9	2,978	96.4	2,493	94.2	90.6
Royal Berkshire NHS Foundation Trust	12	56.3	2,585	97.6	2,095	97.1	95.8
Calderdale and Huddersfield NHS Foundation Trust	13	98.9	2,148	97.1	1,823	82.7	80.1
Mid Cheshire Hospitals NHS Foundation Trust	14	100.0	2,833	93.7	2,369	69.3	64.2
The Mid Yorkshire Hospitals NHS Trust	15	99.6	1,975	98.5	1,702	79.5	78.4
Cardiff & Vale University LHB	16	96.4	2,412	89.6	2,165	50.2	45.5
Epsom and St Helier University Hospitals NHS Trust	17	98.9	2,573	96.9	2,122	89.8	87.7
Barts Health NHS Trust	18	99.3	3,819	90.0	3,132	83.5	75.5
Frimley Health NHS Foundation Trust	19	98.7	3,130	97.2	2,589	59.3	57.4
Bradford Teaching Hospitals NHS Foundation Trust	20	98.5	2,094	94.5	1,721	62.9	59.3
University Hospitals Plymouth NHS Trust	22	94.9	2,504	98.8	2,157	89.7	88.6
University Hospitals Birmingham NHS Foundation Trust	23	99.2	4,045	96.8	3,215	96.2	93.1
Hampshire Hospitals NHS Foundation Trust	24	77.0	2,334	95.2	1,989	72.4	68.8

Appendix 6 table continued: The percentage of eyes with preoperative VA, postoperative VA and change in VA data for participating centres in the audit

Centre name	Centre number	Estimate of cases submitted to the audit (%)*	Number of eligible operations**	% with preoperative VA data	Number of operations eligible for postoperative VA results	% with postoperative VA data	% with change in VA data
Royal Cornwall Hospitals NHS Trust	25	98.2	1,671	90.5	1,422	84.5	79.0
Manchester University NHS Foundation Trust	26	56.1	3,056	97.8	2,537	92.6	90.5
King's College Hospital NHS Foundation Trust	27	95.4	7,041	96.4	5,875	92.7	89.4
Shrewsbury and Telford Hospital NHS Trust	28	95.9	2,837	84.7	2,323	80.8	68.7
The Hillingdon Hospitals NHS Foundation Trust	30	100.0	1,750	97.1	1,431	86.0	83.6
Aintree University Hospital NHS Foundation Trust	31	98.8	1,129	93.3	924	94.4	88.1
Royal United Hospitals Bath NHS Foundation Trust	32	100.0	1,523	89.0	1,304	67.3	61.0
Chesterfield Royal Hospital NHS Foundation Trust	33	98.9	1,644	96.3	1,378	96.4	92.8
Mid Essex Hospital Services NHS Trust	34	99.8	1,501	87.0	1,236	61.9	55.1
Harrogate and District NHS Foundation Trust	35	99.8	1,158	95.9	941	86.0	83.0
North West Anglia NHS Foundation Trust	36	99.7	2,709	97.5	2,240	77.8	76.0
Northern Devon Healthcare NHS Trust	37	100.0	1,400	98.6	1,160	89.1	88.8
Wirral University Teaching Hospital NHS Foundation Trust	39	98.6	922	80.2	769	79.3	62.9
South Warwickshire NHS Foundation Trust	40	99.7	1,872	97.4	1,606	75.1	73.3
Isle of Wight NHS Trust	41	93.8	1,342	91.6	1,107	86.5	79.6
St Helens and Knowsley Teaching Hospitals NHS Trust	42	74.0	1,459	98.1	1,305	58.2	57.0
Wrightington, Wigan and Leigh NHS Foundation Trust	43	99.1	1,160	99.4	942	93.0	92.4
Warrington and Halton Hospitals NHS Foundation Trust	44	81.3	1,193	96.7	954	84.0	81.8
South Tees Hospitals NHS Foundation Trust	45	76.5	2,342	96.4	1,913	55.9	54.0
The Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust	46	64.3	2,559	92.3	2,129	58.6	54.9
Barking, Havering and Redbridge University Hospitals NHS Trust	47	73.2	1,623	86.9	1,303	51.7	45.3
Royal Free London NHS Foundation Trust	48	47.6	1,894	96.0	1,564	25.3	24.6
University Hospitals Coventry and Warwickshire NHS Trust	49	94.7	2,726	96.0	2,301	94.3	90.6
Barnsley Hospital NHS Foundation Trust	50	13.3	169	11.2	134	9.0	2.2

