The ROYAL COLLEGE of OPHTHALMOLOGISTS

The Way Forward

Options to help meet demand for the current and future care of patients with eye disease

Cataract

The Way Forward

Cataract

The Royal College of Ophthalmologists has commissioned this project in light of the increasing awareness that **the number of patients with diseases of older age is growing across the United Kingdom (UK) without a commensurate growth in the number of ophthalmologists and other resources available to treat those patients.**

New ways of working are not the solution, but do form part of it

Some eye departments or sub-specialist services in a department may still be meeting demand with traditional models of service delivery, but increasingly, the challenge that our growing elderly population presents will lead to decompensation of those services as capacity simply will not keep pace with demand. This project aims to capture some of the innovations and service redesigns from different units around the UK, and to present these options to consultant colleagues who are wishing to improve efficiency, and create a service that is sustainable in the face of such growing disparity between demand and resource. **These new ways of working are not the solution, but do form part of it. More ophthalmologists, more eye health care professionals (HCPs), more space, more resource as well as more efficient ways of working are urgently needed.**

Peer reviewed and grey literature were searched, and **telephone interviews conducted with more than 200 consultant service leads** in order to capture the ideas, and discussion around those ideas for this report. It is clear that a one size solution will not fit all. However it is equally clear that every eye department is going to have to progress to new models of working.

Previous national initiatives from "Action on Cataracts" in 2000, through the NHS Institute for Innovation and Improvement's "The Productive Operating Theatre" (TPOT) programme to the 2015 RCOphth / British Orthopaedic Association (BOA) /Monitor report "Helping NHS providers improve productivity in elective care" have sought to encourage increased efficiency in cataract services.

The Way Forward project aims to equip ophthalmologists with tools to respond to the need for increased efficiency by quantifying the growth in demand that is expected over the next 20 years, and by presenting some practical options for dealing with that growth gleaned from what your colleagues in other departments around the country are already doing. The project also aims to provide a substrate and mechanisms for practical peer support and networks where possible. In addition the advice in the documents aims to be in line with the RCOphth sustainability and objectives (appendix D)

Members can email: wayforward@rcophth.ac.uk for more information.

UK 2016-2035: More people, more older people, more requirement for eye care

The demographic changes in the earth's population are well known; there are more people, and those people are living longer. The effect of this on ophthalmic services is clear, with The Royal College of Ophthalmologists (RCOphth) president, Prof Carrie MacEwen, describing the situation as "*a perfect storm of increased demand, caused by more eye disease in an ageing population requiring long term care*".[3]

The commissioning of The Way Forward project, the methodology for which is presented in appendix A, was driven by awareness of the growth in the elderly population alongside the absence of commensurate growth in either the financial or human resources required to deal with the increasing burden of ophthalmic disease. Appeals by the RCOphth to have the number of UK ophthalmic training posts increased have been declined, and the previous practice of importing ophthalmologists from around the world may be less easy. A global shortage of ophthalmologists is reported,[4] and there are also ethical issues around attracting staff from the national health systems of countries with greater ophthalmic human resource problems than the UK.[5-8]

cataract accounts for over a third of the cases of vision impairment in those over 75 years[10]

There is the acute necessity therefore to plan for a future in which the volume of eye care service delivered per ophthalmologist increases. Efficient cataract services are an important part of that future landscape. Global estimates of visual impairment (presenting visual acuity <6/18, ≥3/60) and blindness (presenting visual acuity <3/60) due to cataract in **2010 set the figures at 10.8 million people blind and 35.1 million visually impaired**.[9] Visual impairment due to cataract is also prevalent in the UK, with population based surveys showing cataract to account for over a third of the cases of impairment (<6/18 best corrected visual acuity (BCVA)) in those over 75 years,[10] and having a prevalence of visually significant cataract (<6/12) or operated cataract of 35% in those over 65 years.[11] Whilst we may regard blinding cataract as a rarity in the UK,12 as recently as 1999, national data from across the UK reported 15% of patients failed to achieve 6/60 at the time of listing for cataract surgery,[13] with the least affluent in society preferentially affected.[14,15]

As options for dealing with the demands put on services are discussed, consideration must be given to the issue of long term sustainability. We have a duty of care to take into account the social impact on the people involved in the services, the economic sustainability as well as the environmental impact This so-called Triple Bottom Line that must be met as we pay due regard to the people, the profitability and the planet (appendix E).

Projections of cataract numbers: how many more people will have cataracts?

The number of cataract operations performed in the UK over the past 50 years has grown at a rate that is clearly not explicable by rising prevalence of visually significant cataract (figure 1). This is particularly true in the last 25 years since phacoemulsification became standard (figure 1 and 2).[1,16,17] The level of cataract at which ophthalmologists felt confident that they could offer surgery with an acceptable degree of confidence that it would improve vision changed enormously with the advent of extra-capsular surgery which was then further accelerated with the introduction of phacoemulsification [18] and this must be presumed to be the main driver of the growth seen in figure 1 and figure 2. However, although we are not expecting another quantum shift in practice such as that which phacoemulsification produced, it is not clear whether we have reached a steady state which would permit us to say that there is a fixed conversion rate between prevalence of un-operated cataract and surgical activity.

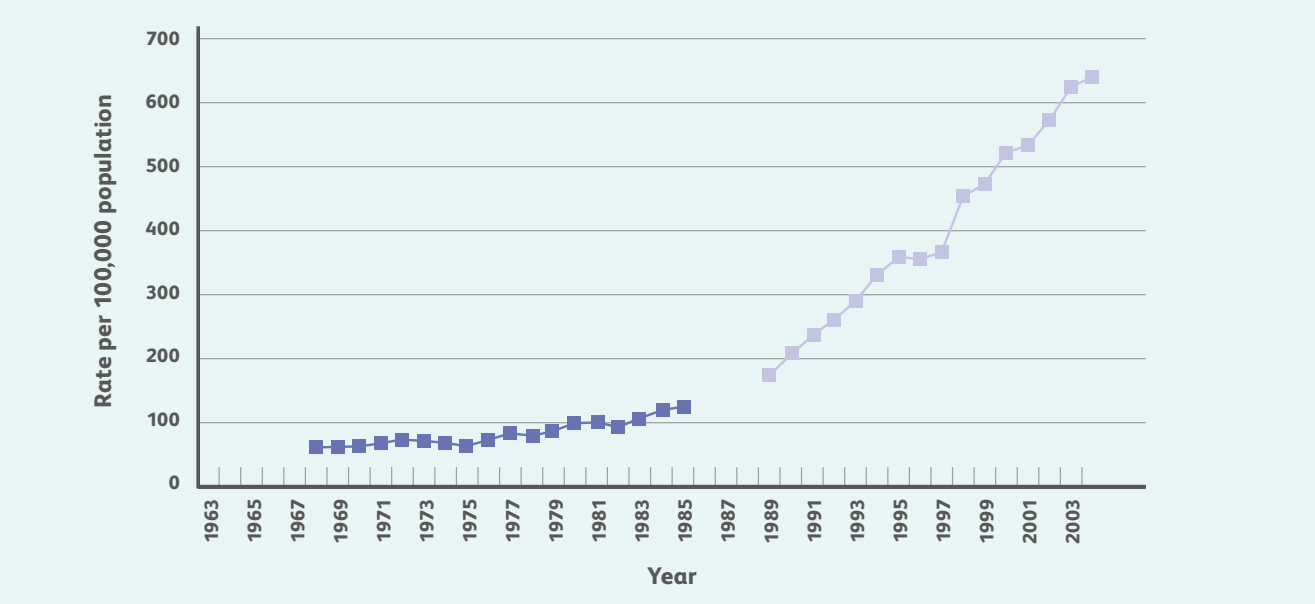

Figure 1: English cataract totals and rate per 1,000 population 1998-2015 [19]

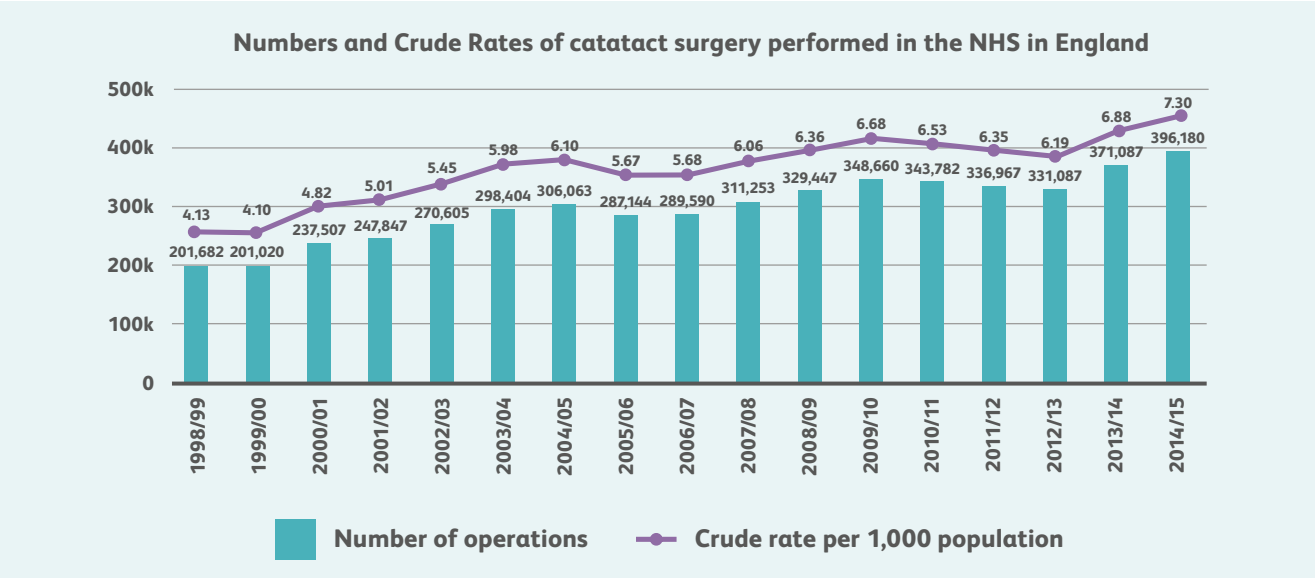

Figure 2: Intra-ocular lens insertion rates (annually per 10,000) across the UK [23]

Nonetheless, it is inescapable that there will be a substantial portion of demand that is determined by prevalence. Estimates of future prevalence growth can therefore be considered to provide an estimate of the minimum expected growth in demand. Understanding of how capacity and demand interact in our organisations is important for planning, and this is discussed further in Appendix F. Reflection on where our individual departments stand presently in the balance between capacity and demand allows us to identify what trigger points are likely to provoke us to decide to increase our capacity, and what actions we are likely to take to achieve that expansion.

For example, If your department runs cataract lists of 6 per session and is currently coping with cataract demand but needs to run occasional weekend initiative lists, you could decide that when you are putting on more than 4 initiative lists in a year, it is time to increase capacity by adding one clinical support worker to the theatre team to increase throughput, increasing routine cataract lists from 6 to 8.

For The Way Forward project, the National Eye Health Epidemiological Model (NEHEM) was utilised and population projections derived from the Office of National Statistics (ONS) were put into this model at

various time points to give estimates of future cataract numbers. These projections and the anticipated demographic shifts are presented in full in Appendix B along with discussion of the calculations.

The key finding is that a growth in prevalent cataract between 2015 and 2035 leads us to anticipate an increase of around 50% in the numbers of cataract operations we are to be expected to perform over the next 20 years (25% increase over the next 10 years). This assumes that current behaviour persists in terms of diagnosis and referral by primary care, thresholds for ophthalmologists offering surgery and the proportion of patients wishing to proceed. Any of these three things may alter, but will merely act as a filter for the underlying swell in cataract numbers.

We can expect the number of cataract operations we are expected to deliver to increase by 50% from 2015 to 2035

These projections resonate with alternative published projections, such as the projection of a rise in the UK number of people with visual impairment due to cataract of 21% between 2010 and 2020.[20,21] The 50% growth in cataract numbers predicted by 2035 contrasts with the estimated growth in consultant numbers (estimates from Health Education England (HEE)) which project a growth of just under 10% from 2014-2023 (HEE, Centre for Workforce Intelligence Dashboard).

Surgical workload: How many operations will be required each year?

For workforce planning nationally, or departmental planning within a specific hospital, what is really wanted is some estimate of the likely surgical workload. One such published projection of surgical workload based on predicted population structure changes, and on the UK cataract surgical activity in 2008, estimated an increase of 22% over the 10 years from 2010. This represents an increase from 389,000 cataract operations performed in the UK in 2010, to 474,000 in 2020.[20] The assertion that prevalence is going to predominate as the main driver of change in the numbers of operations performed may be true, but the cause of the often reported variation in the demand for cataract surgery is poorly understood.[1,2,22]

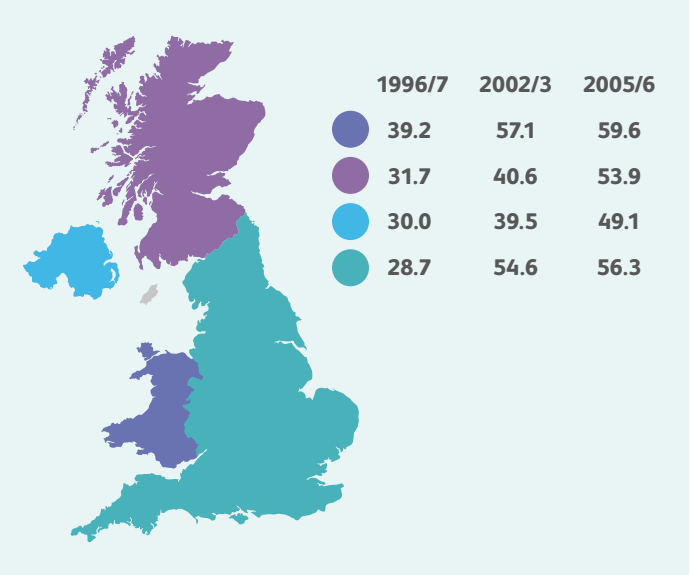

Figure 3: Intra-ocular lens insertion rates (annually per 10,000) across the UK[23]

Variation is seen between home nations, as shown in figure 3, but between regions the variation is actually greater.[2,15] If, in addition to the increases due to demographic pressures pushing prevalence up by 25% over the next 10 years (and 50% over the next 20 years), the lowest demand regions were to see a shift in other factors that increased their surgical activity rates threefold to match the demand in the most active region, the total increase in demand could be substantially larger. The corollary is also true, and should regression towards the lower activity regions be seen, growth will be much less. In addition, despite an overall increase in cataract operations, since 2010 there has been a reduction in the rates of surgery for those aged 65 in England as commissioners have sought to limit access to surgery.

