

**Title of paper:**

The Royal College of Ophthalmologists' National Ophthalmology Database Study of Cataract Surgery:  
report 11, Techniques and Complications of Local Anaesthesia

**Running Title:**

Techniques and complications of local anaesthesia in the United Kingdom

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## **Abstract**

### **Objective:**

To describe variation in local anaesthesia techniques and complications over a 10-year period for cataract surgery in the United Kingdom.

### **Methods:**

Data from the Royal College of Ophthalmologists National Ophthalmology Database was used.

Eligible for analysis were 1 195 882 cataract operations performed using local anaesthesia between 01/04/2010 and 31/03/2020 in 80 centres.

### **Results:**

Overall, topical anaesthesia alone was used in 152 321 (12.7%) operations, combined topical and intracameral anaesthesia in 522 849 (43.7%), sub-Tenon's in 461 175 (38.6%), and peribulbar/retrobulbar anaesthesia in 59 537 (5.0%). In National Health Service (NHS) institutions, 48.3% operations were topical with/without intracameral vs 88.7% in independent sector treatment centres (ISTC). 45.9% were sub-Tenon's in NHS vs 9.6% in ISTC. 5.8% were peribulbar/retrobulbar in NHS vs 1.7% in ISTC. Anaesthetic complication rates decreased from 2.7% in the 2010 NHS year to 1.5% in the 2019 NHS year (overall, 2.1% for NHS; 0.2% for ISTC). Overall anaesthetic complication rates were 0.3%, 0.3%, 3.5% and 3.1% for topical alone, combined topical/intracameral, sub-Tenon's and peribulbar/retrobulbar respectively. Complication rates were higher for sharp needle anaesthesia (peribulbar/retrobulbar) in patients taking warfarin rather than direct oral anticoagulants (4.8% vs 3.1%;  $p=0.024$ ). Considerable variation was observed between centres on anaesthetic choices and anaesthetic complication rates.

### **Conclusions:**

Combined topical and intracameral is the most common choice of anaesthesia for cataract surgery in the United Kingdom and is associated with lower anaesthetic-related complication rates than sub-

Tenon's and peribulbar/retrobulbar anaesthesia. Variation in anaesthetic choice exists between centres and between NHS & ISTC sectors.

(250 words)

## Introduction

Cataract surgery is the most frequently performed operation in the National Health Service (NHS), with approximately 456 000 operations undertaken in England during the 2019 NHS year.[1] Along with the growth in the quantity and quality of cataract surgery being performed, anaesthetic techniques available for adult cataract surgery have also evolved. The goals of anaesthesia in cataract surgery include adequate analgesia, rapid recovery from anaesthesia and minimization of the risks of complications from both surgery and anaesthesia.[2]

Sharp needle local anaesthesia (LA) techniques such as retrobulbar and peribulbar blocks provide good analgesia and akinesia but are associated with higher risks of sight-threatening complications such as globe perforation.[3] In rare instances of inadvertent injection through the optic nerve sheath, life-threatening complications could also occur.[4] Therefore, it is unsurprising that there has been a shift in anaesthetic practice in the United Kingdom (UK) towards techniques that avoid the use of a sharp needle, such as sub-Tenon's injection which utilises a blunt cannula, and topical anaesthesia (with or without intracameral anaesthetic agents) for cataract surgery.[5] However, there remains a heterogeneity in the adoption of anaesthetic techniques by clinicians across the UK.[2] Previous reports on the safety profiles of different anaesthetic techniques were survey-based and published more than a decade ago.[3,6] Given the evolution of anaesthetic techniques for cataract surgery, there is a need to explore the trends in preferred anaesthetic technique and their corresponding complication rates in the clinical setting.

This analysis of data submitted to the Royal College of Ophthalmologists (RCOphth) National Ophthalmology Database (NOD) aims to describe the variation in choice of local anaesthesia for cataract surgery and the associated complications over the 10-year period from the 2010 to 2019 NHS years in the UK. This will help provide an evidence-based guide to safety strategies when deciding the choice of LA for cataract surgery.

