

*The* ROYAL COLLEGE *of*  
OPHTHALMOLOGISTS

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## The Way Forward

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

Glaucoma

# The Way Forward

## Glaucoma

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The Royal College of Ophthalmologists commissioned this project as there is increasing awareness that **the number of patients with ophthalmic 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.**

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

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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 cannot keep pace with demand. This project aims to capture some 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 to help meet the 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 consultants** leading their services in order to capture and discuss their ideas and innovations for this report.

It is clear that one size will not fit all, however it is equally clear that every eye department is going to have to progress to new models of working, and insights are available from those who have already undertaken to reconfigure their services in ways that permits more patients to be seen.

**The Way Forward project aims to equip ophthalmologists with tools to estimate and evaluate the size of the growth in demand that can be expected over the next 20 years, and most importantly, to offer some practical options for dealing with that growth gleaned from what our 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 objectives (appendix D).

**Members can email: [wayforward@rcophth.ac.uk](mailto:wayforward@rcophth.ac.uk) for more information.**

# UK 2016–2035: More people, more older people, more need for eye care

The demographic changes across the western world are well known; there are more people, and those people are living longer. The effect of this on ophthalmic services in the UK 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”.<sup>2</sup>*

The commissioning of The Way Forward project, (methodology in appendix A) was driven by awareness of this growth in the elderly population and an absence of commensurate growth in either financial or human resources to deal with the increasing burden of ophthalmic disease. Appeals by the RCOphth to have the number of ophthalmic training posts increased have been declined, and the previous practice of importing ophthalmologists from around the world may be less easy as a global shortage of ophthalmologists is reported,<sup>3</sup> and there is greater awareness of ethical issues around attracting staff from the national health systems of countries with greater ophthalmic human resource problems than the UK.<sup>4-7</sup>

There is the acute necessity to plan for a future in which the volume of eye care service delivered per ophthalmologist increases. Efficient glaucoma services, therefore, are an essential part of that future landscape. 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 is the so-called Triple Bottom Line that must be met as we pay due regard to the people, the profitability and the planet (Appendix D).

*Efficient glaucoma services... are an essential part of that future landscape*

## Glaucoma Projections 2010–2035

In order to quantify the expectation of growth in glaucoma case numbers, projections of age stratified population growth, as produced by the Office for National Statistics (ONS) were taken and prevalence estimates from population based surveys was applied to these projections. As there is significant variation in the prevalence of ophthalmic diseases between populations of different ethnicity,<sup>8-13</sup> and as the ethnic make-up of the UK is expected to change substantially over the next 20 years,<sup>14</sup> it was also necessary to take this shift into account.

For The Way Forward project, the National Eye Health Epidemiological Model (NEHEM) was utilised with ethnographically stratified population projections put into this model at various time points to give estimates of future glaucoma case numbers. The population projections, glaucoma epidemiological modelling and discussion thereof is presented in appendix B.

*From 2010 to 2035, the population over 75 years of age will rise by >80%. Those over 85 will more than double.*



**8.9m by 2035**

The growth in the elderly population is exemplified by the fact that in 2010 there were estimated to be 4.9 million UK residents over 75 years of age (1.4 million >85 years). By 2035 the population over 75 years is expected to be more than 80% larger at 8.9 million, and the population over 85 years of age will be 2.5 times larger at 3.5 million. The ratio, therefore, of those of working age compared to those of retirement age will drop from 3.16 in 2010 to 2.87 by mid-2035.<sup>15</sup>



Glaucoma



OHT



Glaucoma Suspects

This growth in the elderly population drives a rise in glaucoma numbers; modelling for The Way Forward project predicts that from 2015 to 2035, the number of people in the UK with glaucoma will rise by 44% (22% rise from 2015 to 2025). This will be accompanied by a rise of 16% in the numbers with ocular hypertension (OHT), and 18% identified as glaucoma suspects. These estimates resonate with other projections; a 2009 study estimated we would see a 23% rise in the diagnosed cases of glaucoma in the UK between 2010 and 2020.<sup>16,17</sup>

*Over the next 20 years glaucoma cases are predicted to rise by 44%, glaucoma suspects by 18% and OHT by 16%*

The Way Forward estimates are for prevalence, not diagnosed cases. It is frequently quoted that 50% of prevalent glaucoma is undiagnosed.<sup>18-23</sup> As recently as the 1980's, an analysis of the routes to hospital of patients with open angle glaucoma found that over half presented as a result of visual symptoms, and a full quarter of patients had advanced field loss at the point of presentation.<sup>24</sup> With improving technology, a greater ability to detect early disease and a more proactive approach to management,<sup>25</sup> it is probable that a progressively greater percentage of prevalent cases will end up being referred and diagnosed, so our 44% growth in clinic numbers over the next 20 years may likely be an underestimate as the conversion factor from prevalence to diagnosed cases changes.