Local application of predicted growth figures

For the purposes of local planning with hospital managers, it seems intuitive to reason that the demographic shift will produce a 25% growth in cataract numbers over the next 10 years, and for a department currently running at full capacity to cope with existing demand, changes are going to be required to avoid progressive under-provision and the need for waiting list initiatives or recruitment of outside help.

Historically, the fall-back option for increasing capacity would have been expansion of the consultant numbers, or utilisation of associate specialists or staff grades. This will become less easy, however, against the backdrop of a national and international shortage of ophthalmologists;[4,5] more efficient use of existing human resource will therefore become mandatory. For outpatient activity, a 40% increase in activity in the past 10 years has been reported, and this has led the RCOphth to publish a Three Step Plan for eye department to protect patients from the negative consequences of the delays caused by this rapid growth in demand.[24]

Cataract Pathways: The Way Forward

Whilst only the older consultants will remember the days of inpatient cataract surgery, it is still within the working lifetime of most consultant ophthalmologists that every cataract patient referred was seen in clinic by an ophthalmologist, returned at a later date for their biometry (which may have been done by an ophthalmologist) and pre-assessed prior to having their first eye operated. Patients were reviewed on the first day post-operatively by the operating surgeon, then again 2 and 6 weeks later, with a visit to a community optometrist for refraction prior to consideration of re-listing for second eye (figure 4).

In some units now there is no part of this pathway that remains with the ophthalmologist other than the operation itself. Whilst this may seem too "ophthalmologist-light" for some, several parts of the pathway offer opportunities to improve efficiency by appropriate devolution of tasks to non-medical eye Health Care Professionals (HCPs), who can perform pre-op and post-op assessments.

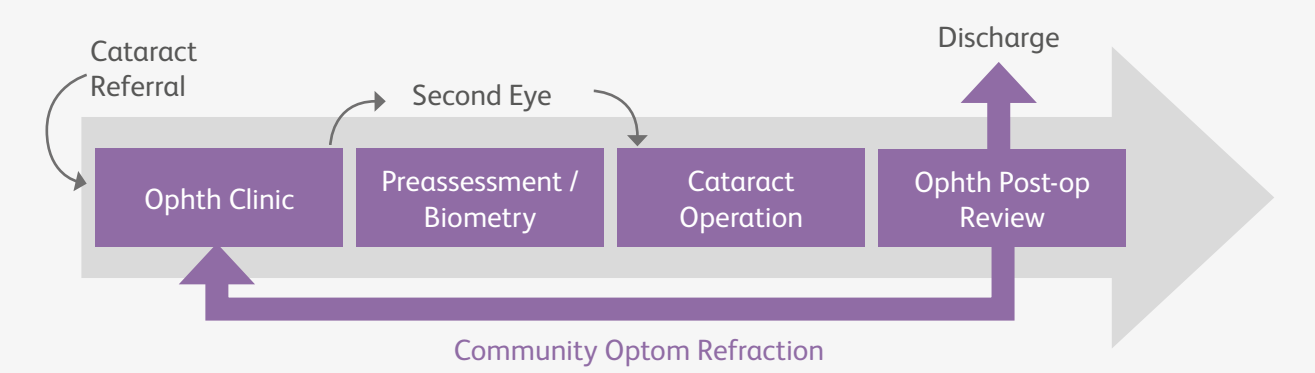

Figure 4: The Traditional Cataract Pathway has largely been abandoned

Demand Management

Epidemiological modelling has shown that restricting cataract surgery provision in the UK to only those with <6/12 would reduce the number of operations by more than the 100,000 needed annually to control the backlog of visually impairing cataracts.[21] Attempts, therefore, to limit the numbers of operations performed by setting visual thresholds or other criteria for listing have been implemented in some localities and this has led to a reduction in surgical rates.[25-27] These restrictions are frequently criticised and can be viewed as a blunt tool for determining which individuals should and should not be eligible for publicly funded cataract surgery.[26,28,29] However, with the rapid expansion in the numbers of cataracts being done each year, the question has been asked, "Are we doing too many cataract operations?"[1,18,30,31]

Cost-utility analyses of cataract surgery, and second eye surgery have shown it to be good value,[32-36] and cataract surgery also has indirect societal and health-economic advantages in improving well being, reducing isolation and premature need for care while also reducing falls and road traffic accidents. [34,37-41]

What is evident is that our thresholds for operating have dropped such that in 1990 fewer than 9% of patients attained 6/12 at the time of listing,[42,43] a proportion which had increased to 31% by 1997[13] and to 45% by 2003.[44] This pattern reflects a time of changing and increasingly successful surgical techniques. Moving away from crude acuity measures to vision related quality of life, scores out of 100 on the VF-14

questionnaire[45] (with 100 being no problems with vision) for NHS cataract patients have risen from 68.1 average pre-operatively in 1994[46] to 83.2 in 2006.1[8]

Although there has been an undoubted reduction in thresholds for listing for surgery, reported satisfaction scores do remain very high. More refined tools are required if we are to ultimately determine whether the threshold for listing is correct, and this will vary as a function of the quality of surgery we are able to offer as an NHS standard in the future. While the numbers increase year on year, this may not be meeting the expected need in the growing population aged over 65. The Atlas of variation demonstrated a reduction in this age group undergoing cataract surgery.

One interviewee (Cat 42 –this is an interview reference code to permit anonymisation), after doing an audit which showed that only 2/3 optometry referrals for cataract surgery resulted in surgery, felt that optometrist referrals should be re-routed through GPs to act as gatekeepers to ensure appropriateness. However, published comparison of GP and Optometry referrals for cataract surgery suggests that optometrists may be better placed to help patients decide if they wish to be referred for cataract surgery than GPs.[47] The conversion rate from referral to surgery from different referral sources can easily be audited locally. This audit cycle would permit every eye department to gather information to help provide feedback to primary care that may minimise inappropriate utilisation of cataract clinic slots if referral quality can be improved.

Imposed Criteria for listing for surgery

The "Commissioning Guide: Cataract Surgery"[48] produced jointly by RCOphth and College of Optometrists indicates that 'Visual acuity on its own is not an adequate measure of visual disability from cataract and surgery should be considered in the first or second eye of patients with significant visual symptoms due to cataract'

However, it is clear that some CCGs have imposed criteria for listing based on level of visual acuity (VA). The most stringent criteria reported in this survey were an acuity of 6/24 or worse before second eye surgery can be considered in one locality (Cat7), and 6/18 or worse in both eyes for non-drivers in another (Cat37). Consultants' attitudes to these criteria varied. Some consultants reported that valuable clinic time is taken up explaining the 'rationing' situation to patients, and having to make applications for exemption in cases of good visual acuity which disguises a disabling cataract with symptoms such as glare when driving. In some departments different criteria are applied by different commissioners within the area they serve. This "postcode lottery" may create significant stress in the clinician/patient relationship "*I tell them that if they lived elsewhere they could get surgery; it isn't my job to protect commissioners from their own decisions*." (Cat26)

Surveys and evaluations of these criteria have been undertaken.[26,27] In 2012, almost half (71/151) of commissioners in England were restricting access to surgery on grounds of acuity rather than clinical symptoms and visual needs, and of the 67 policies evaluated, 92% used criteria that did not reflect Department of Health / RCOphth guidance or research evidence.[27]

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Scoring Systems to decide who is eligible for surgery

In two Trusts, consultants reported that a scoring system incorporating VA and subjective indicators was utilised; patients having to score over a certain figure in order to be referred, thereby controlling numbers

at the point of referral. (Cat23) This use of scoring systems has been reported in the UK elsewhere[49] but is most widely employed in the publicly funded health care service in New Zealand. The New Zealand Clinical Priority Assessment Criteria (CPAC) used for cataract listing has been in use for many years, although it is not without problems and variability in the practical application of a scoring system may result in persistent inequity of access to surgery.[50-53] As one UK consultant whose commissioners try to apply a functional criteria to limit cataract surgery commented, , *"…patients are being quickly educated in the need to play the system, whether this be due to coaching by referring optometrists or simply them looking up the criteria on the CCG website. It seems to me that criteria based on a strict list of symptoms (rather than a thorough discussion of the effect on daily life as part of the consultation) favours the well-educated, IT savvy patient and disadvantages others" (Cat 11).*

Referral and surgery should be performed based on symptoms, clinical assessment and discussion with the patient regarding the risk/benefit analysis[27]

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Improving referral criteria to reduce false positive

Referral criteria - reducing false positives: improving efficiency

Optimising the use of clinic and patients' time by ensuring that referrals are appropriate is a priority. Patients referred for cataract should be good candidates for surgery with symptoms due to the cataract and a desire to undergo the operative procedure. Training and working with primary care to increase cataract referrals that will be considered appropriate to undergo surgery is effective because of the large numbers of patients involved with this diagnosis. The ideal 'conversion rate' to cataract surgery is not known, but referral guidelines and dedicated forms can lead to rates of more than 80%.

False positive referrals waste capacity and patients' time.

One of the consultants receiving referrals from a 'points based' referral system which had been enhanced by a payment to optometrists who carried out the points assessment found a gradual increase in false positive referrals (i.e. patients referred for cataract surgery who were discharged at first visit as symptoms did not justify intervention). In 2010, 74% of referrals were listed for cataract extraction, dropping to 66% by 2015 (Cat 42). It was considered that the fee received by optometrists from commissioners for each direct referral made had encouraged a lower referral threshold. To avoid this potential financial driver for inappropriate cataract referrals, two departments described the fee as being paid by the hospital itself (rather than commissioners) to the referring optometrist only "for appropriate referrals" (Cat 33 and Cat 20). This clearly incentivises careful referral practice, but might be considered unethical if an independent sector provider was using financial incentives to optometrists to encourage "choose and book" referrals to their facility.

Another English unit reported having a 40% conversion rate from direct cataract referrals to surgery, which they managed to improve to 70% by training local optometrists through the local optical committee (LOC) to disseminate the commissioners' criteria for listing (Cat24). This contrasts with a conversion rate of 92% reported by a consultant in Wales (Cat 39), where no listing criteria apply, and the clinical training and engagement with local optometrists was felt to be excellent under the Wales Eye Care Services (WECS). Other units who had audited their conversion rates reported 75% (Cat 15) and 80% (Cat 41).

The overarching principles for cataract referral are laid out in the Department of Health "Action on Cataracts"[54] best practice guidance and echoed in the RCOphth Cataract Surgery Guidelines 2010. Many

direct cataract referral forms exist which facilitate the interface between community optometrists and cataract services. The best examples of these forms include explicit questions to which the optometrist must answer "YES" before referring, as well as clear clinical information.

- *Does the cataract affect the individual's sight and quality of life?*
- *Does the patient understand the risks and wish to have surgery if it is offered?*

Direct referral forms present the opportunity to include questions to identify patients who have had previous refractive laser surgery and/or who wear contact lenses, and to request that the referring optometrist provide a cataract information leaflet so patients come to clinic better informed with an opportunity to cancel should they change their minds before the appointment.

Any proposed restriction criteria should be subject to a careful evaluation and re-evaluation to ensure equity of access is preserved and that those most vulnerable to poor uptake of services are not preferentially prevented from accessing a service.

Efficiencies in Cataract surgery patient flow

The 'traditional' cataract pathway, where an ophthalmologist sees the patient before the operation and after the operation (Figure 4) is still reported to be run by only 10% of consultants interviewed (4/39). Some units utilise non-medical eye HCPs for pre-operative assessment, others for the post-operative review and the remainder for both pre- and post-operative management. The average number of HES visits in a both eye pathway was 4.6, with the average number of visits seeing an ophthalmologist being 3.1. The difference was more attributable to the use of HCPs in post-operative rather than pre-operative clinics.

Non-ophthalmologists in the pre-operative cataract pathway

Of the 42 departments represented at interview, 9 (21%) had HCPs (6 Optometrist, 2 nurse practitioners and one both) seeing patients referred with cataract and listing them for surgery such that the first time the patient sees an ophthalmologist is on the day of surgery. This is not satisfactory for patients who need to discuss the surgery with their surgeon and slows up the process on the day of surgery as the surgeon requires time to review and speak to the patients pre-operatively. It also does not comply with the RCOphth standards or commissioning guidelines which state **"Although many aspects of preoperative assessment for cataract surgery can be delegated, it is very important that the final decision to operate and an individualised care plan is undertaken in advance of the patient's admission by an appropriately qualified and skilled member of the cataract surgical team responsible for the patient's operative care"** – an additional clinic visit may be necessary to achieve this. [48,55]

Many consultants commented that they had recruited particular individuals to these clinical roles, and particularly with nurse practitioners, suggested not all might be suitable for training. One unit previously had nurse practitioners seeing pre-op cataracts, but as they only achieved 4/5 per clinic, the service was discontinued as it was not cost effective (Cat 13).

It is clear that in many units HCPs are trained to work effectively in the cataract pathway. However many consultants expressed frustration with effort having been put into training HCPs, for them to subsequently leave the department (Cat 20). This paralleled the experience in glaucoma, (Gl 51, Gl 21) with some who reported having excellent HCP colleagues nearing retirement age anticipating great difficulty recruiting replacements (Gl 28).