Appendix 6 table continued: The percentage of eyes with preoperative VA, postoperative VA and change in VA data for participating centres in the audit

Centre name	Centre number	Estimate of cases submitted to the audit (%)*	Number of eligible operations**	% with preoperative VA data	Number of operations eligible for postoperative VA results	% with postoperative VA data	% with change in VA data
Salisbury NHS Foundation Trust	51	99.4	1,205	99.4	1,027	98.3	97.9
London North West University Healthcare NHS Trust	52	89.8	549	73.2	461	67.0	52.1
Nottingham University Hospitals NHS Trust	55	57.8	1,889	87.9	1,564	88.2	77.8
Yeovil District Hospital NHS Foundation Trust	56	100.0	924	100.0	805	98.1	98.1
SpaMedica (Manchester)	57	100.0	3,620	99.8	3,053	88.9	88.8
SpaMedica (Wakefield)	58	100.0	5,708	99.9	4,849	89.9	89.8
East Sussex Healthcare NHS Trust	59	100.0	3,054	89.4	2,579	71.5	65.4
Imperial College Healthcare NHS Trust	60	98.1	3,506	92.9	2,929	93.9	87.1
Portsmouth Hospitals NHS Trust	61	97.4	2,393	96.6	2,016	93.9	90.6
Cambridge University Hospitals NHS Foundation Trust	63	97.0	2,289	86.9	1,938	78.6	69.1
East Kent Hospitals University NHS Foundation Trust	64	93.9	2,553	85.5	2,053	57.6	49.8
East Suffolk and North Essex NHS Foundation Trust	65	44.5	2,638	94.4	2,238	22.7	21.9
SpaMedica (Wirral)	66	100.0	2,472	99.9	2,025	92.5	92.5
County Durham and Darlington NHS Foundation Trust	67	98.3	1,615	92.4	1,447	97.3	92.0
United Lincolnshire Hospitals NHS Trust	68	47.0	1,635	94.8	1,372	57.1	54.0
SpaMedica (Newton-le-Willows)	69	100.0	1,634	99.9	1,367	90.1	90.0
Northampton General Hospital NHS Trust	70	82.4	1,892	70.7	1,594	24.7	17.6
SpaMedica (Liverpool)	71	100.0	1,396	100.0	1,143	87.6	87.6
James Paget University Hospitals NHS Foundation Trust	72	90.1	1,829	88.4	1,483	74.7	69.0
Bolton NHS Foundation Trust	73	99.9	1,908	99.4	1,598	89.0	88.4
Kingston Hospital NHS Foundation Trust	74	66.2	1,344	26.0	1,152	0.6	0.2
Northern Lincolnshire and Goole NHS Foundation Trust	75	34.1	862	76.2	861	96.6	74.2
The Rotherham NHS Foundation Trust	76	61.1	615	95.8	483	47.6	45.1
Torbay and South Devon NHS Foundation Trust	77	98.2	1,413	93.9	1,107	45.4	43.5
Great Western Hospitals NHS Foundation Trust	78	86.1	1,605	91.0	1,286	83.2	74.6
SpaMedica (Bolton)	79	100.0	2,737	100.0	2,178	88.4	88.3
The Princess Alexandra Hospital NHS Trust	80	92.8	668	97.3	563	90.8	88.3