### Where we are now – Current Backlog

The rise in numbers is already being felt by many in the Hospital Eye Service (HES). At interview, 57% (25/44) consultants reported an existing backlog that is causing delays to the follow up patients; new patients are on a target driven pathway, so delays are not tolerated. A quarter of those with a backlog (6/25) said that this was being brought down by a variety of means; evening or weekend clinics, recruiting more ophthalmologists, sourcing external provision. Two consultants had been asked to triage the backlog, assigning patients to risk categories to determine who could be safely delayed the most (GL30, 45 (- these are codes for The Way Forward interviews to permit anonymous referencing)).

*Two consultants reported having been asked to triage the backlog to see which follow ups can be safely delayed the most!*

### Applying these estimates to your glaucoma service

One consultant interviewed for this project when asked about their department's plans for the increasing numbers commented, "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)

Predictions of the expected growth in glaucoma patients permits us to debate with hospital managers about how services need to be changed now in order to cope with a 22% rise in numbers of glaucoma cases over the next ten years, rather than waiting for patient complaints to spur us into action. Between June 2005 and May 2009, the National Patient Safety Agency (NPSA) received reports of 44 glaucoma patients who experienced deterioration of vision, including 13 reports of total loss of vision, attributed to delayed follow up appointments with a further 91 incidents related to delayed, postponed or cancelled appointments for patients with glaucoma.<sup>26</sup> A BOSU study is soon to report on the same issue, and the results are expected to resonate with the NPSA findings.<sup>2</sup> In response, the RCOphth has published a Three Step Plan for eye departments to implement to protect patients from the negative consequences of the delays caused by the rapid growth in demand cited as a 40% increase in outpatient activity in the past 10 years.<sup>27</sup>

*National Patient Safety Agency (NPSA) received reports of 44 glaucoma patients who experienced deterioration of vision*

It is therefore incumbent upon us, as clinical leaders in our glaucoma services, to explore options for how we are going to meet the challenge of increased demand. For further discussion of the interaction between demand and capacity in service planning see appendix C.

## Referral Options - Reducing false positive referrals to improve capacity

Over the next 10 years, we can expect a 22% growth in the numbers of people with glaucoma, a 10% growth in the numbers of glaucoma suspects and 9% increase in those with OHT (see appendix B). Eye departments are at different places in the capacity / demand equilibrium. Some may still be coping with the traditional model of service delivery where every potential glaucoma or OHT referral is seen initially and followed up by an ophthalmologist (figure 1), but most departments have already reached the point where demand has outstripped capacity to such an extent that re-organisation was essential.