Nurses being involved in the consent process and obtaining the signature on the consent form for cataract surgery is an established practice in some

The nurse led cataract clinic was discontinued as it was not cost effective

units.[56] Just under half of departments (14/32 (44%)) who had non-ophthalmologists listing patients for first or second eye operations also had them participating in the process of informed consent. This permits time for reflection and discussion on the part of the patient. Consent is recognised as being a continuous process from first consultation through to the day of surgery and all HCPs and ophthalmologists involved in the pathway contribute to this. The GMC indicates that a doctor can delegate consent to someone who is suitably trained and qualified, has sufficient knowledge about the procedure and complies with Good Medical Practice – 'Consent –patients and doctors making decisions together'.[55] This involves discussion about possible refractive outcomes and the requirements and risks for each patient as an individual. Training and accreditation by a senior ophthalmologist is essential and governance structures must be in place.

The final decision to operate and confirmation of consent should be taken by an ophthalmologist as the responsibility for identifying and mitigating any operative risk always lies with the surgeon.[57] This should take place in advance of the date of surgery.[55]

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Adjusting HES cataract clinic protocols - Improving in-hospital flow

In the course of The Way Forward interviews, consultant leads were asked to explain a typical pathway for a patient referred with bilateral symptomatic cataract who wished surgery for both eyes. Some pathways have grown up in a serendipitous way over time, but published examples exist of how pro-active whole pathway redesign for cataract services can increase productivity with existing ophthalmology resources, reduce waiting lists, and improve training opportunities.[58] Not every pathway redesign transpired to be sustainable, (for example no department was found to be still running a "one-stop" clinic and surgery arrangement as has been reported previously.[59])

Figure 5: Pathway where the ophthalmologist's only role is to operate are used in some departments either with HES HCPs or community optometrists (Cat 15, 22, 39, 41)

A number of different configurations were identified. The most consultant-light versions of the pathway have ophthalmologists solely providing the two surgical interventions and overall leadership and clinical governance (figure 5). **Such pathways are not consistent with the RCOphth commissioning cataract guidance[48] and the recently stated RCOphth response to the Monitor Report on productivity in elective care indicates that the final decision to operate is made by an experienced ophthalmologist.**[57] However , it is clear that many eye units in the UK have devolved the decision making process concerning cataract surgery (especially second eye surgery) to trained HCPs using defined protocols and pathways. As stated above – the final decision regarding surgery should always be taken by an ophthalmologist as the responsibility for identifying and mitigating operative risk always lies with the surgeon.

Some pathways are presented below in detail with every blue arrow box representing a visit to an ophthalmic health care professional (HCP). The first (Figure 6) is notably efficient for the patients. It reduces HES visits by having a standardised questionnaire referral from the community optometrist based on a full dilated examination before referral to the clinical nurse specialist cataract clinic. In this example >90% of referred patients had surgery. The pathway employs enhanced community optometrist review after first eye surgery, then discharges second eyes directly back to the GOS optometrist for follow up. In this pathway, the ophthalmologist saw each patient in the nurse specialist cataract clinic to check briefly the findings and discuss. Thus a ten patient cataract clinic takes only about 40 min of the

ophthalmologist's time (cat 39). This requires "*buy-in from all stakeholders in the pathway*" (including patients) which may not be possible in every setting.

Figure 6: Patients are discharged routinely from theatre (1st or 2nd eye) to GOS optometry review and re-referred if needed (Cat 38)

Another model (figure 7) involves the ophthalmologist seeing referred patients in a one stop clinic which includes assessment by a team of HCPs. Agreement for surgery to both eyes takes place at that visit and the patient returns for second eye surgery either directly or after a visit to the community optometrist. The cost of a GOS sight test after the first eye is avoided by use of auto-refraction on the day of second eye operation. After the second eye operation visit the patient is discharged to routine GOS review for refraction. Models such as this may rely on auto-refraction to inform IOL selection for the second eye – but feedback for audit purposes regarding patient and refractive outcomes is essential. Another consultant described keeping second eye waits short to avoid a repeat pre-assessment (Cat 3, 5 and 40). This, however, could lead to prolonging the wait for first eyes.

Figure 7: Second eye listed on the day of first operation (Cat 5 and 40)

These schemes or similar have been running in some settings for many years without reported problems.

If a department wishes to, but is unable to recruit suitably skilled in-hospital HCPs to run pre-assessment cataract clinics or post-operative reviews and wants to secure greater engagement of community optometrists in the pathway, they could consider what one department has done by arranging a service level agreement with local optometrists who have been accredited by the HES after training. An enhanced fee is paid from their tariff to permit community optometrists to provide these services (figure 8).[60]

Figure 8: HES funded community optometrist support (Cat 20)

All of the above models are real world examples that have been running for some time in UK eye units. They reflect units under pressure that have developed realistic ways of freeing up time for ophthalmologists to see higher risk patients. These are not suitable for complex or complicated patients. A selection of post-operative patients should be reviewed by all surgeons and trainees should see all their patients during the early learning period.

Post-operative care – who reviews patients?

The vast majority (35/39) reported that an HCP, other than an ophthalmologist, sees the patient post-operatively. The first eye follow up is done by hospital staff in 26/39 (67%) of departments, with second eye follow-ups in hospital for 24/39 (62%).

Some aspects of delivering an efficient sustainable service, such as pooled cataract waiting lists or routine trainee participation in surgery, meet resistance but become widely accepted by patients and clinicians.[61-63] It would be reasonable to assume that 20 years ago, almost 100% of cataract patients would have been reviewed by an ophthalmologist post-operatively after uncomplicated phacoemulsification, whereas this practice has reduced considerably now.[64] Now only 11% are seen by an ophthalmologist. There has been a shift, which may have been pioneered by enthusiasts, but is now the increasingly practised approach where ophthalmologists review patients after cataract surgery only if symptoms dictate, or if there has been a complication or co-existing pathology or if they are referred back.

Tens of thousands of UK cataract patients are discharged directly after surgery each year

- A range of practice was reported regarding post-operative follow up from uncomplicated cataract surgery (Figure 9). Four departments (10%) reported that ophthalmologists still see all post-operative cataract patients. The majority (57%) utilised HCPs, either nurses, optometrists or both, in the setting of the HES
- More than a quarter of departments reported discharging patients straight from theatre after uncomplicated surgery to community optometry; half of these using the standard GOS, but half having this service attract an enhanced tariff. Two departments reported a hybrid with "*nurse practitioners seeing first eye post-ops but we discharge from theatre for the second eye so they just go to their normal optometrist when they finish their drops*" (Cat41)

Fig 9: Who sees routine post-ops?

The sample surveyed represented around one third of the departments in the UK and if their responses were nationally representative, this could indicate approximately 100,000 appointments being released in the HES each year in the UK. Discharging patients immediately post–operatively (with full back-up) has been viewed by many departments as an adequately safe way to reduce low-value activity, and thereby increase capacity for higher risk patients with potentially sight-threatening conditions such as glaucoma, diabetic retinopathy or AMD.

This policy will not be suitable for all patients or services and should only be considered with full recognition of

- Patient safety and wishes
- Co-morbidity and complications
- The need for adequate training for the ophthalmic trainees who require to see post-ops during their training
- Full audit availability and feedback to all surgeons
- Clear, dedicated lines of communication for patients and optometrists being available
- Training and protocols for optometrists

The cost saving for secondary care could potentially increase costs incurred to the wider health care economy if the number of GOS or enhanced optometry visits is increased. No cost analysis study of different pathways had been done, but schemes utilising the usual GOS sight test process are at little risk of increasing the overall financial burden on the wider health economy, as it can probably be reasonably assumed that most patients will attend for a GOS sight test following cataract surgery, whether or not they had a post-operative clinic visit to HES.

Second eye pathways (figs 5 - 8)

Pathways for patients who are definite candidates for surgery to both eyes can reduce the number of visits by organising surgery for the second eye at the same time as the first – with provision for the first (uncomplicated) eye to be assessed on the day of second eye surgery.

As described above, the pathway that involved fewest visits reported listing for the second eye operation on the day of first eye surgery if all has gone well (two separate departments do this with no post-operative follow-up until the day of second eye surgery). One department places them on a routine list to return about 3 months later; "*we've been doing this for two and a half years without problems; patients phone in if there are problems*" (Cat 5). Thus they may attend the GOS for glasses review in the interim. The other department performs second eye surgery 4 weeks later, so even a GOS review is avoided and auto-refraction is utilised (Cat 40).

Implications for training

If ophthalmologists are excluded from the pre-operative clinical decision making to any significant degree, it is not possible for ophthalmologists in training to gain sufficient experience to evaluate whether the symptoms of cataract expressed by a patient are commensurate with extent of cataract visible (a mismatch indicating another pathology may be present). A deficit in experience of the pre-operative cataract patient also compromises trainees' ability to evaluate the appropriateness of the decision to offer surgery to patients with understanding of patient expectations, varying levels of risk, other pathologies and cataract-related symptomatology. This is unacceptable and adequate experience is essential.

Discharge from theatre or HCP routinely seeing all the post-ops leaves trainees unfamiliar with the range of expected normal HES appearances, acceptable variations and common complications in the post-operative period. This would compromise their ability to identify problems requiring intervention.

Mechanisms to ensure appropriate exposure to a reasonable sample of post-operative cases must therefore be constructed.

Ways of ensuring trainees get the necessary exposure (are essential)

Ways of ensuring trainees get the necessary exposure were not specifically identified at interview, but finding local solutions is the duty of those serving as college tutors and training programme directors to ensure adequate exposure to patients throughout the surgical pathway with emphasis on decision making, co-morbidity risks and continuity of care. Ophthalmologists must be competent at pre-operative and post-operative assessment and management of all patients in their care.

Are we compromising quality and safety of care for the sake of efficiency?

A publication from 1995 in the British Journal of Ophthalmology, without reference, states that, "*It is commonly accepted that the 1st day postoperative review is essential*".[64] Twenty years later, of 42 UK eye department consultant leads interviewed, only one is providing a first day post op phone call, and none are routinely performing a first day post-operative clinical review. That change was difficult for many to accept. There were research projects and discussion in the literature, but with finite resource to deploy, ultimately the practice of first day post op review has been abandoned provided co-existent pathology is absent.[64-67]

the drive for efficiency is not a "race to the bottom", to provide the cheapest possible eye care service

It must be emphasised that the drive for efficiency is not a "race to the bottom", to provide the cheapest possible eye care service. Reducing visits to the minimum is cost-effective for both the HES and the patients and a return to former practice would deplete resources required for safe care that should be allocated to activities of greater value to our patients. However cataract pathways are structured, the bottom line is high quality, safe and compassionate care for **ALL** patients, not just those with average cataracts and few co-morbidities. In the race for productivity and technical sophistication, we must never lose sight of the fact that most patients arriving on the day of surgery are overwhelmed, frightened and have forgotten most of what they have been told previously about the surgery.

high quality, safe and compassionate care for ALL patients

The question, "How lean is too lean?" is an essential one, but overall, the drive for efficiency must be considered when resources are limited. The process of change management is difficult. Debate and experience sharing are essential, but some of the "fear of the unknown" is alleviated by reflecting that the above pathways are all established in other units and reportedly running without problems. A pathway is too lean if it contains inadequate provision for detecting, correcting and learning from error or other adverse occurrence. Checks and balances must be in place - audit and governance structures must be robust and action taken to alter any systematised risks that are uncovered.

A pathway is too lean if it contains inadequate provision for detecting, correcting and learning from error or other adverse occurrence. Checks and balances must be in place

Improving surgical flow and AMD throughput

Surgery options

When asked about division of theatre lists into training and service delivery lists only a quarter of eye departments (9/36) had separate entities. Twenty three (64%) said every list was a training list, and four departments (11%) had no trainees. Interviewees were asked to indicate the maximum and minimum numbers of routine local anaesthetic (LA) cataract operations that any consultant in their department is routinely putting on service and training lists. The frequency in terms of numbers of eye departments (y-axis) is plotted against number of cases routinely put on the list (x-axis) is shown (figure 10 and 11). These indicate that 10-12 cases are being carried out on consultant only lists although some are doing only 4 cases (median 7 cases). Training lists have a median of 6 cases with a spread between 4 and 8.