## Methods

The RCOphth NOD is open to centres performing both NHS funded and private cataract surgery in England, Northern Ireland, Scotland, Wales, and the Channel Islands, in NHS centres, independent sector treatment centres (ISTCs) and private providers. The data, compliant with the RCOphth minimum national cataract dataset, is recorded on electronic medical record systems (EMR) or in-house databases and submitted annually for cataract operations using phacoemulsification to treat patients aged 18 years or older, where the primary intention was cataract surgery and not combined 'cataract + other' surgery, unless the 'other' surgery formed part of the cataract operation (e.g., an operative manoeuvre to increase the size of the pupil). Further information on an audit eligible cataract operation can found on the audit website ([www.nodaudit.org.uk](http://www.nodaudit.org.uk)).[7]

Eligible cataract operations were performed between 01/04/2010 and 31/03/2020 which equate to the 2010 to 2019 NHS years where each NHS year runs from 01 April to 31 March. The operations were performed in RCOphth NOD contributing centres with at least 50 eligible operations that supplied data for anaesthesia (type, needle, medication and complication). Excluded were operations without details for anaesthesia, operations where general anaesthesia was used and data from centres with <1% of patients taking anticoagulant medication due to concerns about the accuracy of medication records in these centres.

The anaesthetic technique was categorized as topical anaesthesia alone, combined topical and intracameral, sub-Tenon's and peribulbar/retrobulbar. In cases of multiple category allocations, the more invasive/advanced technique was considered to have been used.

Medications of interest were aspirin, antiplatelet agents (dipyridamole, clopidogrel, grepid, prasugrel, ticagrelor, ticlopidine), warfarin and direct oral anticoagulants (DOACs; dabigatran, rivaroxaban, edoxaban, apixaban). For patients taking aspirin plus anticoagulants, warfarin or DOACs, the medication of use was assumed to be the non-aspirin medication.

Anaesthetic complication rates are for 'one or more' anaesthetic complication and statistical comparisons between the anaesthetic complication rates and patients taking warfarin or DOACs were performed using chi-squared or Fisher's exact test where appropriate dependent on the sample size. Confidence intervals were calculated using the Fleiss quadratic continuity correction score,[8] and all analyses were performed using STATA 16 (StataCorp. 2019. Stata Statistical Software: Release 16. College Station, TX: StataCorp LLC).

The lead clinician and Caldicott Guardian (responsible nominee for data protection) at each centre provided written approval for anonymized data extraction. Anonymized database analyses of this type do not require ethical permission due to being viewed as audit or service evaluation (see <http://www.hra.nhs.uk/research-community/before-you-apply/determinewhether-your-study-is-research/>). This study was conducted in accordance with the declaration of Helsinki, and the UK's Data Protection Act.

## **Results**

### **Sample and demographics**

Within the study period, 1 195 882 operations performed on 814 826 patients were eligible for analysis from 80 centres, where 953 859 (79.8%) operations were performed in NHS institutions and 242 023 (20.2%) operations in the ISTC.

The operations were performed by 3 001 surgeons, 845 of whom had data for more than one surgeon grade, where 1 342 consultant surgeons performed 817 937 (68.4%) operations, 330 career grade non-consultant surgeons (associate specialist, staff grades and trust doctors) performed 107 494 (9.0%) operations, 1 637 more experienced trainee surgeons (years 3–7, fellows and registrars) performed 230 144 (19.2%) operations and 537 less experienced surgeons (years 1-2 or equivalent) performed 40 307 (3.4%) operations.

During the study period, 329 332 (40.4%) patients had surgery to both eyes including 870 (0.1%) patients who underwent immediate sequential bilateral cataract surgery (ISBCS). For the ISBCS patients, 378 (43.4%) were male, 490 (56.3%) were female, for 2 (0.2%) patients their gender was not stated and the median age at surgery was 71.4 years (IQR; 61.7-79.3 years).

For non ISBCS patients, 348 906 (42.9%) patients were male, 463 848 (57.0%) were female and the gender was not stated for 1 211 (0.1%) patients. First treated eye surgery was performed on 693 567 (58.1%) eyes where the median age at surgery was 76.2 years (IQR; 69.1-82.2 years), and second treated eye surgery was performed on 500 575 (41.9%) eyes where the median age at surgery was 77.2 years (IQR; 70.4-82.8 years).

### **Anaesthetic technique**

Topical anaesthesia alone was used in 152 321 (12.7%) operations (NHS year 2010 to 2019 range; 11.2% - 13.0%), combined topical and intracameral anaesthesia in 522 849 (43.7%) operations (NHS year range; 31.7% - 50.9%), sub-Tenon's anaesthesia in 461 175 (38.6%) operations (NHS year range; 45.5% - 34.0%), and peribulbar/retrobulbar anaesthesia in 59 537 (5.0%) operations (NHS year range; 11.6% - 2.1%), **Figure 1**.