Appendix 6 table continued: The percentage of eyes with preoperative VA, postoperative VA and change in VA data for participating centres in the audit

Centre name	Centre number	Estimate of cases submitted to the audit (%)*	Number of eligible operations**	% with preoperative VA data	Number of operations eligible for postoperative VA results	% with postoperative VA data	% with change in VA data
Wye Valley NHS Trust	81	5.6	112	76.8	112	79.5	62.5
Cwm Taf University LHB	82	100.0	1,370	81.8	1,082	80.8	64.6
Sherwood Forest Hospitals NHS Foundation Trust	83	63.0	1,150	61.8	987	7.8	5.2
Royal Surrey County Hospital NHS Foundation Trust	84	17.9	310	97.7	262	96.2	93.5
Southport and Ormskirk Hospital NHS Trust	86	90.8	818	58.7	682	70.2	38.7
Stockport NHS Foundation Trust	87	6.1	107	8.4	107	0.0	0.0
Care UK (Shepton Mallet NHS Treatment Centre)	88	100.0	2,466	99.1	2,079	96.3	95.5
Care UK (St Marys NHS Treatment Centre)	89	99.8	2,455	99.8	2,094	86.4	86.2
Care UK (Emersons Green NHS Treatment Centre)	90	100.0	2,446	99.6	2,175	58.0	57.7
Care UK (Will Adams NHS Treatment Centre)	91	100.0	2,142	99.3	1,761	98.6	97.9
SpaMedica (Sheffield)	92	100.0	1,718	100.0	1,258	87.0	87.0
Care UK (Peninsula NHS Treatment Centre)	93	100.0	1,604	95.5	1,287	97.0	93.4
North Cumbria University Hospitals NHS Trust	94	53.8	1,385	97.5	1,109	12.1	11.9
Care UK (Rochdale Ophthalmology Clinical Assessment and Treatment Centre)	95	100.0	1,115	98.6	931	76.2	75.4
Royal Liverpool and Broadgreen University Hospitals NHS Trust	96	37.7	1,051	92.4	756	33.1	32.1
Care UK (North East London NHS Treatment Centre)	97	98.5	930	88.2	766	95.2	82.6
North Middlesex University Hospital NHS Trust	98	88.0	887	74.3	642	86.0	63.1
Brighton and Sussex University Hospitals NHS Trust	99	16.1	466	98.5	119	5.0	5.0
Care UK (SH Devizes NHS Treatment Centre)	100	100.0	470	100.0	385	99.2	99.2
Surrey and Sussex Healthcare NHS Trust	101	19.6	440	67.3	395	2.3	0.8
Aneurin Bevan University HB	102	36.7	427	95.3	262	50.0	46.6
Care UK (Southampton NHS Treatment Centre)	103	34.7	413	86.7	286	87.4	86.0
SpaMedica (Birmingham)	104	99.1	219	100.0	29	93.1	93.1
St Stephens Gate Medical Practice	105	-	202	99.5	196	89.3	88.8

Appendix 6 table continued: The percentage of eyes with preoperative VA, postoperative VA and change in VA data for participating centres in the audit

Centre name	Centre number	Estimate of cases submitted to the audit (%)*	Number of eligible operations**	% with preoperative VA data	Number of operations eligible for postoperative VA results	% with postoperative VA data	% with change in VA data
The Dudley Group NHS Foundation Trust	106	24.2	185	33.0	135	56.3	17.0
Abertawe Bro Morgannwg University Health Board	107	2.5	114	83.3	103	30.1	30.1
East Cheshire NHS Trust	108	52.7	50	6.0	0	0.0	0.0
Overall for all centres	N/A	84.5	213,808	91.9	177,380	76.0	72.1

*The estimate of the proportion of cases submitted to the audit is derived from the number of completed cataract operations supplied to NHS Digital or NWIS for the audit period. This estimation uses a pro rata calculation for a centre's denominator where the proportion of time during the audit cycle that a centre had been recording cataract operations was multiplied by the number of cataract operations supplied to NHS Digital or NWIS. The numerator was the number of operations a centre had supplied to the audit. Centres that had more operations submitted to the national audit than in the NHS Digital or NWIS data were all assumed to have a complete submission rate as the actual rate was not possible to estimate.