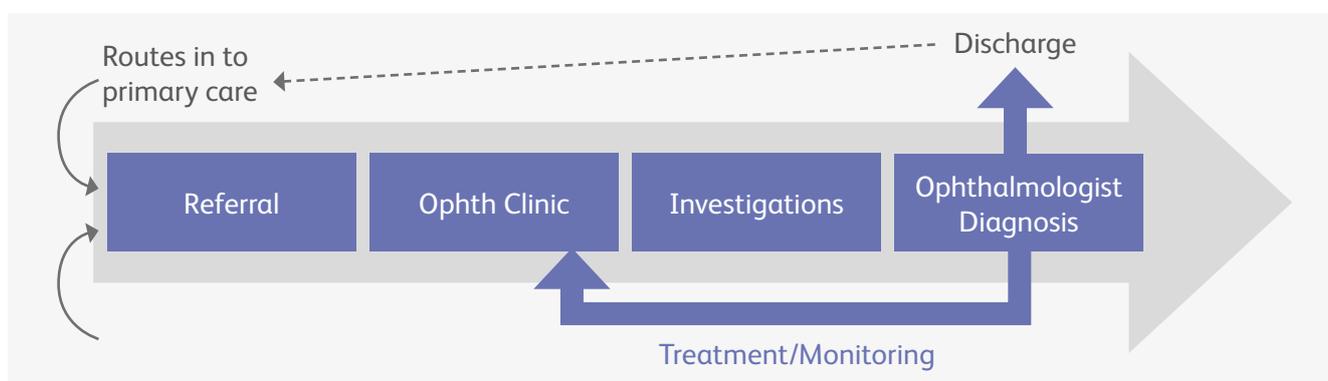


Figure 1: Traditional model of glaucoma care

Interventions have been devised to reduce demand on hospital eye services (HES) at each point on this pathway, from referral filtering schemes to reduce unnecessary referrals reaching secondary care, to community monitoring schemes for OHT and stable treated glaucoma. These will be explored in turn, and potential options for efficiency savings presented.

### Pre-Referral Considerations: Getting those most in need of our services, into our services

There is a step in the pathway prior to referral which often remains invisible to the ophthalmic community, but which is of great importance in terms of preventing visual loss and using the capacity we have appropriately.

Just as with cataract and diabetes,<sup>28</sup> lower socio-economic status is an established association of late presentation and thereby glaucoma related blindness.<sup>29-32</sup> The discussion around the use of finite resources must, therefore, include consideration of whether we are utilising a lot of capacity picking up disease earlier and earlier in certain demographics who take up the NHS funded sight tests readily. Other societal groups, who are less prone to take up the sight tests, remain under-diagnosed and untreated. Ophthalmologists have an ethical responsibility to promote equitable access to the GOS. For example one can encourage glaucoma patients to function as probands, directing their relatives to attend sight tests.<sup>33</sup> Another example is to influence the siting of non-hospital based eye care services in order to improve access to those with lower socio-economic status or those with higher ethnic risk factors.<sup>30</sup>

Population screening for glaucoma is not considered to represent adequately good value for money<sup>34</sup> as insufficient criteria for a screening programme can be met.<sup>35</sup> Nevertheless, opportunistic case finding is intentionally promoted by encouraging General Ophthalmic Services (GOS) sight test uptake with eligibility criteria for free testing that reflect the relative risks of various groups.<sup>36</sup> The frequency with which optometry sight testing should be recommended in different groups and at different ages may need revisiting as technology and demographics change (see for example the Canadian recommendations<sup>37</sup>).

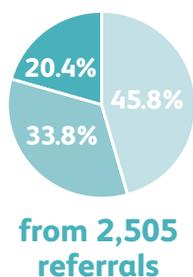
In Scotland, in an effort to reduce inequality, sight tests have been made free for all, yet there is no evidence that this has encouraged uptake of testing by the socio-economically less advantaged.<sup>38</sup> In fact the health gap may have been widened as the more affluent have disproportionately responded to this encouragement to access services.<sup>39</sup>

Although societal behavioural change might take a generation, it is clear that the pre-referral steps in the patients' journey to receiving effective care, primarily regular uptake of NHS sight tests, are a matter of great importance.<sup>40</sup>

## Reducing Demand on the Ophthalmologist/HES: Glaucoma Referral Filtering Schemes (GRFS), encompassing referral refinement (GRRS)

Reducing demand by avoidance of seeing unnecessary referrals is a good way of maximising the use of existing capacity. As substantial savings of secondary care glaucoma clinic appointments are potentially on offer through glaucoma referral filtering schemes (GRFS), the options are discussed comprehensively below.

### How much capacity could a GRFS save secondary care services?



An analysis of 2,505 referrals for suspected glaucoma to one eye department over a 10 year period showed that 45.8% were discharged at first visit, and only 20.4% were confirmed as having glaucoma - figures which demonstrate the significant diagnostic challenge that glaucoma presents.<sup>41</sup> Similar, or slightly lower first visit discharge rates have been produced by other studies with some variation.<sup>42-47</sup> Reduction of the false positive rate has been shown to be possible by running educational sessions for community optometrists,<sup>48</sup> but attempts to reduce the false positive glaucoma referrals by simply disseminating guidelines to local optometrists were not successful.<sup>49</sup>

This figure for false positives represented by the first visit discharge rate of around 40% should not be considered high; it is in fact the rate that would be expected if community optometrist NHS sight tests, as a diagnostic tool for glaucoma applied to a population with 2% prevalence of glaucoma, were to offer a specificity and sensitivity of ~97%.<sup>50</sup> Nonetheless, these false positive referrals can be viewed as sub-optimal use of the secondary care resource, and the rate has conclusively been shown to be amenable to reduction by a variety of GRFS.<sup>42,46,51-53</sup>