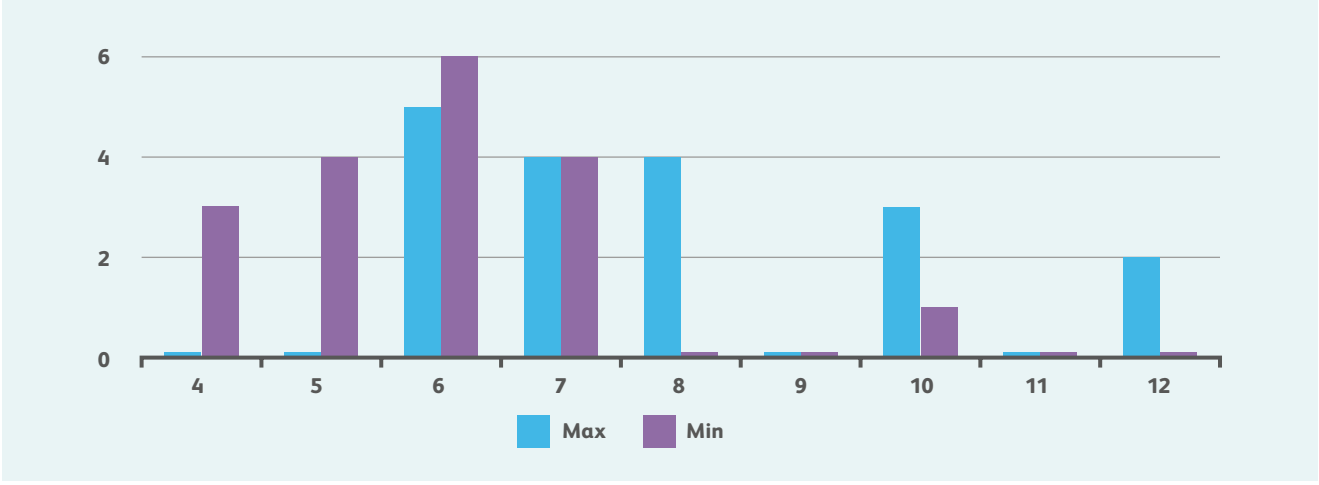

Figure 10: Maximum (front) / Min. (back) cases routinely put on consultant only LA cataract lists

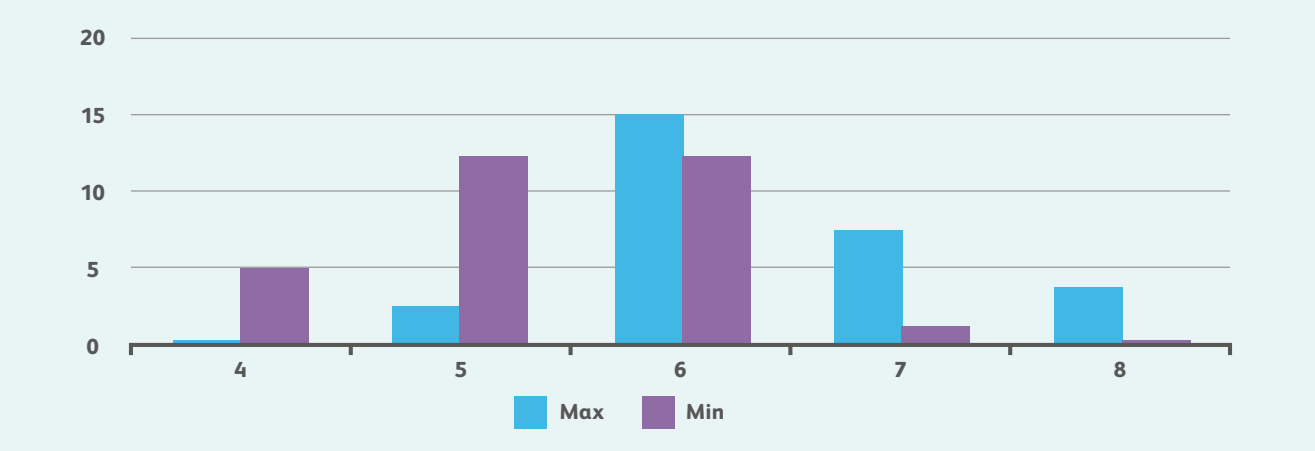

Figure 11: Maximum and Minimum cases routinely put on training lists

There is also variation within departments themselves (figure 12), with some consultant-only cataract lists having just 4 or 5 cases on them as a routine, whereas others are routinely achieving 7 on training lists.

The numbers of straightforward local anaesthetic (LA) cataract operations routinely put on consultant-only lists (not including complicated cases or general anaesthetic (GA)) can be influenced by various factors such as:

- Staffing levels and skill mix in day case area and theatre
- Geography of the department with relation to theatres

Numbers of cataracts on a list may be influenced by:

Staffing levels and skill mix in day case area and theatre

Geography of the department with relation to theatres

In a few instances there were clear, specific explanations for the variance, with one consultant reporting the higher volume lists (10 cases) having an extra Health Care Assistant (HCA) compared to the normal (7 cases) lists (Cat 39). It is worth reflecting on this as most of the overheads are fixed (box).

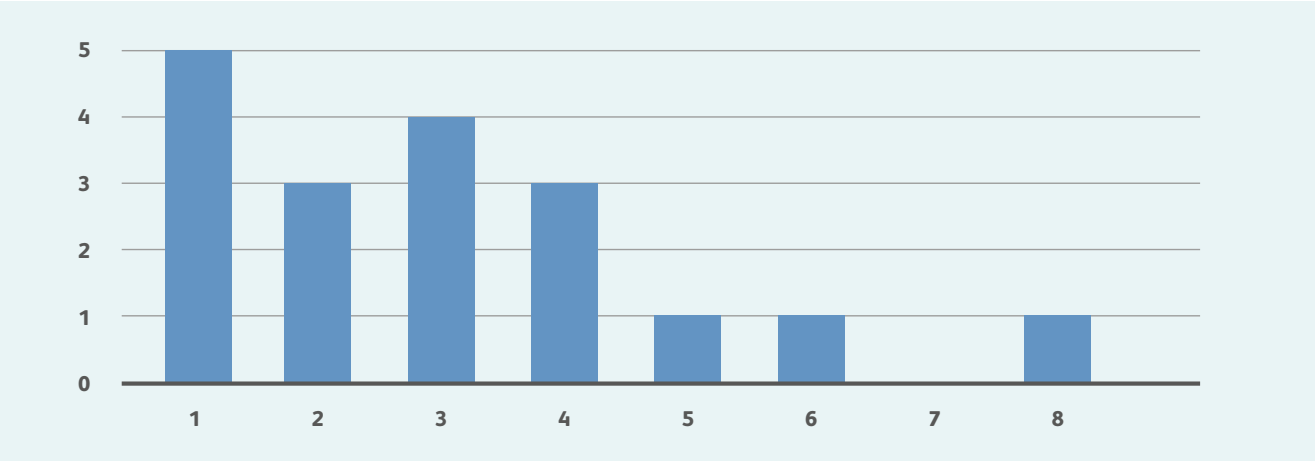

Figure 12: Intra-departmental difference between max. and min. routinely on consultant LA cataract service lists

The addition of one HCA to permit a 7–>10 (42%) increase in throughput is clearly going to be highly cost effective, and the cost analysis is detailed below. However, with theatre staffing budgets often financially unconnected to the income/activity generated by theatres, it is unsurprising that some units report having had to stop running high volume lists as their theatres are unable to provide one extra staff member (Cat 41). The theatre staffing budget may therefore dictate eye department income (for those under Payment by Results (PbR)) and reduce efficiency for everyone.

A: 1 theatre, 1 surgeon, 2 ward nurses, 1 ODP, 1 runner, 2 scrub nurses = 7 cataract op
B: 1 theatre, 1 surgeon, 2 ward nurses, 1 ODP, 1 runner, 2 scrub nurses +1 HCA = 10 cataract op

Much of the variation, however, had no explanation beyond an individual consultant's approach. On further questioning at interview, some explanations were forthcoming; "*the managers are starting to take notice of the variation and we have all just had job plan reviews… when the nurse is setting up the tray for the next case, I am already scrubbed and setting up the phaco machine myself, so I keep things moving.*" (Cat42).

At an RCOphth Congress 2014 session entitled "High Volume Cataract Surgery", the chairman said, "*If we had managers worth their salt they would be driving this agenda forward*", however it seems that consultants with the desire to run efficient services are commonly the driving force. Managers could also inspire this service progression by creating financial structures such that, if we work harder and smarter, saving money or bringing in more via PbR tariffs, then there will be more money available to develop eye care services, instead of "*the money disappearing to cross subsidise loss making parts of the hospital*" (Cat 40).

Management might also ensure theatre staff are rewarded / allowed to go home when the list finishes – so they get into the habit of working in a time-efficient manner. One consultant operating at two sites in a trust commented, "*on one site the staff leave when the job is done so there is a real team feeling to get on with the job; on the other site they have to stay till their shift officially ends, so we all drag our heels, there is no motivation to get finished.*" (Cat 41).

"on one site the staff leave when the job is done so there is a real team feeling to get on with the job; on the other site they have to stay until their shift officially ends, so we all drag our heels, there is no motivation to get finished." (Cat 41).

Some units report having had to stop running high volume lists as their theatres are unable to provide one extra staff member

Cataract lists - Volume

The 2015 RCOphth / Monitor report entitled "Helping NHS providers improve productivity in elective care" set the target of departments performing one cataract operation every half an hour.[68] Comparing this target to the variation reported in The Way Forward interviews (figure 13), it is clear that we are not, as a nation, routinely achieving this half an hour per case target, and should look for opportunities to streamline processes to achieve "higher volume".

The alternative is a qualitative shift to "high volume" surgery, where all the processes are very tight, staffing levels are higher in order to maximise support for the ophthalmologist so that the surgeon really just operates, and delays (such as patients needing to go to the toilet when they are sent for) are systematically excluded. Not every surgeon will be willing or able to sustain 3-4 operations per hour, and even those who are able to work at this intensity may not be able to continue over an entire working career, but such surgeons should be identified and supported. For some, the opportunity to establish a high-volume service is a challenge that is reported to be rewarding for the surgeon, their team, and their patients.

Higher Volume Lists
- Good for staff morale
- Provide sustainable service for demand (Cost per case reduced)
- Training experienced surgeons
- Reduce patient waiting times

Normal Volume Lists
- Help meet short term targets for theatre budgets
- Treat complex cases / may require grading of surgical difficulty
- Training junior surgeons

Figure 13: Higher volume drives quality & value

So whilst consideration should be given to all cataract surgeons being supported to achieve the recommended one operation per 30 minutes, only those whose physical and administrative theatre working environments that are conducive to efficiency may have the option of configuring a truly high volume service. There is absolutely no place for hurrying the surgeon, or cutting corners in this agenda.

There is absolutely no place for hurrying the surgeon, or cutting corners in this agenda.

In the drive towards higher volume operating, both for efficiency's sake and for improved outcomes, the need for sustainability must be remembered. One consultant commented, "*Our job is a marathon, so the drive for efficiency to do 10 on the list is fine in the short term, but unless you can guarantee staffing levels you end up killing yourself.*" (Cat 19) Trusts cannot expect to emulate the best performing units if they have "*poorly designed or poorly staffed units*".[57] Another consultant achieving high volume throughput commented that "*a crucial part of the equation for future success is the urgent need for eye trained theatre nurses*" (Cat 14), which is a collective responsibility, as more than one interviewee lamented the negative effect of valuable nursing staff leaving for other units.

Only those whose physical and administrative theatre working environments that are conducive to efficiency may have the option of configuring a truly high volume service

Poor theatre practices may predispose the patient to greater risk and high volume lists must ensure that patient safety is paramount.[69]

Higher volume may require more staff, but the additional productivity will pay the entire year's salary in the first few weeks

Although economic analysis is most obviously relevant to those practising under PbR, it is equally applicable to all home nations as it serves as a surrogate for the value you are providing to your health service, albeit in an indirectly remunerated way. This is obviously only the case if there are sufficient finances to pay for more cases, but increased efficiency should benefit more patients overall.

If your service currently manages 6 cataracts per list, using the calculation presented in Appendix C, (which may overestimate income if only standard (unenhanced) cataract operations are performed, and your unit does not receive London-weighting), you would make a profit of £1,471.[59] (figure 14).

Number of Cataracts per list	Income (£880 per case but varies with location and complexity)	Expenses (£)	Profit (£)	Profit per Case (£)
5	£4400	3583.13	816.87	163.37
6	£5280	3808.41	1471.59	245.27
7	£6160	4033.68	2126.32	303.76
8	£7040	4258.96	2781.04	347.63

Figure 14: Income versus expense for varying productivity of cataract lists

If, by employing an additional whole time Band 5 nurse, who may cost £40,000 to employ per annum (£800 per week, £200 per 10 hour day), you can increase capacity from 6 per list to 8 per list on just one list each day, this will generate an additional £1,309.[45] profit each day. Hence by the middle of February, the additional profit generated by the presence of that extra Band 5 nurse will have covered their salary for the entirety of the rest of the year.

The cost of employing this nurse may be borne by a different budget holder from that which receives the credit for the increased activity. Persuading hospitals to fund this extra staff member may therefore be difficult if the management processes are poorly constructed, despite the economics of the scenario making the case an easy one to present in theory. The other caveat, most relevant in England, is that many trusts have a monopoly purchaser of their services. If the CCG has reached the end of their finite budget then increasing your activity may not result in more income, however, increasing "per list" productivity may allow a reduction in the number of lists a service requires to run, with obvious cost saving implications.

Categorising Patients for surgery into risk categories to facilitate training and cataract list scheduling

One useful pre-requisite for ensuring there are appropriate training cases on training lists, and that higher volume is possible on service lists, is some means of categorising patients for surgical difficulty on the basis of the pre-operative examination. These can be used to aid risk management and effective scheduling of lists even for all grades of surgeon.

Examples of a grading systems that permits assignment of cataract patients to appropriately experienced surgeons (figure 15 and 16) were shared by 2 clinical leads. In the example in figure 15 a claustrophobic patient (2) with a small pupil (1.5) = 3.5 would undergo surgery by a fellow; if they were under GA that negates the claustrophobia hence the score drops to 1.5 and an SpR can do the case. If they had had a PC rupture in the other eye (3) (hence total 6.5) they would have to go to a consultant.

Some are much more simple (Fig 16), but can assist in deciding how to compile a theatre list for training purposes. These grading systems are applied as a routine part of the cataract pathway in many units, and were reported to make the job of constructing appropriate lists very easy.

There can be a tension between training and efficient service delivery. Training increases the costs of delivering cataract services as lists may run slower and complications may be higher, especially for those in the early stages of training.[70,71] Just as training is essential, but can impact negatively on service provision, there is also a negative impact of establishing cataract services outside the traditional training environment of the established NHS secondary care providers, as this leaves fewer cases for trainees,[72] and those left may be more complicated cases which are unsuitable for training. [73,74] More straightforward cases therefore become a precious resource. A standardised risk categorisation tool allows mapping of changes over time, and permits lists that can support training to be constructed to optimise use of more straightforward cases for training.