NHS institutions used topical anaesthesia alone in 125 516 (13.2%) operations, combined topical and intracameral in 335 098 (35.1%) operations, sub-Tenon's in 437 868 (45.9%) operations and peribulbar/retrobulbar in 55 377 (5.8%) operations. For ISTCs topical anaesthesia alone was used in 26 805 (11.1%) operations, combined topical and intracameral in 187 751 (77.6%) operations, sub-Tenon's in 23 307 (9.6%) operations and peribulbar/retrobulbar in 4 160 (1.7%) operations. For individual centres, the anaesthesia technique varied considerably ranging from 0 - 100% for both topical and combined topical and intracameral anaesthesia, 0 - 97.9% for sub-Tenon's and 0 - 70.9% for peribulbar/retrobulbar, **Figure 2**.



## Anaesthetic complications

Overall, an anaesthetic complication occurred in 20 204 (1.7%) operations and the rate decreased across our study period, from 2.7% in the 2010 NHS year to 1.5% in the 2019 NHS year, **Figure 3**. The anaesthetic complication rates were 0.3%, 0.3%, 3.5% and 3.1% for topical anaesthesia alone, combined topical and intracameral, sub-Tenon's and peribulbar/retrobulbar respectively, and varied considerably between contributing centres, ranging from <0.1% to 11.0% with 7 (8.8%) centres anaesthetic complication rate higher than 5%, **Figure 4**.

For NHS institutions an anaesthetic complication occurred in 19 801 (2.1%) operations, and the anaesthetic complication rates were 0.3%, 0.4%, 3.7% and 3.3% for topical alone, combined topical and intracameral, sub-Tenon's and peribulbar/retrobulbar anaesthesia respectively. For the ISTCs an anaesthetic complication occurred in 403 (0.2%) operations, and the anaesthetic complication rates were 0.1%, 0.1%, 0.4% and 0.6% for topical alone, combined topical and intracameral, sub-Tenon's and peribulbar/retrobulbar anaesthesia respectively.

The most frequently occurring anaesthetic complications were subconjunctival haemorrhage and conjunctival chemosis. Both occurred in 0.7% operations and were more likely to occur in sub-Tenon's and peribulbar/retrobulbar anaesthesia than topical or combined topical and intracameral anaesthesia, **Table 1**.

The anaesthetic complication rates were 1.9% in patients taking aspirin, 2.3% in patients taking anti-platelet medication, 2.3% in patients taking warfarin, 2.2% in patients taking DOACs, and 1.5% in patients taking none of these.

Between patients taking warfarin or DOACs, no statistical differences were found in the anaesthetic complication rates for topical anaesthesia alone (0.1% vs. 0.2%;  $p = 0.576$ ), combined topical and intracameral anaesthesia (0.5% vs. 0.4%;  $p = 0.097$ ), or sub-Tenon's anaesthesia (5.1% vs. 4.9%;  $p =$

0.460). In contrast, the anaesthetic complication rate was higher in patients taking warfarin rather than in those patients taking DOACs who underwent peribulbar/retrobulbar anaesthesia (4.8% vs. 3.1%;  $p = 0.024$ ).

## **Discussion**

This study demonstrates that anaesthetic related complication rates for cataract surgery in the UK decreased over a 10-year period from 2.7% in the 2010 NHS year to 1.5% in the 2019 NHS year. Findings of our study also confirmed the ongoing trend of centres favouring non-sharp needle LA techniques over peribulbar/retrobulbar anaesthesia for cataract surgery in the UK.[3,5]

Combined topical and intracameral anaesthesia is now the most popular choice of anaesthesia across both NHS institutions (35.1%) and ISTCs (77.6%) in England. Similarly, elsewhere across the globe, topical anaesthesia with or without intracameral injection is the preferred anaesthetic technique for phacoemulsification surgery.[9-12] Systematic reviews and meta-analyses have shown a better safety profile for topical and intracameral anaesthesia compared to needle-based anaesthetic techniques. Topical anaesthesia also has a wider acceptability to patients, as well as requiring less time for administration.[13,14]