**1 centre's VA data not included.

Appendix 7: Case complexity PCR and VA Loss

Appendix 7 table: Posterior capsular rupture and VA Loss results for participating centres in the audit

		Posterior Capsular Rupture Overall Consultant Surgeon PCR rate = 1.1%				Visual Acuity Loss Overall Consultant Surgeon VA Loss rate = 0.9%			
Centre name	Centre number	Number of operations	Unadjusted PCR rate (%)	Case complexity index (%)	Adjusted PCR rate (%)	Number of operations	Unadjusted VA Loss rate (%)	Case complexity index (%)	Adjusted VA Loss rate (%)
Moorfields Eye Hospital NHS Foundation Trust	1	17,621	1.2	1.8	0.8	9,338	0.4	0.8	0.4
The Newcastle upon Tyne Hospitals NHS Foundation Trust	2	7,863	1.4	1.6	1.0	5,246	0.5	0.8	0.5
Norfolk and Norwich University Hospitals NHS Foundation Trust	3	4,263	0.7	1.5	0.5				
Leeds Teaching Hospitals NHS Trust	4	4,520	1.1	1.9	0.6	3,276	0.6	1.1	0.5
York Teaching Hospital NHS Foundation Trust	5	4,067	0.8	1.6	0.6				
Oxford University Hospitals NHS Foundation Trust	6	3,717	2.3	2.2	1.2				
University Hospitals Bristol NHS Foundation Trust	7	3,958	1.8	2.1	1.0	2,786	1.0	1.1	0.8
Gloucestershire Hospitals NHS Foundation Trust	8	3,453	1.2	1.7	0.8	2,339	0.6	0.9	0.6
Sheffield Teaching Hospitals NHS Foundation Trust	9	3,260	1.6	1.8	0.9	2,635	0.8	0.9	0.8
Sandwell and West Birmingham Hospitals NHS Trust	10	4,038	2.4	2.2	1.2	3,106	0.7	0.8	0.8
University Hospital Southampton NHS Foundation Trust	11	2,978	1.5	1.7	1.0	2,259	0.3	1.0	0.3
Royal Berkshire NHS Foundation Trust	12	2,585	1.1	1.7	0.7	2,007	0.2	0.7	0.3
Calderdale and Huddersfield NHS Foundation Trust	13	2,148	0.9	1.5	0.7	1,461	0.7	1.0	0.6
Mid Cheshire Hospitals NHS Foundation Trust	14	2,833	1.2	1.8	0.7	1,522	0.8	0.9	0.8
The Mid Yorkshire Hospitals NHS Trust	15	1,975	1.3	1.8	0.8	1,334	0.7	1.2	0.5
Cardiff & Vale University LHB	16	2,412	1.5	1.8	0.9				
Epsom and St Helier University Hospitals NHS Trust	17	2,573	2.1	1.8	1.3	1,860	0.1	1.0	0.1
Barts Health NHS Trust	18	3,819	1.6	1.9	0.9	2,364	0.5	0.8	0.6
Frimley Health NHS Foundation Trust	19	3,130	1.4	1.7	0.9				
Bradford Teaching Hospitals NHS Foundation Trust	20	2,094	1.2	1.8	0.7				
University Hospitals Plymouth NHS Trust	22	2,504	0.6	1.8	0.4	1,911	0.7	1.0	0.6
University Hospitals Birmingham NHS Foundation Trust	23	4,045	1.7	2.0	1.0	2,993	0.8	1.0	0.7
Hampshire Hospitals NHS Foundation Trust	24	2,334	1.0	1.4	0.8	1,368	0.5	0.9	0.5