### NICE guideline introduction 2009

NICE guidelines, introduced in 2009, led to an edict from the Association of Optometrists that any patient measuring a pressure greater than 21mmHg should be referred.<sup>54</sup> A rise in the number of referrals was duly noted,<sup>55,56</sup> and a negative impact on referral accuracy was demonstrated, with a predictably larger negative effect on the specificity of the general community optometrists rather than optometrists with a special interest in glaucoma (OSI).<sup>55,57</sup>

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*Examples may demonstrate that referral filtering can work, but without impact assessment planning built into the design of a newly started scheme, it will be hard to inform the debate around whether a specific local scheme does convey benefit rather than merely adding cost and delay to the referral pathway.*

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The national need for referral filtering has been accentuated therefore, and GRFS are now widespread with 66% (31/47) of glaucoma leads interviewed for this report indicating that referral filtering is in operation in their locality, many schemes relatively new. Evaluation of these is far less widespread however, although anecdotal process indicators of the schemes may be positive with over 1,100 glaucoma referrals not forwarded to secondary care as a result of the Northern Ireland Goldmann applanation tonometry (GAT) referral filtering scheme set up in 2012 (GL25). Whilst specific

examples may demonstrate that referral filtering can work, without impact assessment planning built into the design of a newly started scheme, it will be hard to inform the debate around whether a specific local scheme does convey benefit rather than merely adding cost and delay to the referral pathway. When a new GRFS is commissioned, a robust continuing evaluation process must be instituted to ensure value (one department collaborated to set up a GRFS that reduced first visit discharge rate to 9%, but after a few years and the introduction of NICE guidelines in 2009, the rate had risen to 21%, bringing into question the value of the scheme in eliminating false positives (GL 6)).

### **Can technology filter the referrals into “disease / no disease” categories to reduce false positive referrals?**

An NIHR funded Health Technology Assessment compared different nerve imaging modalities and their potential use to filter referrals by eliminating patients deemed at low-risk of glaucoma on the basis of VA, IOP and imaging (scanning laser polarimetry (GDx), optical coherence tomography (OCT) and Scanning laser Tomography via the Heidelberg Retinal Tomography (HRT) using two different diagnostic algorithms).<sup>58</sup> The study concluded that whilst such an approach was cost effective, it resulted in 1 in 7 cases of glaucoma being inappropriately discharged. As imaging technology is advancing rapidly it is probable that automated referral filtering will be realised in the future.

### **Options in Glaucoma Referral Filtration Scheme (GRFS) configuration, encompassing referral refinement (GRRS)**

Glaucoma referral filtering schemes (GRFS) represent a hierarchy of pathways that are used to reduce false positive glaucoma referrals to hospital eye clinics, the most sophisticated being glaucoma referral refinement (GRRS) which is delivered by highly trained practitioners. The term glaucoma referral refinement (GRRS) is commonly used to encompass all levels of glaucoma filtering schemes, but this is not in keeping with NICE guidance<sup>54,59</sup>. The RCOphth glaucoma commissioning guideline summarises the NICE compliant, inter-professionally agreed terminology which is used in this document<sup>60</sup>.

Most current GRFS systems involve utilisation of optometrists with a special interest (OSI), who have undergone appropriate training and accreditation.<sup>42,46,52,53</sup>

In accordance with the NICE Glaucoma Guideline (CG85),<sup>54</sup> the NICE Quality Standard (QS7)<sup>59</sup> and the NICE Accredited RCOphth Commissioning Guideline for Glaucoma,<sup>60</sup> there is a hierarchy of GRFS. (Fig 2)

- “Repeat Measures” involves repeating of intra-ocular pressure (IOP) measurement where discs and field are normal, mostly by optometrists with core competence
- “Enhanced Case Finding or Repeat Measures Plus” includes repeating applanation IOP and taking other clinical measures by health care practitioners trained to the level of the College of Optometrists (CoO) Professional Certificate in Glaucoma, and the highest level
- “Referral Refinement” delivering added clinical value through a full clinical evaluation by practitioners trained to the level of the CoO Professional Higher Certificate in Glaucoma (previously Certificate A, or equivalent for non-optometrists).<sup>61</sup>