Co-morbidities/risk assessment

Glaucoma	1.5	Age 70 – 90	1.5
No fundal View	1.5	Age >90	2.5
Diabetic retinopathy	1.5	Only Eye	3
Severe Corneal opacity/disease	2	Positioning difficulties *	1.5
Angle closure/shallow AC	2	Tremor *	2
Small pupil/ Synechiae	1.5	Claustrophobia/Anxiety *	2
PXF/zonular weakness	3	Hard of hearing/Limited English *	2
Alpha-Blocker	1.5	Axial Length <22mm	2
White/Brunescent cataract	3	Axial Length > 26mm	1.5
Posterior polar cataract	3	Previous vitrectomy	2
PC rupture other eye	3	Previous trabeculectomy	1.5

Add values to derive risk score (**not included in score if GA*)

Total Score: _____SpR (<3) Fellow (3-6) Consultant only (>6)

Figure 15: Risk assessment (Cat 12)

Cataract grading	Suitable for which grade of surgeon?
Grade A	Any
Grade B	Senior trainee
Grade C	Consultant

Figure 16: Cataract Complexity score

Surgical simulation in training promotes efficiency in teaching centres

The use of simulation in training helps mitigate some of the conflict between training and service delivery by ensuring the slowest, most complication prone part of the early learning curve is traversed outside a live theatre setting.[75] This shortening of the learning curve [76] could facilitate greater productivity on training lists and reduce complications for patients. Simulation can also be used as a warm up before more complex surgery, or after a time out of surgery and may lead to improved average performance and reduced complications.[77] Simulation followed by intensive training in theatre has been modelled with very low complication rates and high surgical numbers in the first year of live surgery.[78] Training of senior trainees should include the management of high volume lists.

Staffing of theatre

When asked at interview to denote the number of staff involved in running a single cataract list, the mean average reported was 6. The most common configuration described was 2 staff on the ward area (typically a trained nurse and a health care assistant (HCA)) - one Operating Department Practitioner (ODP/ODA) with two scrub nurses and one "runner" (HCA) in theatre (figure 19 top half). Two units ran on just 4 staff, the reduction being possible by having one on the ward area feeding directly into a theatre with 3 staff present, but those doing higher volume lists generally reported having to increase staff numbers in order to reduce turnover time in theatre. Driving staff numbers down, therefore, can be a false economy if it also leads to a limitation of the numbers of operations that can be performed.

Driving staff numbers down is a false economy as it limits the number of operations

If staff cost savings are needed and a list is being run with 6 staff (figure 17 - top), the physical environment may be able to facilitate this. One department described their day-case unit with the ward area feeding directly into theatre (figure 17 – bottom). The ward nurses therefore put in the anaesthetic drops meaning there was no need for an ODP and no delay in bringing patients through.

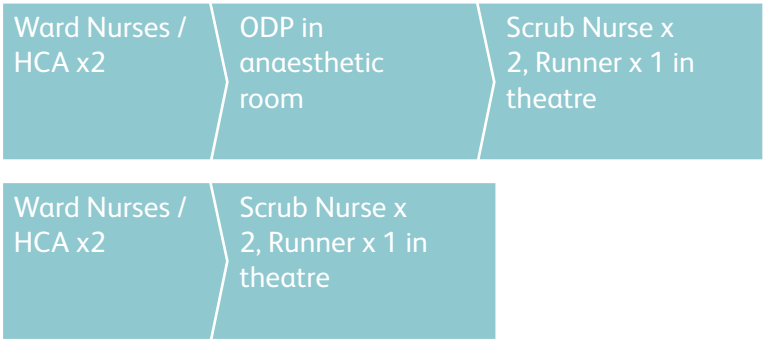

Figure 17: Proximity of waiting area to theatre reduces staff costs and delays

Anaesthetic support

Historically, where cataract surgery was performed on an inpatient basis and many more procedures were performed under general anaesthetic, every surgical list in every hospital would have been expected to have an anaesthetist in attendance. This situation has changed, and a new configuration is required to reflect the very low percentage requirement for GA cataract surgery. Proportionate risk management and a commitment to lean pathways and avoidance of low-value activity,[79,80] such as consultant anaesthetists giving sub-Tenon's anaesthetic blocks which can safely and effectively be delivered by a non-doctor,[81] is now required. This change is in acceptance of the fact that sub-optimal use of resource in one area means less resource is available to deliver health care to others. Getting value for money therefore becomes a clinical and moral imperative.

A proportionate evaluation of the risks of topical or local anaesthetic surgery permit most trusts to run the majority of their cataract lists without an anaesthetist present (figure 18), but with a 2222 crash team available if needed. Many hospitals also run satellite surgical centres without the presence of

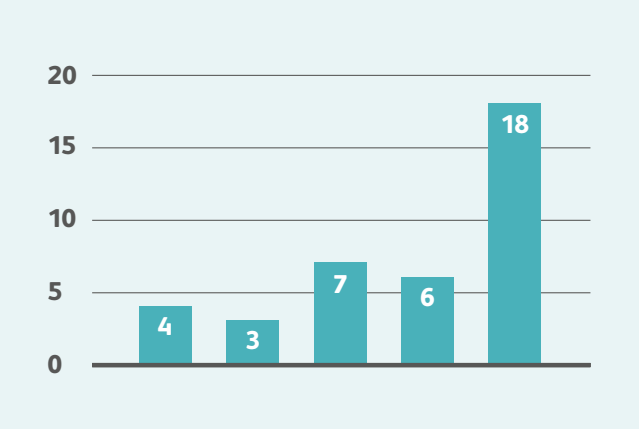

Figure 18: Presence of anaesthetist on local anaesthetic cataract lists

an anaesthetist such that the staff are able to administer immediate life support, whilst awaiting a 999 ambulance in the same way as NHS Minor Injury Units, Walk-In Centres and ophthalmic Independent Sector Treatment Centres would.

On interview, it was clear that some consultant ophthalmologists would have preferred to maintain anaesthetic presence on their operating lists, even when they are constituted only of local anaesthetic cataract procedures, but with an anaesthetist costing as much as an ophthalmologist it is increasingly difficult to convince managers to support a consultant job plan that involves a session giving 6 sub-Tenon's injections.

One consultant reported operating on *"three different sites; one site has an anaesthetist on every list, and the other two have no anaesthetist at all" (Cat24).* This variation is not driven by rational risk assessment or cost-effectiveness evaluation but by historical precedent.

It needs to be acknowledged that significant real-world logistical constraints exist as the managerial choice of whether to allocate an anaesthetist to a list may be a binary decision. Hence once the anaesthetist has been removed, all future access on that list to GA surgery is also removed. It is clear that "when it's gone, it's gone". The truth of this statement in itself demonstrates that the business case for putting an anaesthetist on that list would never be accepted, so to preserve access to GA, some reported trying to *"keep a few GA cases on the lists to avoid losing the anaesthetist"* (Cat36); one lead commented that *"50% of lists have anaesthetist on them despite just 1-2% GA rate. So some consultants still want an anaesthetist to give the sub-Tenon's for them."* (Cat9)

Many units, therefore, preserve GA capacity on some ophthalmic lists, and only assign cataract patients to those lists where the patient is deemed to require GA or significant sedation and the skills of an anaesthetist are therefore essential.

The bottom line should be what is needed for a safe service which is accessible to all patients who need it. For LA lists, any suitably trained person can administer the LA, but the College cataract guideline states correctly that there must be someone other than the surgeon and scrub nurse nearby with a current ILS qualification who can initiate resuscitation. GA provision should be determined by the number of patients who require GA cataract surgery. Although the indications for GA are limited, many of those patients will be challenging surgically and anaesthetically so these lists are likely to require experienced surgeons and anaesthetists.

there must be someone other than the surgeon and scrub nurse nearby with a current ILS qualification who can initiate resuscitation.

Avoiding post-operative district nurse visits to put in drops

There is a proportion of patients who, mostly due to dementia or arthritis, are unable to put in their own eye drops. In such cases, support from friends or family is normally recruited, but where this is not forthcoming, district nurse services are usually requested. If a patient is using four times a day drops for four weeks, this amounts to over 100 separate visits for a district nurse. Hence even if an eye department only has one patient per week with this requirement, over the year this is nearly 6000 visits for the local district nurses to perform.

It is unlikely that this expense is born by the local eye department or acute trust, however this is clearly an opportunity for us to save the wider health care economy a significant spend. A single injection of 20-40mg sub-Tenon's triamcinolone has been shown in two Randomised Controlled Trials to be an effective and safe substitute for post-operative steroid drops.[82,83] Experience and published evidence[84,85] are increasingly

inclining people to abandon the previously ubiquitous use of post-operative antibiotic drops, which patients are likely to be applying in an unhygienic fashion.[86] A depot steroid injection therefore may obviate the necessity for any post-operative drops.

This opportunity to make a saving for the wider health economy demonstrates the problem of implementing evidence-based efficiency savings when the specific budget holder who might benefit may be unaware of the potential saving, and there is no direct incentive for the provider for whom the intervention is effectively cost neutral.

Alternative surgical techniques

Whilst the western world employs phacoemulsification as the primary means of cataract extraction, the majority of the world still relies on manual extra-capsular techniques. There has been a lot of interest internationally in the development of sutureless "small-incision" cataract surgery (SICS). SICS has comparable outcomes and complications rates to phacoemulsification in the hands of surgeons experienced in both techniques. [87-91] The main disadvantages of SICS are the greater induced astigmatism and longer recovery time compared to phaco. Although some report the learning curve to be less hazardous than for phaco,[90] this is not necessarily the case.[92] The potential advantages of SICS are primarily economic: the cost of a SICS procedure being less than phaco.

The relative benefits of this saving vary between locations depending upon the costs of phaco consumables and foldable lenses relative to the fixed overheads. In settings where staff costs (the main fixed overhead) are low, the relative burden of phaco consumables loom larger. Hence in the UK where staff costs are high, the proportional economic advantages of SICS will be less dramatic than in the majority of the world where staff costs are lower.[93] These advantages would disappear when the extended rehabilitation for working age patients and the possible need for an extra-follow up visit are factored in.[94-96]

The other main international innovation of note is that of immediate sequential bilateral cataract surgery which has gained popularity in Scandinavia and Canada.[97-107] This has not been explored with any enthusiasm in the UK, probably due to the shorter average travelling time for patients compared to those seen in lower population-density settings where this practice has flourished, and a fear of bilateral endophthalmitis, albeit unfounded according to published series.[104,108-117]

Is it time for a rethink about the way we deliver cataract surgery and training in the UK?

If marketisation of the NHS continues, it is unlikely that policy will protect the market share of the traditional NHS comprehensive eye departments in England. It is therefore incumbent upon us to ensure that our eye departments are as competitive as possible

If demand on publicly funded cataract services grows as anticipated (50% increase in the next 20 years), without significant explicit rationing, a commensurate growth in numbers of ophthalmologists or significant improvement in theatre efficiency, then re-configuring the way we deliver cataract services is inevitable. Interacting with the various strands of evidence and experience to construct a fresh approach to whole-nation cataract services forces us to face the reduced complication rates and greater economic efficiency that can be delivered by high volume surgeons in high volume surgical practice.[118,119] Training in cataract surgery also requires full consideration within this, but it may be that the traditional apprenticeship model of cataract surgical training has to give way to evidence-based intentional surgical training structures to provide specialist high volume cataract surgeons.

The landscape of cataract surgery provision has already shifted for much of the UK as provision outside of the traditional NHS secondary care ophthalmology providers take on an increasing percentage of the less complex surgical load.[120] Training may also relocate to such facilities. A greater concern, however, is whether comprehensive providers who are being funded according to their activity (i.e. PbR) need to retain the majority of the less complex cataract surgical case load in order to remain financially viable.

If marketisation of the NHS continues, it is unlikely that policy will protect the market share of the traditional NHS comprehensive eye departments. If we believe our current locally based service delivery is optimal for patients, it is incumbent upon us to ensure that our eye departments are as competitive as possible. The income generated needs to be retained and reinvested in local eye care services rather than siphoned off by the trusts in which they are housed. If this is not done, it would seem intuitive that an independent sector provider, able to pick and choose what services they provide and able to retain their income to reinvest, will out-perform the comprehensive provider. The resulting slow dismantling of our eye departments from the outside may be hard to reverse.

This concern may be presently restricted to the English context. However the drive to provision of high value services is universal across the UK as we strive to do the best we can with the resources we have.

Considerations

Things any department could do straight away:

- Meet with hospital managers. Outline the projections for the prevalence of cataract to rise by 25% in the next 10 years.
- Map your current cataract pathway, then map what you would like it to look like. Create a stepwise programme of change to advance your service based on current availability of staff.
- Audit cataract referrals – what proportion get listed for surgery? If it is less than 80%, it is likely that cataract clinic capacity is being sub-optimally utilised, there may be value in creating clearer written advice to referral sources that reflect RCOphth commissioning guidelines.[48]
- Consider the possibility of coming to an arrangement with local optometrists with training and communication arrangements so that second eye cataracts can be discharged post-ops directly following their operation
  - if the surgery has been uncomplicated,
  - there were no postoperative complications with the first eye
  - there are no increased risk factors for postoperative complications
  - there are no other ocular co-morbidities
  - direct lines of communication have been established between the patient and the eye department

Tens of thousands of UK patients are discharged in this way annually and have been for many for years without problems.

Things any department could do straight away that don't help you at all, but improve efficiency of the health care system as a whole:

- If more than 10% of cataract operating lists have anaesthetist input, organise to collect GA cataract patients onto dedicated lower volume lists. In cases where a sub-Tenon's anaesthesia may be desirable, this could be given by the ophthalmologist or appropriately trained HCP.
- Where patients are unable to put in their own eye drops and have no family support, a 30mg sub-Tenon's triamcinolone injection will prevent you having to arrange district nurses to give four times a day drops for 28 days (4 x 28 = 112 district nurse home visits saved)
- Things that could be considered as part of a pathway redesign:
- Training either HES HCPs or community optometrists to see routine post-operative patients following uncomplicated first eye surgery.
- Start a "Higher Volume Cataract Surgery" work stream with theatre staff and managers. Engage theatre nurses in finding answers to the questions, "why are we only able to do 6 x 10-15 minute operations (60 – 90 minutes of surgery) on a 4 hour (240 minute) operating list?" and "How can we improve turnaround time?" Progressing this agenda will certainly require engagement of the full team. It may require expansion of that team, and may require reviewing theat

Appendix A

Way Forward - Methodology

Introduction

The Way Forward project is an exciting opportunity to identify and disseminate current best practice models in the delivery of eye care in the UK. The substantial breadth of the work, including prevalence, projected trends in prevalence and absolute cases numbers over the next 20 years across the major ophthalmic diseases of public health significance (cataract, glaucoma, Diabetic retinopathy and AMD as well as emergency eye care service provision) in all countries within the UK, necessitates a high level overview approach, but with specific detailed examples to illustrate themes, and provide impetus for positive change. Literature review will be combined with some primary data collection in the form of surveys of current practice to determine what innovations and service designs have been successfully employed already.