Appendix 7 table continued: Posterior capsular rupture and VA Loss results for participating centres in the audit

		Posterior Capsular Rupture Overall Consultant Surgeon PCR rate = 1.1 %				Visual Acuity Loss Overall Consultant Surgeon VA Loss rate = 0.9 %			
Centre name	Centre number	Number of operations	Unadjusted PCR rate (%)	Case complexity index (%)	Adjusted PCR rate (%)	Number of operations	Unadjusted VA Loss rate (%)	Case complexity index (%)	Adjusted VA Loss rate (%)
Royal Cornwall Hospitals NHS Trust	25	1,671	1.6	1.7	1.0	1,124	0.8	1.1	0.6
Manchester University NHS Foundation Trust	26	3,056	1.7	2.0	0.9	2,297	0.3	0.9	0.3
King's College Hospital NHS Foundation Trust	27	7,041	1.5	1.6	1.0	5,252	1.0	0.9	1.0
Shrewsbury and Telford Hospital NHS Trust	28	2,837	1.1	1.6	0.8	1,596	1.2	0.8	1.3
The Hillingdon Hospitals NHS Foundation Trust	30	1,750	2.0	2.3	1.0	1,196	0.4	0.7	0.5
Aintree University Hospital NHS Foundation Trust	31	1,129	2.6	1.7	1.7	814	1.1	1.0	1.0
Royal United Hospitals Bath NHS Foundation Trust	32	1,523	1.0	2.0	0.5	796	1.4	1.0	1.2
Chesterfield Royal Hospital NHS Foundation Trust	33	1,644	2.7	1.9	1.6	1,279	0.7	0.9	0.7
Mid Essex Hospital Services NHS Trust	34	1,501	1.9	1.4	1.5				
Harrogate and District NHS Foundation Trust	35	1,158	0.5	1.9	0.3	781	0.9	0.9	0.9
North West Anglia NHS Foundation Trust	36	2,709	1.3	1.7	0.8	1,702	0.4	1.0	0.4
Northern Devon Healthcare NHS Trust	37	1,400	1.1	1.7	0.7	1,030	0.7	1.0	0.6
Wirral University Teaching Hospital NHS Foundation Trust	39	922	0.5	1.7	0.4	484	1.4	1.1	1.2
South Warwickshire NHS Foundation Trust	40	1,872	0.8	1.7	0.5	1,178	0.4	1.1	0.3
Isle of Wight NHS Trust	41	1,342	0.7	1.5	0.5	881	1.0	0.9	1.0
St Helens and Knowsley Teaching Hospitals NHS Trust	42	1,459	1.3	1.6	0.9				
Wrightington, Wigan and Leigh NHS Foundation Trust	43	1,160	0.8	1.3	0.6	870	0.7	0.8	0.8
Warrington and Halton Hospitals NHS Foundation Trust	44	1,193	0.6	1.5	0.4	780	0.9	0.8	1.0
South Tees Hospitals NHS Foundation Trust	45	2,342	1.2	1.8	0.7				
The Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust	46	2,559	0.8	1.6	0.6				
Barking, Havering and Redbridge University Hospitals NHS Trust	47	1,623	1.5	1.6	1.0				
Royal Free London NHS Foundation Trust	48	1,894	1.3	1.7	0.8				
University Hospitals Coventry and Warwickshire NHS Trust	49	2,726	0.9	2.0	0.5	2,085	0.5	0.9	0.5

Appendix 7 table continued: Posterior capsular rupture and VA Loss results for participating centres in the audit