The various NICE required levels of case complexity and corresponding training requirements for optometrists and other practitioners are summarised in the RCOphth Commissioning Guideline for Glaucoma.<sup>60</sup> In the interests of service efficiency GRFS schemes may be combined with monitoring for people within relevant case complexity strata, ideally with disc imaging.<sup>53</sup> Alternatively community data collection of Visual Acuity (VA)/Goldmann applanation tonometry (GAT)/Visual Field (VF)/disc photo etc. may be electronically linked to HES for glaucoma consultant virtual review.<sup>62</sup> The common feature of all GRFS is in the aim of preventing attendances at HES by eliminating false positives.

#### **Repeating IOP measurement (‘repeat measures’):**

A proportion of referrals are purely based on non-contact tonometry (NCT) IOP. In one survey of all community optometry examinations over a fixed period, 73/3295 (2.2%) patients on a single NCT reading were found to have an IOP >21mmHg.<sup>51</sup> When analysing the referrals to HES since the introduction of

the NICE guidelines in 2009, proportions of referrals based solely on high IOP (fields and discs considered normal) were 45% for community optometrists with no special interest in glaucoma (non-OSI), and 29% for OSI.<sup>46</sup>

Equipping and encouraging community optometrists to repeat IOP measurements with a more robust method of IOP measurement (GAT) can reduce IOP only referrals – one study showing that 46/73 (63%) of patients found to have IOP 22-25mmHg on NCT, had IOP of 21mmHg or less when repeated with GAT.

*“Our local repeat IOP measurement scheme stops around half of the referrals for raised pressure from coming to the department” (GL 52)*

Repeat IOP measurement for “IOP-only” referrals is recommended by the Joint College Guidelines.<sup>63</sup> One consultant interviewed said *“Our local repeat IOP measurement scheme stops around half of the referrals for raised pressure from coming to the department” (GL 52)*. Another unit micro-triages referrals so that IOP only referrals are diverted to an HES nurse IOP measuring clinic, which eliminates ~50% of the patients who had spurious elevated IOP on NCT (GL25). Triage of referrals into Red, Amber, and Green in another department permits low risk “Green” new patients to go directly to the virtual clinic and ensures the “Red” get an early senior opinion (GL33).

### Corneal Pachymetry: a way to enhance your referral filtering?

In a survey of people over 65 years old as part of the Bridlington Eye Assessment Project (BEAP), 85 of 1,643 people (5.2%) were found to have a pressure >21mmHg using GAT,<sup>64</sup> and would therefore be expected to be referred. This 5.2% referral rate was found to be open to substantial reduction by application of the Joint College Guidance<sup>65</sup> (with or without the addition of corneal pachymetry). The guidance states that consideration be given to not referring OHT suspects where the patient is felt to be at low risk of significant visual-field loss in their lifetime (i.e. patients aged over 80 with IOP <26mmHg (or over 65 years with IOP <25mmHg) and normal discs, fields and Van Herrick), and by itself achieved a reduction of 63% in the referrals which increased to 85% when Central corneal thickness (CCT) was also taken into account.<sup>64</sup> NHS Scotland have invited every optometry practice in Scotland to apply for funding for a corneal pachymeter in addition to GAT, the financial argument being that this will save unnecessary referrals based solely on elevated pressure.