Anaesthetic complication rates were higher for both sub-Tenon's and peribulbar/retrobulbar anaesthesia compared to topical anaesthesia with or without intracameral injection, ranging from the frequently occurring but less severe complications such as subconjunctival haemorrhage and conjunctival chemosis to sight threatening complications including retrobulbar/peribulbar haemorrhage and globe/optic nerve perforation. It is worth noting that there was no significant difference in our study between the risk of globe/optic nerve perforation with sub-Tenon's anaesthesia (8/461 175) compared to peribulbar/retrobulbar anaesthesia (2/59 537). The relatively low incidence of retrobulbar/peribulbar haemorrhage and perforation with sharp-needle LA,

combined with the decreasing use of these techniques, (5.8% of operations in NHS, 1.7% in ISTCs), may suggest that they are only being performed by more senior anaesthetists or surgeons who have been using them for a long time but who may not be teaching these techniques to trainees. It is not possible to determine the seniority of clinicians performing these blocks from the NOD data, however if the assumption that this technique is not being passed on is true, then we will expect to see their numbers continue to dwindle while the safety profile is maintained.

The observation that sight-threatening complications such as retrobulbar/peribulbar haemorrhage, which would intuitively be more likely to occur with the use of sharp needles in peribulbar/retrobulbar anaesthesia rather than sub-Tenon's,[5,15] are observed in the sub-Tenon's subgroup at a frequency comparable to that recorded in the peribulbar/retrobulbar subgroup, also fits with the assumption that trainees are being taught sub-Tenon's anaesthesia whereas only experienced clinicians persist in using sharp-needle techniques.

In NHS institutions, 45.9% of the operations were still carried out under sub-Tenon's anaesthesia compared to just under 10% in the ISTCs. This figure is comparable to findings in 2013 which showed that 50.5% of all NHS cataract operations were performed under sub-Tenon's anaesthesia.[2] Aside from the possible need for akinesia for cases performed in the NHS, either due to clinical indications or surgical training needs, there is perhaps a reluctance of clinicians in the NHS to adopt topical anaesthesia routinely for cataract surgery. Clinical guidelines jointly published by the RCOphth and Royal College of Anaesthetists acknowledged the association between needle-based anaesthetic techniques and serious complications, but stopped short of recommending topical anaesthesia as a first option for routine cataract surgery which does not require akinesia.[16] From a medicolegal perspective the paid:closed ratio indicates claims that are hardest to defend. Interestingly, 'inadequate anaesthetic' was quoted as the reason with the highest paid:closed ratio for cataract surgery malpractice claims in England from 1995-2008.[17] This has to be taken into account when faced with the choice between denser (e.g., sub-Tenon's) and lighter (e.g., topical with or without

intracameral) forms of anaesthesia. Nevertheless, given almost a quarter of individual centres in our study adopted exclusively or near exclusively topical anaesthesia, it may be the time for the other centres to evaluate if there is a real need for sub-Tenon's anaesthesia as a default option in routine cataract surgery. If training needs are driving the continued use of sub-Tenon's anaesthesia then there it may be beneficial to have prospective trials comparing sub-Tenon's anaesthesia to topical anaesthesia for trainees of different levels, to assess the impact on intra-operative complications.

ISTCs increase surgical capacity locally within the current NHS structure in order to deliver adequate volumes of cataract surgery.[18] ISTCs largely are not engaged in training very junior trainees, and commonly apply strict demographic exclusion criteria for patients not only in relation to blood pressure, blood sugar and body mass index but also patient mobility and difficulties with cooperation for example due to anxiety, tremor or dementia.[18] Hence it is not surprising that lighter forms of anaesthesia such as topical would suffice and are therefore more prevalent in ISTCs given the relatively higher experience level of their surgeons, and lower complexity of cases. This situation may not persist, however, as the most junior trainees require access to less complex cataract surgeries for the purpose of training, so action will be necessary to either secure sufficient low-complexity work for traditional training institutions, or move training to institutions who are operating on the majority of the lower complexity cases.[19]

Previous studies on the effects of warfarin on anaesthetic complications concluded that warfarin was associated with a modest increase in minor complications related to sharp needle and sub-Tenon's anaesthesia, but there was no increased risk of sight-threatening complications.[20,21] The risk of anaesthetic complications in relation to the use of DOACs has not been well studied.