		Posterior Capsular Rupture Overall Consultant Surgeon PCR rate = 1.1 %				Visual Acuity Loss Overall Consultant Surgeon VA Loss rate = 0.9 %			
Centre name	Centre number	Number of operations	Unadjusted PCR rate (%)	Case complexity index (%)	Adjusted PCR rate (%)	Number of operations	Unadjusted VA Loss rate (%)	Case complexity index (%)	Adjusted VA Loss rate (%)
Barnsley Hospital NHS Foundation Trust	50	169	0.6	1.1	0.6				
Salisbury NHS Foundation Trust	51	1,205	1.4	1.6	0.9	1,005	0.3	0.9	0.3
London North West University Healthcare NHS Trust	52	549	2.7	2.8	1.1				
Nottingham University Hospitals NHS Trust	55	1,889	1.2	1.9	0.7	1,217	0.8	0.9	0.9
Yeovil District Hospital NHS Foundation Trust	56	924	2.2	1.4	1.7	790	0.5	0.9	0.5
SpaMedica (Manchester)	57	3,620	0.6	1.3	0.5	2,711	0.1	0.7	0.1
SpaMedica (Wakefield)	58	5,708	0.4	1.1	0.4	4,356	0.2	0.7	0.3
East Sussex Healthcare NHS Trust	59	3,054	1.3	1.6	0.9	1,686	0.4	0.9	0.4
Imperial College Healthcare NHS Trust	60	3,506	3.1	2.5	1.4	2,552	1.1	0.9	1.1
Portsmouth Hospitals NHS Trust	61	2,393	1.6	1.6	1.1	1,827	0.5	1.0	0.5
Cambridge University Hospitals NHS Foundation Trust	63	2,289	1.0	1.8	0.6	1,339	0.2	0.8	0.2
East Kent Hospitals University NHS Foundation Trust	64	2,553	1.1	1.8	0.7				
East Suffolk and North Essex NHS Foundation Trust	65	2,638	1.2	1.6	0.8				
SpaMedica (Wirral)	66	2,472	0.4	1.3	0.3	1,873	0.3	0.7	0.4
County Durham and Darlington NHS Foundation Trust	67	1,615	1.0	1.7	0.7	1,330	0.5	0.9	0.4
United Lincolnshire Hospitals NHS Trust	68	1,635	1.3	1.6	0.9				
SpaMedica (Newton-le-Willows)	69	1,634	0.2	1.3	0.2	1,230	0.2	0.8	0.3
Northampton General Hospital NHS Trust	70	1,892	1.1	1.6	0.7				
SpaMedica (Liverpool)	71	1,396	0.5	1.3	0.4	1,001	0.1	0.6	0.1
James Paget University Hospitals NHS Foundation Trust	72	1,829	1.0	1.5	0.7	1,024	0.4	0.7	0.5
Bolton NHS Foundation Trust	73	1,908	1.2	1.9	0.7	1,413	0.6	0.8	0.7
Kingston Hospital NHS Foundation Trust	74	1,344	1.6	1.5	1.2				
Northern Lincolnshire and Goole NHS Foundation Trust	75	862	1.5	1.4	1.2	639	1.1	0.8	1.2
The Rotherham NHS Foundation Trust	76	615	0.8	1.7	0.5				
Torbay and South Devon NHS Foundation Trust	77	1,413	1.9	1.7	1.2				
Great Western Hospitals NHS Foundation Trust	78	1,605	1.1	1.5	0.8	959	1.1	1.2	0.8
SpaMedica (Bolton)	79	2,737	0.4	1.2	0.4	1,924	0.4	0.7	0.5

Appendix 7 table continued: Posterior capsular rupture and VA Loss results for participating centres in the audit