The Way Forward project is a shared learning opportunity, and to that end, a survey of UK departments was undertaken by phone interview employing a semi-structured interview template to guide interviews.

Literature Search

Literature search included both peer reviewed publications via search of Medline and a search of the grey literature. Exhaustive literature review such as that which would be undertaken for a systematic review, was not achievable or appropriate within the terms of reference of this work, so a search strategy for each major condition was undertaken selecting for papers where the condition is a major MeSH term and appropriate sub-headings will be included rather than exploding all trees.

Search Strategy: ((“Cataract/economics”[Majr] OR “Cataract/epidemiology”[Majr] OR “Cataract/organization and administration”[Majr] OR “Cataract/prevention and control”[Majr])) OR (“Cataract Extraction/economics”[Majr] OR “Cataract Extraction/epidemiology”[Majr] OR “Cataract Extraction/nursing”[Majr] OR “Cataract Extraction/organization and administration”[Majr] OR “Cataract Extraction/standards”[Majr] OR “Cataract Extraction/statistics and numerical data”[Majr] OR “Cataract Extraction/supply and distribution”[Majr] OR “Cataract Extraction/trends”[Majr]) AND (“UK” OR “Northern Ireland” OR “Scotland” OR “England” OR “Wales”). Using PubMed (www.pubmed.org accessed 12/11/2015), 227 citations were returned of which 73 were deemed relevant and full text retrieved.

To look outside of the peer reviewed literature available through PubMed, other relevant databases were searched.

The Cumulative Index of Nursing and Allied Health Literature (CINAHL), Health Management Information Consortium (HMIC) and Health Business Elite data bases were also searched with the strategy (“UK” OR “Northern Ireland” OR “Scotland” OR “England” OR “Wales”) AND (ophth* OR eye) AND (service OR clinic OR design) which produced 83, 119 and 55 references respectively of which 47 references were taken up for review. Particular key references in each subject area were entered into the Science Citation Index.

This search strategy was designed to have a higher specificity than sensitivity for relevant papers for efficiency. To mitigate the risk of missing important papers, for the older key papers identified from the search, future studies that cited those papers were then also viewed and for more recent papers, their references also inspected.

Prevalence Estimates and Case numbers for the UK up to 2035

With age as the most significant risk factor for the major conditions of interest, prevalence projections based on demographic trends will be produced nationally using case definitions and age stratified data

from relevant populations. Other risk factors such as ethnicity and smoking are not static in the UK population, and although predictions regarding changes in these risk factors, stratified by age, across the country, applied to prevalence data derived from relevant populations might have been possible, more benefit was seen to lie in discussion of trends in these risk factors.

The interest we have in prevalence (for chronic problems such as glaucoma and diabetic retinopathy) or incidence (for treatable conditions such as symptomatic cataract), is primarily for predicting the demand on ophthalmic services. The study will acknowledge that the link between disease prevalence and the demand for services is not strong; this is exemplified by the regional variation seen in the UK in the numbers of cataract operations performed per 100,000 per annum. This figure is reported to vary from <300 cataracts per 100,000 per year to >800 cataracts per 100,000 per year (as noted in the RCOphth Cataract Commissioning Guidance).[2] It is unlikely that this difference is accounted for by local variations in prevalence.

The prevalence estimates and methodology employed, using the NEHEM, are expanded upon in Appendix B.

Interviews with UK consultants leading cataract services to identify good practice examples

In the rapidly changing landscape of health service delivery in the UK, it must be recognised that not all good practice examples will have reached publication.

Using the RCOphth database of lead clinicians, emails were sent to every lead clinician in the UK asking them to nominate colleagues who might be prepared to be interviewed about the service configuration in their departments for Cataract, Glaucoma, AMD, DR and Emergency Eye Care. In some cases, one consultant was nominated to be interviewed for more than one sub-specialist area.

Nominated consultants were then contacted by email to arrange an interview time using a scheduling application, and the interview was then conducted using a semi-structured interview template, with data recording done into a spreadsheet for later thematic evaluation. Examples of poor practice or instances where departments are experiencing difficulty in realising the quality and quantity of service that they would have liked to deliver were seen as being as informative as the examples of good practice.

Project Output

It was initially intended that one single “Way Forward” project written report would be released, however with the volume of data gathered from interview and literature search, it was felt that it might be difficult to keep the document acceptably concise without limiting the opportunity to present different models of practice. It was therefore concluded that separate reports should be prepared for each subject area. These reports were prepared by the principal investigator, reviewed by members of the Leeds Ophthalmic Public Health Team and The Way Forward Project Board along with reference consultants. After revision, a pre-final draft is then to be circulated to all consultants who had participated in The Way Forward project interviews for final input prior to RCOphth ratification and dissemination.

Dissemination through national congresses and regional educational meetings is intended. The success of the project can be seen to pivot around whether any change in local practice is facilitated by the output, either by reports or by presentations.

Appendix B

Population Growth and Ageing: Cataract Demand Projections for the UK 2015-2035

In order to quantify the expectation of growth in case numbers for cataract, projections of population growth, as released by the Office for National Statistics (ONS) were taken and prevalence data from population based surveys were applied to these projections.

Growth projections for our elderly population

The population growth projections for each of the 4 nations of the UK derived from the ONS are given in table B1. However, it is not the total population growth that is of concern, but the projected increasing age of that population, with a diminishing ratio of those of working age compared to those of retirement age (ratio in 2010 of 3.16, dropping to 2.87 by mid-2035).[121]

	2010	2015	2020	2025	2030	2035
United Kingdom	62.3	64.8	67.2	69.4	71.4	73.2
England	52.2	54.5	56.6	58.6	60.4	62.1
Wales	3.0	3.1	3.2	3.2	3.3	3.4
Scotland	5.2	5.4	5.5	5.6	5.7	5.8
N. Ireland	1.8	1.9	1.9	2.0	2.0	2.0

Table B1: ONS 2010 data based projections for UK population growth (millions)

In 2010 there were estimated to be 4.9 million UK residents over 75 years of age (1.4 million >85 years) whereas by 2035 the total over 75 years is expected to be 8.9 million (3.5 million >85 years). Figure B2 below graphically demonstrates this population shift.

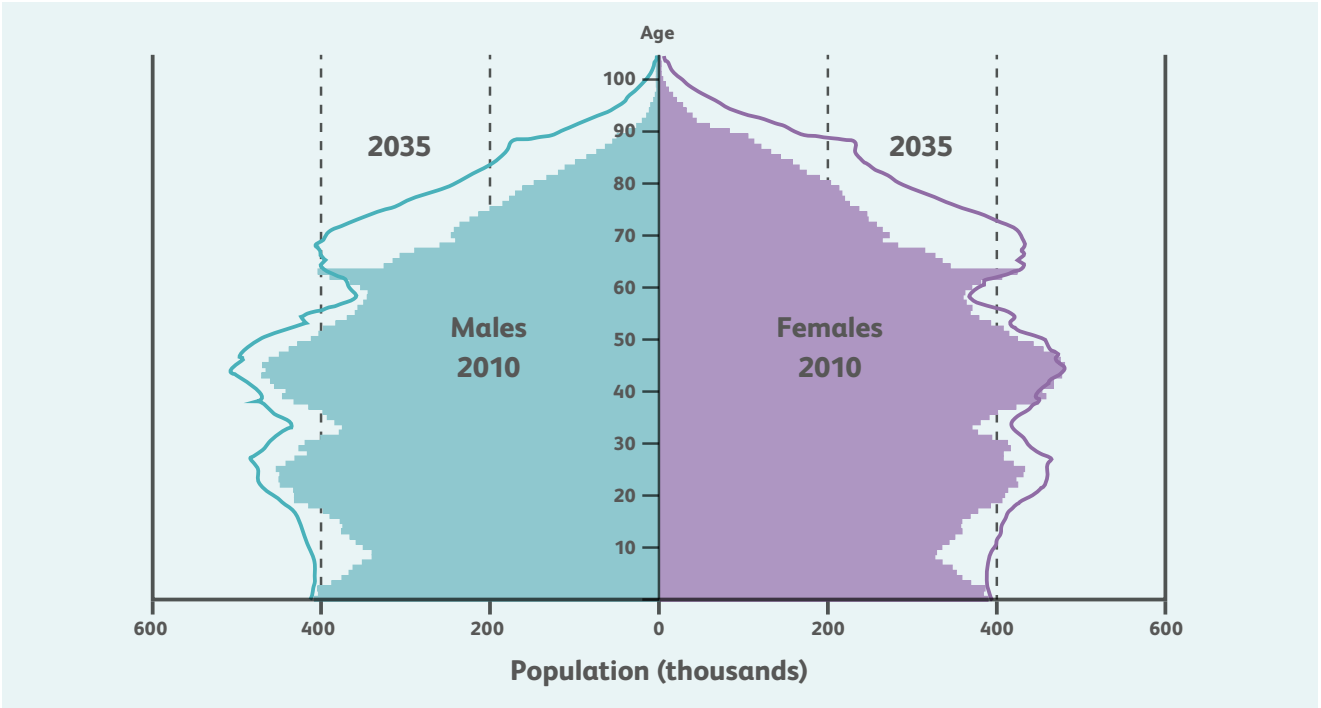

Figure B2. Estimated and projected age structure of the UK population mid-2010 and mid-2035

This can also be seen in the life-expectancy figures which rose between 1990 and 2013 by 5.4 years (95%CI 5.0-5.8) from 75.9 to 81.3 years.[122,123]

In 2014, in England and Wales as a whole, there were 870 people aged 90 and over per 100,000 population, compared to 739 people aged 90 and over per 100,000 population in Scotland and 654 in Northern Ireland. These differences to some extent reflect the life expectancy at older ages in that, at age 85, the average English or Welsh man can expect to live another 5.9 years, or 6.8 years for females, compared with the average Northern Irish 85 year old living 5.7 years (male) and 6.6 years (female) and in Scotland 5.5 years (male) and 6.4 years (female).[123]

Epidemiological modelling to predict growth in the numbers of patients with eye diseases

If we can estimate the number of people in each age group at various time points into the future, and we can estimate the age stratified prevalence of various diseases within those populations, then we can produce estimates of the total numbers of people with the diseases in question.

The population projections, stratified by age, as presented in table B3 can be utilised in order to populate the National Eye Health Epidemiological Model (NEHEM), an online resource (www.eyehealthmodel.org) that permits national or local estimation of the numbers of patients with various ophthalmic diagnoses. NEHEM was created by the Public Health Action Support Team (PHAST), having been commissioned by a consortium of interested bodies including The Royal College of Ophthalmologists, the Association of British Dispensing Opticians, the Association of Optometrists, the College of Optometrists, the Federation of Ophthalmic and Dispensing Opticians; the consortium acknowledged the Central (LOC) Fund for their support in commissioning this, and the LOCSU for hosting the model as an online resource.

	2010	2015	2020	2025	2030	2035
40-49	8.28	8.52	8.78	8.85	8.82	8.88
50-59	8.08	8.68	8.77	8.34	8.23	8.66
60-69	6.11	6.47	6.89	7.28	7.87	7.99
70-79	4.80	5.12	5.54	6.14	6.58	6.71
80+	3.16	3.50	4.00	4.78	5.41	6.20

Table B3: UK Population by age derived from ONS 2010-based population projections (millions)

The population based survey data from whence the NEHEM prevalence estimates are derived, varies by disease. So for example, whilst Australian data might be suitable for projections regarding glaucoma, given the relative exposure of different populations to known risk factors, it is unsurprising that the population based survey from Melbourne, Australia produced a higher prevalence of cataract than that found in a population from Somerset.[124,125] Much more important to estimation of prevalence than the actual prevalence, however, is the definition of a "case".

Estimating cataract prevalence runs a significant risk of being meaningless in practical terms. Diseases that are binary, such as retinitis pigmentosa, have clear and distinct populations of cases and non-cases. With the broad based pyramid of progressive lenticular opacity in the UK population, and in the absence of any clear internationally agreed case definition used in epidemiological studies, slight changes in the definition of a case have large impacts on prevalence estimates.

Additionally, more than any other disease under consideration by The Way Forward project, the conversion rate from prevalence to demand on eye care services has not been identified in a generalizable way for cataract. Demand has been shown to be highly variable over time and between geographic regions, as demonstrated in the NHS Atlas of Variation (figure B4 and B5) citing Keenan et al.[1,2] There has also been demonstration of substantial variation in the productivity of hospitals,[126] so both supply and demand have local drivers that have not been well characterised.