However, given their fixed dosing regime and relative inertness in interactions with other medications, DOACs theoretically have a risk profile equal or better than warfarin,[21] although there has not been a direct comparative study. Our results have shown that patients taking warfarin were at a higher risk of anaesthetic complications compared to those taking DOACs for

peribulbar/retrobulbar anaesthesia only and not the other forms of anaesthesia. It is also worth noting that majority of these anaesthetic complications were not sight-threatening. Discontinuation of these anti-thrombotic medications perioperatively for cataract surgery therefore may not be justifiable, as any interruption in anticoagulation increases the risk of thromboembolic events and can lead to significant morbidity or mortality.[22]

The main strength of this study is that the data were non-selective, pooled and anonymized, and therefore may be more generalizable than data obtained from controlled trials and less subject to publication bias from single-centre case series. This study has several limitations. In this analysis, 40.4% patients had cataract surgery to both eyes which can introduce patient level correlation impacting on statistical comparisons. It is possible that not all recorded first-eye operations were the patients' actual first-eye surgery, as patients could have their first-eye surgery prior to a centre adopting an electronic data collection system, or performed in a different centre, and at present the RCOphth NOD cannot link patients' data if collected at different centres. It is not possible to account for all the sources of variation between centres, patients, and possible correlations, consequently the interpretation of p-values requires caution as they are likely to be too low, especially when the event rates are low. The authors recognise that many of the anaesthetic complications may be dependent upon the seniority of the clinician administering anaesthesia, however we do not have details of the roles or experience of clinicians who administered the anaesthesia. Another issue highlighted by this study is the inconsistency in data entry into EMR. This can be observed from the presence of a small number of complications in the topical anaesthesia groups, such as retrobulbar/peribulbar haemorrhage and globe/optic nerve perforation (n=3) which could not possibly be caused by the topical anaesthetic. These may have been instances where the complication was inaccurately recorded or where a needle-based technique was used for anaesthesia but it was inappropriately denoted as topical. Other complications on the database, such as sub-conjunctival haemorrhage recorded as a complication of topical anaesthesia in 651 operations might be postulated to be predominantly an intraoperative rather than anaesthetic

complication, but were recorded by EMR users in the wrong section. Underreporting is a risk for all large studies of safety. It is possible that some serious complications were missed, or their incidence underestimated, particularly in instances where complications were noted intra-operatively making it hard for them to be attributed to the anaesthesia. At some centres, the anaesthetist completes the anaesthetic fields on the EMR immediately after the anaesthetic, but at other sites these details are entered by the surgeon only after surgery has been completed.

In summary, combined topical and intracameral anaesthesia has become the most common choice of anaesthetic technique for cataract surgery in the UK over the past 10 years, and has been shown to be safer than sub-Tenon's and retrobulbar/peribulbar blocks. It may, therefore, be recommended as the first-choice anaesthesia for short, uncomplicated cataract procedures if akinesia of the eye is not required. Patient factors (comorbidities and individual preference) and surgical factors (longer anticipated surgical time or involvement of a surgical trainee) need to be taken into consideration before deciding on anaesthetic technique.

## **Summary**

What was known before:

- There has been a shift away from sharp-needle local anaesthesia for cataract surgery in the United Kingdom in recent years.
- Needle based anaesthesia including sub-Tenon's (blunt needle) and peribulbar/retrobulbar (sharp needle) can have sight threatening complications such as globe perforation and/or retrobulbar/peribulbar haemorrhage.

What this study adds:

- Combined topical and intracameral is the commonest choice of anaesthesia for cataract surgery in the United Kingdom and has an excellent safety profile.

- Sight threatening complications associated with sharp-needle local anaesthesia techniques were very infrequent over the past decade.
- Patients on warfarin who undergo peribulbar/retrobulbar anaesthesia are at a higher risk of non-sight threatening complication compared to those on direct anticoagulants. There is no additional risk with Warfarin / DOACs for sub-Tenon's or topical/intracameral anaesthesia.

### **Acknowledgments**

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.

We acknowledge the support of the hospitals that participated in this National Ophthalmology Database Audit study and thank our medical and non-medical colleagues for the considerable time and effort devoted to data collection.

### **Conflict of interest**

All authors declare no conflict of interest in relation to the work described.

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## Supplementary information

The participating centres included in this study are listed in alphabetic order below, separated into the 52 English NHS Trusts, 27 Independent Sector Treatment Sites and the centre from the Channel Islands.