		Posterior Capsular Rupture Overall Consultant Surgeon PCR rate = 1.1%				Visual Acuity Loss Overall Consultant Surgeon VA Loss rate = 0.9%			
Centre name	Centre number	Number of operations	Unadjusted PCR rate (%)	Case complexity index (%)	Adjusted PCR rate (%)	Number of operations	Unadjusted VA Loss rate (%)	Case complexity index (%)	Adjusted VA Loss rate (%)
The Princess Alexandra Hospital NHS Trust	80	668	2.2	1.7	1.4	497	1.0	0.9	1.1
Wye Valley NHS Trust	81	112	0.9	1.6	0.6	70	0.0	1.1	0.0
Cwm Taf University LHB	82	1,370	1.2	2.0	0.7	699	1.3	1.0	1.2
Sherwood Forest Hospitals NHS Foundation Trust	83	1,150	0.3	1.4	0.3				
Royal Surrey County Hospital NHS Foundation Trust	84	310	0.0	1.3	0.0	245	1.2	0.8	1.4
Southport and Ormskirk Hospital NHS Trust	86	818	0.9	1.9	0.5				
Stockport NHS Foundation Trust	87	107	1.9	1.5	1.4				
Care UK (Shepton Mallet NHS Treatment Centre)	88	2,466	0.3	1.3	0.2	1,986	0.4	1.1	0.3
Care UK (St Marys NHS Treatment Centre)	89	2,455	0.8	1.1	0.8	1,804	0.1	0.6	0.1
Care UK (Emersons Green NHS Treatment Centre)	90	2,446	0.7	1.5	0.6				
Care UK (Will Adams NHS Treatment Centre)	91	2,142	0.7	1.1	0.7	1,724	0.5	0.7	0.6
SpaMedica (Sheffield)	92	1,718	0.9	1.1	0.9	1,095	0.3	0.7	0.4
Care UK (Peninsula NHS Treatment Centre)	93	1,604	0.2	1.1	0.2	1,202	0.1	0.6	0.1
North Cumbria University Hospitals NHS Trust	94	1,385	0.9	1.4	0.7				
Care UK (Rochdale Ophthalmology Clinical Assessment and Treatment Centre)	95	1,115	0.6	1.1	0.6	702	0.9	0.6	1.2
Royal Liverpool and Broadgreen University Hospitals NHS Trust	96	1,051	2.2	2.2	1.1				
Care UK (North East London NHS Treatment Centre)	97	930	0.4	1.3	0.4	633	0.9	0.6	1.5
North Middlesex University Hospital NHS Trust	98	887	1.0	1.7	0.7	405	0.5	0.8	0.6
Brighton and Sussex University Hospitals NHS Trust	99	466	0.6	1.5	0.5				
Care UK (SH Devizes NHS Treatment Centre)	100	470	0.0	1.7	0.0	382	0.3	0.7	0.3
Surrey and Sussex Healthcare NHS Trust	101	440	2.7	1.4	2.1				
Aneurin Bevan University HB	102	427	0.0	2.2	0.0				
Care UK (Southampton NHS Treatment Centre)	103	413	1.5	1.1	1.4	246	0.0	0.5	0.0
SpaMedica (Birmingham)	104	219	1.4	1.5	1.0				
St Stephens Gate Medical Practice	105	202	0.0	1.2	0.0	174	0.6	0.7	0.7

Appendix 7 table continued: Posterior capsular rupture and VA Loss results for participating centres in the audit

		Posterior Capsular Rupture Overall Consultant Surgeon PCR rate = 1.1 %				Visual Acuity Loss Overall Consultant Surgeon VA Loss rate = 0.9 %			
Centre name	Centre number	Number of operations	Unadjusted PCR rate (%)	Case complexity index (%)	Adjusted PCR rate (%)	Number of operations	Unadjusted VA Loss rate (%)	Case complexity index (%)	Adjusted VA Loss rate (%)
The Dudley Group NHS Foundation Trust	106	185	0.5	1.8	0.3				
Abertawe Bro Morgannwg University Health Board	107	114	1.8	2.0	0.9				
East Cheshire NHS Trust	108	50	2.0	1.3	1.7				

The case complexity index is an estimate of the overall predicted probability of the adverse event based on the reported case complexity.

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