Across the UK, different guidance on the threshold for operating on cataract is employed, and the visual demands of patients and the stage of disease at which they present also differs producing an almost three fold variation in the number of cataract operations performed per capita between the areas with the highest and lowest activity, as noted in the RCOphth Cataract Commissioning Guidance (2015).[2,26,4]8

Nonetheless, an attempt at modelling of cataract numbers, both in terms of prevalence and in terms of expected operations is essential with cataract surgery being the most commonly performed operation in the NHS and with cataract still being the leading cause of blindness globally.[9,127]

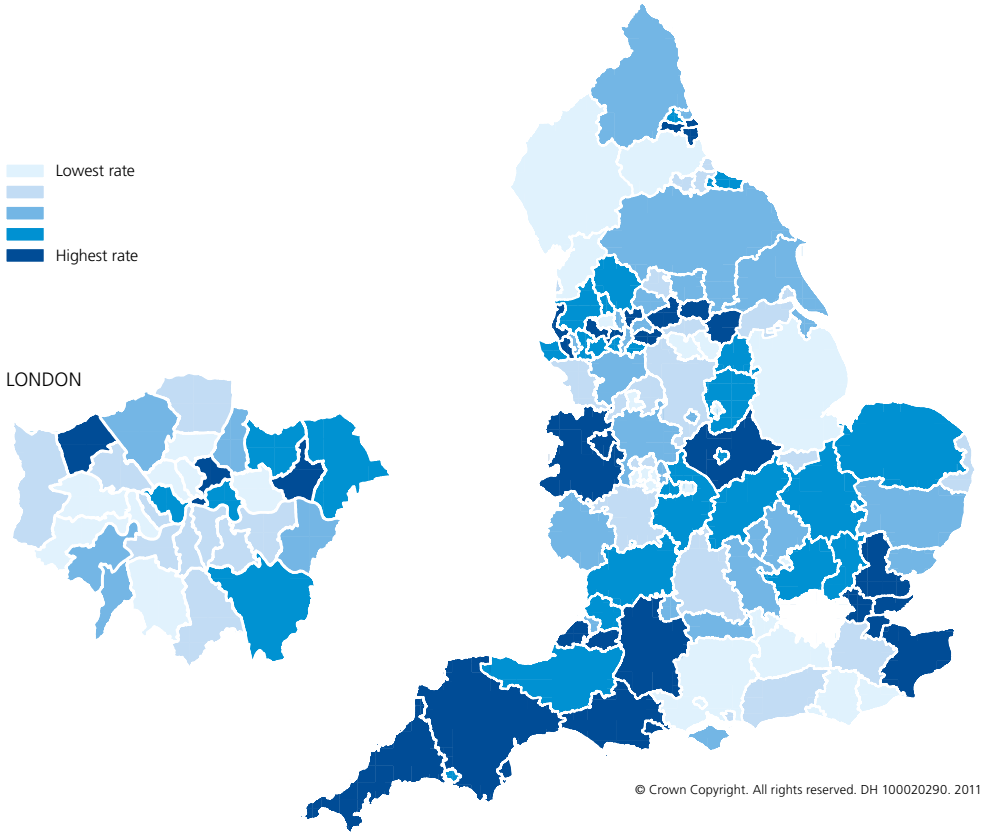

Figure B4: Rate of cataract surgery by CCG in England adjusted for age and sex[2] (from Atlas of variation)

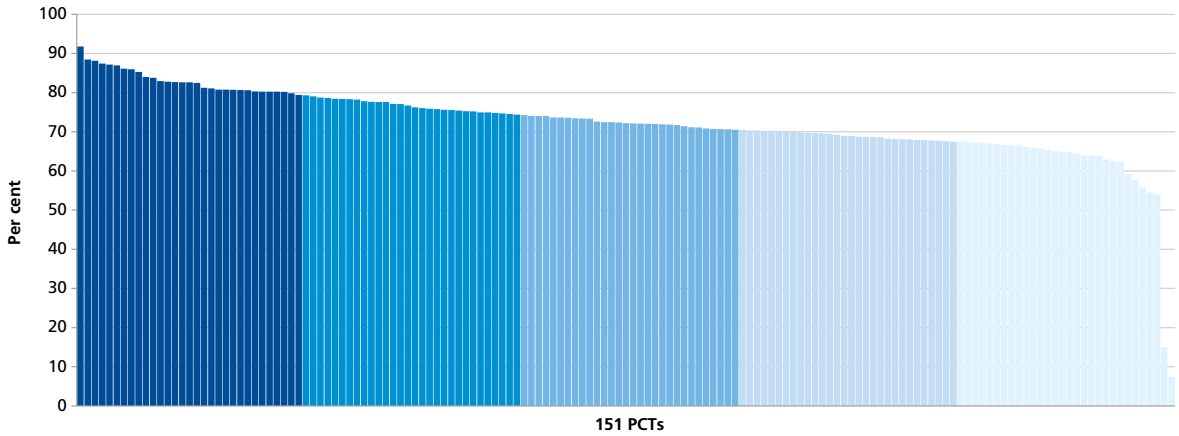

Figure B5: Rates of phaco-emulsification cataract extraction and insertion of lens per 100,000 population aged 65+ by English CCG; 2012/132 (from Atlas of variation)

The NEHEM asserted that, "our model was designed to estimate the prevalence of cataracts which were affecting the patient's vision sufficiently to consider surgery". Because of the wide range of case definitions of cataract prevalence in the various studies, NEHEM elects to provide two cataract estimates, a higher and lower, based on two well designed population prevalence studies which broke down their results according to different age groups.[124,125]

The McCarty et al study was based on 3,271 residents in Melbourne, Australia and defined prevalence of cataracts as 'presence of cataract' (as defined by them) in one or both eyes and 'dissatisfaction with vision.' Anyone who had had cataract surgery in both eyes was excluded. The upper estimate in the NEHEM model uses this case definition. The authors note that the number of people with 'dissatisfaction with vision' was about a third of the total number with 'presence of cataract'. [125]

The Frost et al study was based on 2,783 residents in Somerset and Avon, England and defined prevalence using three criteria (visual acuity, vision related quality of life and whether the patients complained of poor vision) in conjunction with five lens opacity types. The criteria for defining the presence of a cataract were stricter if ocular co-morbidity was present. The prevalence estimates from this study were much lower than those from Melbourne, which is unsurprising, given not only the risk factor exposure, but the strictness of their criteria.

The lower estimate utilises this studies definition of "*Self-reported poor vision in the affected eye, visual acuity 6/6 or worse, vision related quality of life (VCM1) score >1.0 (ranges from 0-5) and posterior sub-capsular cataract, anterior sub-capsular cataract or cortical cataracts affecting greater than a third of the central lens or nuclear colour greater than 2 or nuclear opalescence greater than 3 (Oxford Clinical Cataract Classification and Grading System). In cases of co-morbidity the cataract would need to occupy greater than two thirds of the central lens area or should have colour greater than 2.5 or nuclear opalescence greater than 4 to be defined as a surgical cataract.*"[124]

	High Estimate	Low Estimate
2010	2,173,000	625,000
2015	2,346,000	681,000
2020	2,566,000	760,000
2025	2,866,000	877,000
2030	3,125,000	973,000
2035	3,364,000	1,072,000

Figure B6: UK Cataract projections 2010-35

Although other options for modelling exist,[20] the NEHEM tool was selected as it provides the added functionality of being readily accessible to those wishing to repeat calculations for their locality, as advocated by the RCOphth.[128] So projections can be reworked using NEHEM for each country, or each local catchment population for a particular health board or acute trust, utilising definitions that reflect local practice in terms of what extent of visual impairment from cataract justifies surgical intervention (e.g. English local CCG listing criteria). However, the important message of the data is not the actual numbers of cataracts, but the estimate of what demand it is likely to place on services.

The growth in numbers of operations performed in the UK, particularly in the last 25 years since phacoemulsification became standard, is clearly not attributable to demographic shifts. We are not expecting another quantum shift in practice such as that produced by phacoemulsification; the level of cataract at which ophthalmologists felt confident that they could offer surgery with an acceptable degree of confidence that it would improve vision changed enormously and must be presumed to be the main driver of the growth seen in figure B7. However, we do not appear to have reached a steady state which would permit us to say that there is a fixed conversion rate between prevalence and regional surgical activity.

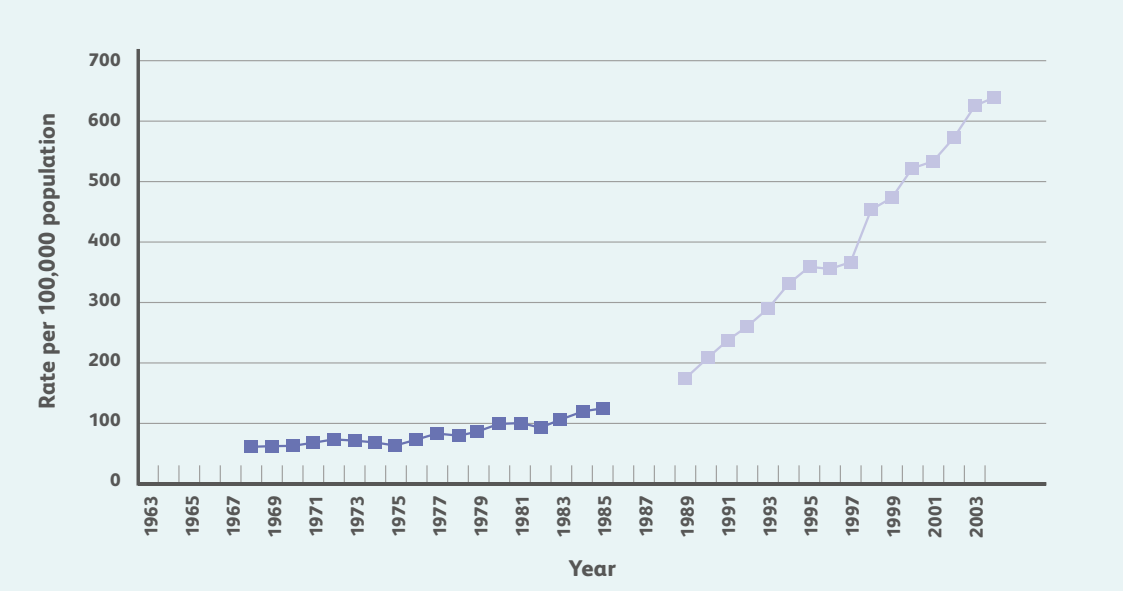

Figure B7: Keenen et al present historic data on English annual cataract operations 1

Nonetheless, it is inescapable that there will be a substantial portion of demand that is determined by prevalence. Hence the growth in prevalent cataracts by 43% (higher prevalence model) and 57% (lower prevalence model) between 2015 and 2035 might prompt us to deduce that an increase of around 50% in the numbers of cataract operations we are to be expected to perform should be anticipated over the next 20 years (25% over the next 10 years).

Alternative projections, are available, that estimate blindness due to cataract to rise in the UK by 17% between 2010 and 2020, and visual impairment to rise by 21% (206,224 to 248,504 in the same period). [20]

Surgical Workload Projections

An alternative projection of surgical workload based on predicted population structure changes estimated an increase from a projected 389,000 cataract operations performed in 2010 (in fact the total was around 345,000 for 2010), to 474,000 in 2020.[20]

Ethnicity and projections of cataract numbers

Although there is significant variation in the prevalence of ophthalmic diseases between populations of different ethnicity, [129-135] (and this variation has been shown to exist for cataract prevalence within certain UK minority populations[136]) the nature of differences between ethnic groups in terms of cataract prevalence has not been sufficiently well described, and neither have trends over time for the extent and direction of these ethnic differences been mapped sufficiently to permit meaningful incorporation of ethnic differences into a model of cataract prevalence for future projection. The problematic nature of considerations of ethnicity in cataract number estimations is exacerbated by the expected changes in the ethnic make-up of the UK over the next 20 years,[137] and the alteration in known risk factor exposure of those populations - for instance in terms of diabetes, lifetime risk of episodes of severe dehydration[138] and sunlight[139], as well as the likely changes in health seeking behaviour in the populations under consideration.[140] For these reasons no allowance for ethnicity is felt appropriate for the projections for The Way Forward project.

Estimated Populations Served by each NHS Trust

In applying the estimates to a particular eye department it would be necessary to know what population that department is drawing its patients from, and also the particular demographic constituency served which will vary markedly across the country. The population served by a particular eye department or NHS Trust, is not easily derived from nationally available statistics. Whilst there are some trusts, whose population boundaries are largely the same as the local units of health administration, such as regional NHS boards in Scotland or Wales, CCG in England and Health and Social Care Trusts in Northern Ireland, there is significant complexity in determining what the functional population served is.

The population may indeed vary by disease, dependant on the services provided in surrounding areas. For example, a smaller unit may be fully catering for their glaucoma population, but only managing their diabetic service up until the point that intravitreal injections are indicated, and may not be running an AMD injection service at all. Hence both their own population served, and that served by the adjacent eye departments will be different for different diseases. Similarly, the Emergency Eye Care services offered may vary over the week, in some units shutting at evenings and weekends, and others not, such that a disproportionate amount of evening and weekend work may be displaced to nearby eye departments.

The geographic boundaries and referral patterns become much less clear in densely populated areas, most notably in the south east of England, as patients might easily end up under a neighbouring trust, particularly if they have initially accessed services on an emergency basis.

For the purpose of the survey, therefore, it was decided that the population served would be asked of each consultant lead. The variation caused by factors such as those above could then be taken into account and indeed many consultants interviewed were able to reflect those differences by citing the population their own trust serves, but adding in surrounding areas or bordering trusts as needed.

Appendix C

Clinical leaders need to understand the interaction between demand and capacity in order to be able to provide for a future in which demand grows by approximately 22% every ten years up to 2035. The outline of a capacity / demand model below should permit the mapping of current service and empower for future planning on the basis of expected increases.

Relevant questions include:

- Where is our department sitting on the demand/capacity graph for the various sub-specialty services we provide?
- Are there obvious inefficiencies that are reducing our effective capacity?
- What was the last thing we did to increase our capacity? (e.g. new staff member or waiting list initiatives)
- What steps will we take in the short term to ensure that being under capacity does not lead to delays that put patients at risk?
- What is our next step to increase permanent capacity? What will be the trigger point that makes us act to increase capacity?