NHS Trusts in England:

Barking, Havering and Redbridge University Hospitals NHS Trust; Barts Health NHS Trust; Bolton NHS Foundation Trust; Calderdale and Huddersfield NHS Foundation Trust; Chesterfield Royal Hospital NHS Foundation Trust; County Durham and Darlington NHS Foundation Trust; East Kent Hospitals University NHS Foundation Trust; East Sussex Healthcare NHS Trust; Epsom and St Helier University Hospitals NHS Trust; Frimley Health NHS Foundation Trust; Gloucestershire Hospitals NHS Foundation Trust; Great Western Hospitals NHS Foundation Trust; Guy's and St Thomas' NHS Foundation Trust; Hampshire Hospitals NHS Foundation Trust; Harrogate and District NHS Foundation Trust; Imperial College Healthcare NHS Trust; King's College Hospital NHS Foundation Trust; Leeds Teaching Hospitals NHS Trust; Manchester University NHS Foundation Trust; Mid Cheshire Hospitals NHS Foundation Trust; Mid and South Essex NHS Foundation Trust; Moorfields Eye Hospital NHS Foundation Trust\*; Norfolk and Norwich University Hospitals NHS Foundation Trust; North Cumbria Integrated Care NHS Foundation Trust; North Middlesex University Hospital NHS Trust; North West Anglia NHS Foundation Trust; Northern Devon Healthcare NHS Trust; Nottingham University Hospitals NHS Trust; Oxford University Hospitals NHS Foundation Trust; Portsmouth Hospitals NHS Trust; Royal Berkshire NHS Foundation Trust; Royal Cornwall Hospitals NHS Trust; Royal United Hospitals Bath NHS Foundation Trust; Salisbury NHS Foundation Trust; Sandwell and West Birmingham Hospitals NHS Trust; Sheffield Teaching Hospitals NHS Foundation Trust; Shrewsbury and Telford Hospital NHS Trust; South Warwickshire NHS Foundation Trust; St Helens and Knowsley Teaching Hospitals NHS Trust; The Hillingdon Hospitals NHS Foundation Trust; The Mid Yorkshire Hospitals NHS Trust; The Newcastle upon Tyne Hospitals NHS Foundation Trust;

Torbay and South Devon NHS Foundation Trust; University Hospital Southampton NHS Foundation Trust; University Hospitals Birmingham NHS Foundation Trust; University Hospitals Bristol and Weston NHS Foundation Trust; University Hospitals Coventry and Warwickshire NHS Trust; University Hospitals Plymouth NHS Trust; University Hospitals Sussex NHS Foundation Trust; West Suffolk NHS Foundation Trust; Wirral University Teaching Hospital NHS Foundation Trust  
Wrightington; Wigan and Leigh NHS Foundation Trust;

Independent Sector Treatment Sites:

Three sites from Community Health and Eyecare Ltd: Face and Eye; Stoke; Watford;

Seven sites from Optegra Eye Health Care: Birmingham Eye Hospital; Central London Eye Hospital; Hampshire Eye Hospital; Manchester Eye Hospital; North London Eye Hospital; Surrey Eye Hospital; Yorkshire Eye Hospital;

Nine sites from Practice Plus Group: Emersons Green; Ilford; Plymouth; Shepton Mallet; Southampton; Rochdale; Devizes; Gillingham; St. Mary's Portsmouth;

Six sites from SpaMedica: Birkenhead; Bradford; Liverpool; Manchester; Newton-le-Willows; Wakefield;

St. Stephens Gate Medical Practice; The Stoneygate Eye Hospital

Guernsey: Medical specialists group Guernsey

\*Including Croydon Health Services NHS Trust and part of Bedfordshire Hospitals NHS Foundation Trust ophthalmology departments as these are part of the same governing authority for ophthalmology.

## **Table and Figure legends**

### **Table 1:**

Anaesthetic complications by anaesthesia technique, organisation structure and medication for 1 195 882 cataract operations performed in 80 centres

### **Figure 1:**

Anaesthesia technique per NHS year (2010 N = 59 678; 2011 N = 71 629; 2012 N= 79 671; 2013 N = 91 302; 2014 N = 103 314; 2015 N = 125 185; 2016 N = 153 499; 2017 N = 162 190; 2018 N = 175 406; 2019 N = 174 008)

### **Figure 2:**

Anaesthesia technique for each contributing centre for 1 195 882 cataract operations performed in 80 centres

### **Figure 3:**

Anaesthetic complication percentages per NHS year (2010 N = 59 678; 2011 N = 71 629; 2012 N= 79 671; 2013 N = 91 302; 2014 N = 103 314; 2015 N = 125 185; 2016 N = 153 499; 2017 N = 162 190; 2018 N = 175 406; 2019 N = 174 008)

### **Figure 4:**

Anaesthetic complication rates for each contributing centre for 1 195 882 cataract operations performed in 80 centres