The Capacity and Demand Model

In business, capacity dropping below demand means losing customers, so increments in capacity are generated when the crisis point (★) of demand equalling capacity is reached figure D1. In publicly funded health care, the managerial drives are more strongly orientated towards avoidance of creating unused capacity (figure D2). The trigger point (★) for creation of more capacity is less well defined, but is likely to be driven by the growth of the backlog, represented by the shaded area under the demand curve. The incremented capacity will, in order to avoid excess capacity, aim to create a capacity/demand equilibrium hence building to match the current demand, but without allowance for expected future demand growth. One consultant interviewed for The Way Forward Project described this dynamic; *"we don't plan for growth, but just for what is currently required. We know a wave of patients is going to hit us, but nothing is done until there is a large backlog, adverse outcomes, patient complaints - and only then, is there enough of a driver for the managers to expand capacity - but as the service grows - the cycle repeats itself. Proactive planning is needed rather than just responding to serious untoward incidents (SUI)."(AMD27)*

Proactive planning is needed rather than just responding to serious untoward incidents (SUI)."(AMD27)

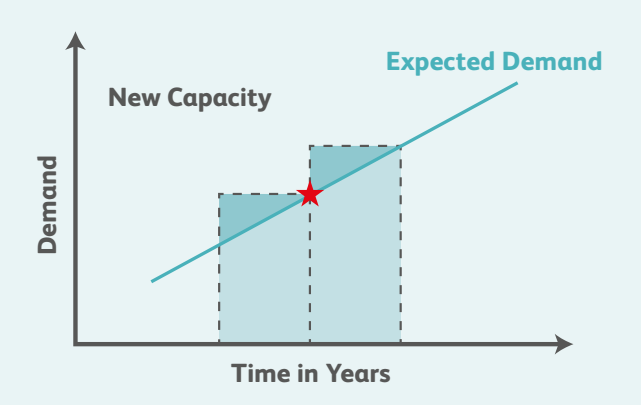

Figure D1: Capacity is incremented in advance of the expected growth in demand

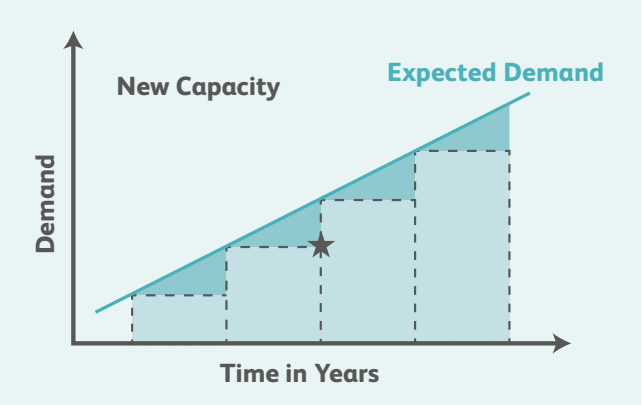

Figure D2: Capacity increments lag behind expected growth in demand

Whilst this behaviour in health management would be contrary to good business, it is rooted in the need to minimise costs. The ideal of balancing capacity and demand intrinsically requires excess capacity, as there will be fluctuation in both demand (patient flow) and capacity (staff sickness / leave). Every time there is an excess of demand, the surgical waiting list or clinic backlog is added to. When there is an excess of capacity (e.g. patients failing to attend appointments), it is harder to benefit from this unplanned excess capacity. Hence, even where capacity matches demand in theory, some capacity is wasted due to short term variation, and waiting list initiatives and backlog clinics are often needed to maintain the status quo.[141]

So in figure D3, the mean capacity might equal the mean demand, but a backlog will still develop. NHS management experience tells us that it is the capacity side that brings more variation to the equation, as staffing and equipment issues cause large unexpected drops in capacity that are not easily remedied in the immediate timeframe needed to avoid loss of activity.[141]

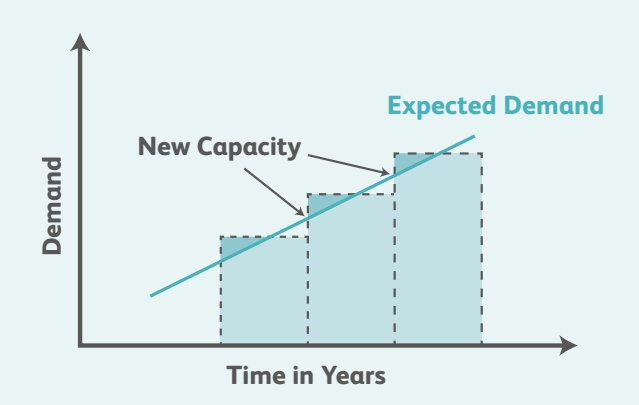

Figure D3: Mean capacity and demand equilibration

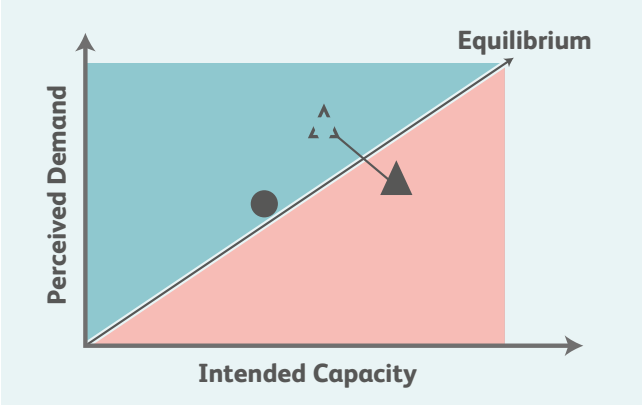

Figure D4: Individual services can be mapped to their current

Demand management and potential capacity maximisation

As we consider our own situations, which may well be different for each sub-speciality service offered, we can place ourselves on a graph of perceived demand plotted against the capacity we intend to provide.

Hence a unit may have a cataract service (●) that is almost coping but requires occasional weekend "initiative" lists in order to avoid breaching the Referral to Treatment Time (RTT) target. The newly built injection facilities and recently trained nurse injectors may, by contrast have moved the previously failing macular service (▲) into a healthy position to cope with current demand and the expected future rise (figure D4).

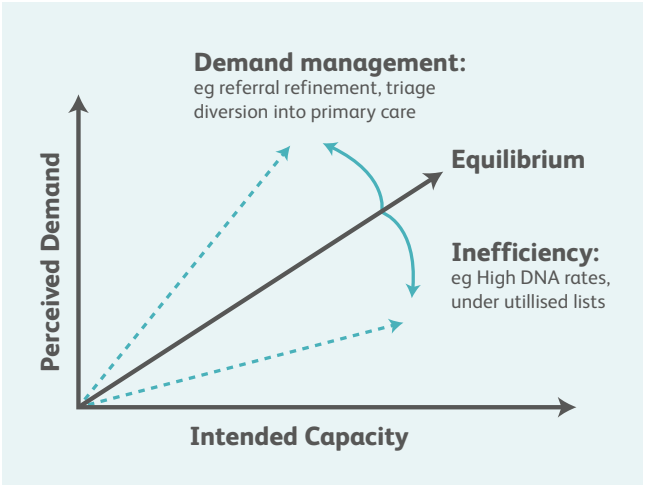

Figure C5: The equilibrium can be shifted to optimise current capacity

When placing our services on this graph, it is important to recognise that the equilibrium line is not fixed, and that factors from either side can shift this (figure D5). Before employing more staff and building more rooms, good management will want to examine potential for reducing inefficiencies and managing the demand side such that the same intended capacity meets a greater amount of perceived demand.[128] If a department has been traditionally performing six cataract operations under local anaesthetic (LA) per four hour operating list, but by improving turnaround time between cases increases this to 8 cases per four hour list, this increase in capacity of 33% permits the department to stay on top of the predicted growth in demand for cataract surgery for at least the next 10 years.

You will usually be under-capacity: how are you going to deal with it?

In any well managed eye department, if there were more capacity than demand, staff would be re-assigned to other tasks to prevent wastage. This appropriate intolerance for being over-capacity, and inevitable short term variation (sickness, DNA, equipment failure) that waste intended capacity, combine to produce the inevitable trend toward every eye department feeling stretched. If we accept this assessment, it is reasonable for departments to decide how they are going to deal with that (e.g. waiting lists initiatives, locums) and to cost that into their services. This proactive approach to being under-capacity should contribute to the protection of patients. The point at which it is decided to put on new permanent capacity (★figure D2) would be determined by the time when the cost of permanent new capacity (e.g. new ophthalmologist or AHP team member) becomes less than the cost of the temporary capacity expansion plan, which would be typically more expensive per patient episode.

Reflection on the Capacity / Demand Model

Answering the questions posed allows us to see where our different speciality services sit at this moment in time, to see how we have approached the need for increased capacity in the past, and therefore to plan our future response.

- Where is our department sitting on the demand/capacity graph for the various sub-specialty services we provide?
- Are there obvious inefficiencies that are reducing our effective capacity?
- What was the last thing we did to put up our capacity? (e.g. new staff member or waiting list initiatives)
- What steps will we take in the short term to ensure being under capacity does not lead to delays that put patients at risk?
- What is our next step to increase permanent capacity? What will be the trigger point that makes us act to increase capacity?

Appendix D

A Sustainable future for ophthalmology: The Triple Bottom Line

The RCOphth's future-proofing strategy aims to train ophthalmologists and allied health and social care multi-disciplinary team (MDT) members to deliver increased service capacity in a high quality, sustainable way.

The UK Climate Change Act commits it to reduce carbon emissions by 80% by 2050. Healthcare providers are already paying real money for their carbon emissions and this will only increase as the United Nations Framework Convention on Climate Change is ratified and adopted. The RCOphth Sustainability Working Group and the "Way Forward" project have engaged with the Centre for Sustainable Healthcare (CSH, Oxford) and the NHS Sustainability Development Unit (SDU) in order to understand environmental costs and to increase the resilience of services for the future.

When developing eye services we must consider the impact of developments on people, profit and planet.[142] In order to be sustainable, developments must meet the Triple Bottom Line of minimising economic and environmental impact (e.g. waste and carbon footprint)[143] whilst optimising social value (e.g. quality and patient experience).[144] In general this goal can be achieved by employing the four principles of sustainable clinical practice: disease prevention and health promotion, patient education and empowerment, lean service delivery and preferential use of treatment options with lower environmental impact. [145]

This report highlights a range of different approaches which can be taken to increase the overall sustainability of eye services given the restrictions on ophthalmologist numbers expansion and well established wider MDT supported models. Service delivery options that promote capacity to meet the broader Triple Bottom Line for patients, professionals and the planet include:

- **Broadening the base of the Consultant supported pyramid:** increase capacity at lower cost through senior ophthalmologist supported training, accreditation and ongoing clinical governance of increasing numbers of MDT clinicians
- **"One-stop" pathways** where all measures are taken to minimize the number of steps in the pathway
- **Minimise low value activities** by ensuring everything has been done to reduce false positive referrals and arrive at definitive management and discharge or risk-stratified follow-up
- **Reduced travel costs and carbon footprint** of multiple patient and staff journeys by rationalizing the number and location of sites, case and skill mix by local determination of the best 'economy of scale' considering the relative merit of larger high volume centralized units versus multiple smaller units
- **IT supported decentralisation and virtual review** - Systems now exist to permit the optimal hybrid of HES in-house services integrated as appropriate to the local context with community ophthalmology services, community optometry or GP with special interest in ophthalmology (GPSI) services to reduce the costs, inconvenience and environmental impact from traditional face to face, multiple journey, multiple location care
- **Efficient use of Estate and Equipment** - Reduce underutilization of expensive estate and equipment which is historically very common at most locations and most service delivery models. Going paper-light/paperless with Electronic Patient Records particularly with clinical information exchange between primary and secondary healthcare and joined up with ECLO and social rehabilitation care. The wastage of disposables, particularly for phaco should be reduced to a minimum.

NHS Commissioning guidance and further information on sustainability and population planning are available at www.rightcare.nhs.uk and www.sustainablehealthcare.org.uk/resources/publications (Sustainable System-Wide Commissioning Guide).

Appendix E

Economic Analysis of costs of running theatre with various staffing options for comparison with income generated (for those units working with Payment by Results) (Cat 9)

			No	Item	per hour	session 4 hours							
Fixed	Staffing	Theatre	1.00	Nurse Band 7	18.20	72.80		Staff + 25%			706.75		
			2.00	Nurse Band 6	17.00	136.00							
			1.00	ODP Band 6	17.00	68.00		Drs + 25%	1.00	Consultant	750.00		
			0.50	Porter Band 2	10.80	21.60			1.00	Trainee	250.00	50% from deanery	
		Ward	2.00	Nurse Band 5	14.70	117.60			1.00	Anaes	750.00		
			2.00	Nurse Band 3	12.60	100.80							
			0.50	Receptionist	10.80	21.60							
	Depreciation	£100,000 @ 10 years 378 lists pa			27.00	27.00							
	Theatre costs			Utilities & IT etc	25%								
					Cost	Cost + VAT							
Variable	Disposable	plus VAT	1.00	Implant	63.00	75.60							
			1.00	Healon	20.00	24.00							
			1.00	Tubing	43.00	51.60							
			1.00	Cefuroxime	5.40	6.48							
			1.00	BSS 500	4.10	4.92							
			1.00	Bss 15	1.00	1.20							
			1.00	Drugs for block	10.00	12.00							
			1.00	Drapes	4.50	5.40							
			1.00	Shield	0.50	0.60							
			1.00	I/A Handpiece	12.50	15.00							
			1.00	Keratome	9.00	10.80							
			1.00	Cystotome	1.07	1.28							
			1.00	Hydrodissection	1.54	1.85							
			1.00	Vitty @ 2%	4.00	4.80							
			2.00	Gloves	2.12	2.54							
			2.00	Gown	6.00	7.20							
				Total	187.73	225.28							
				Revenue @ £880		Cataracts	Cons alone	Cons + Anaes	Cons + Anaes + Trainee	Cons + Anaes + 2x trainee	Cons + Trainee	Cons + 2x Trainee	Trainee alone
				3,520		4	2,357.85	3,107.85	3,357.85	3,607.85	2,607.85	2,857.85	1,857.85
				4,400		5	2,583.13	3,333.13	3,583.13	3,833.13	2,833.13	3,083.13	2,083.13
				5,280		6	2,808.41	3,558.41	3,808.41	4,058.41	3,058.41	3,308.41	2,308.41
				6,160		7	3,033.68	3,783.68	4,033.68	4,283.68	3,283.68	3,533.68	2,533.68
				7,040		8	3,258.96	4,008.96	4,258.96	4,508.96	3,508.96	3,758.96	2,758.96

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