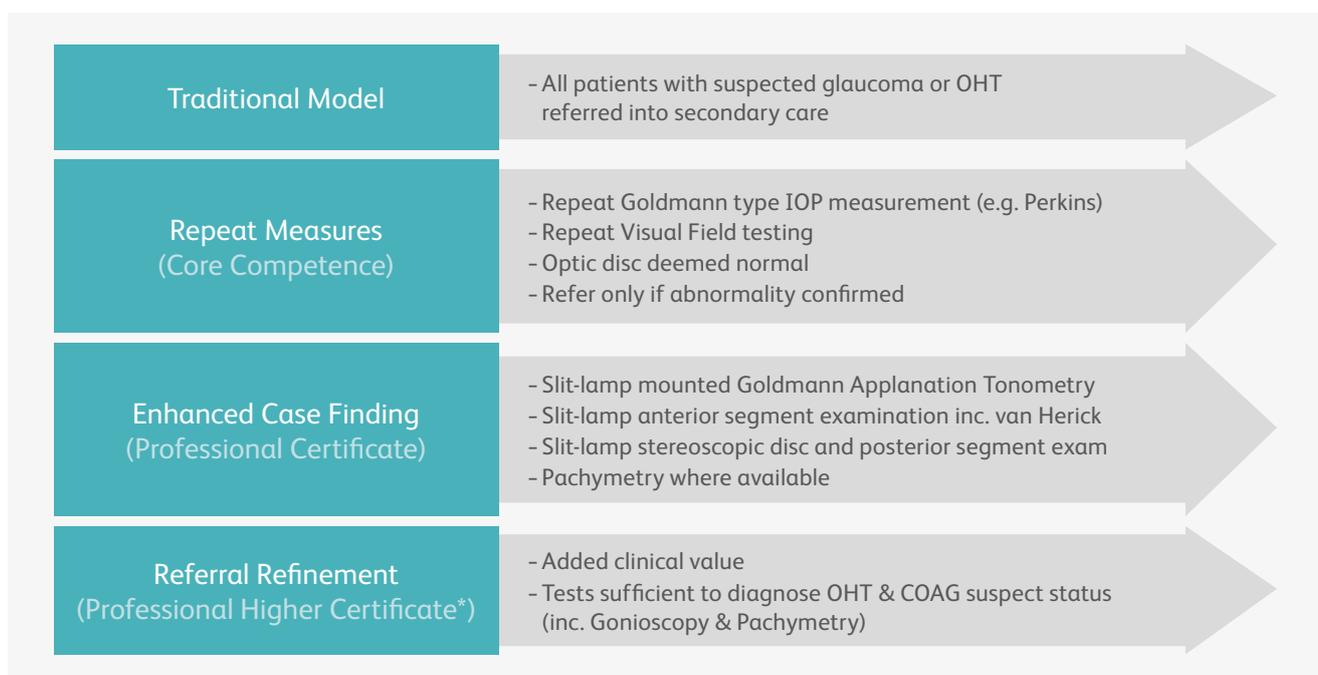


Figure 2: Referral Filtering of Glaucoma/OHT can be systematised<sup>54,59,65</sup>

\* Professional Higher Certificate in Glaucoma ≈ previous Certificate A (CoO Higher Qualifications)

## GRFS by clinical re-evaluation by a non-ophthalmologist

All new glaucoma referrals could be passed to a GRFS, but many feel that there is utility in triaging referrals to GRFS such that “high risk” cases are directly referred to HES to minimise unnecessary delay<sup>46</sup> Below are presented three different approaches, but there are many other individual schemes in operation, some having been published that are referenced in this report, and one multisite comparison of 4 different UK schemes.<sup>46</sup> It is worth noting that the longest running published scheme reported the lowest first HES visit discharge rate,<sup>46</sup> and a service with a well-established scheme of this nature with consultant input to training the optometrists reported that their first HES visit discharge rate is down to 8% (GL 9).

**Protocol based example** – Referral documents triaged by OSI – High risk to HES (included shallow anterior chamber (AC)) (73%), Low risk to GRFS (one abnormality only (field, disc, or IOP >21 and <29))(27%).

In this example, low risk referrals could choose one of 8 community optometrists trained to the relevant level – 33% of attendees were discharged and 67% referred onto HES, i.e. in this system GRFS only avoided 10% of referrals although relaxing the high risk criteria may increase this percentage.<sup>52</sup>

**Consultant dependant example** – Referral documents triaged by glaucoma consultant – 76% to GRFS (6 community OSI examined and imaged/performed fields) – consultant virtual review of data resulted in only 11% transfer to HES. 1,400 HES glaucoma clinic slots were freed up each year conveying an annual saving of £244,200.<sup>62</sup>

**Un-triaged Example** – All referrals to GRFS who then referred on to HES dependant on findings via protocol (Fig 3)<sup>53</sup>. Patients not referred could be re-examined after one year by an OSI with disc imaging capabilities, and then again a year later in similar manner before discharge if referral criteria were not met. Of 1,736 seen in GRFS, 811 (47%) were referred to the HES where only 5/811 were then immediately discharged, suggesting a very low false positive rate.

Single referral criteria	Combined referral criteria
(1) IOP of $\geq 26$ mmHg on two occasions	(1) IOP >22 and visual-field defect
(2) Visual-field defect on two occasions	(2) Suspect optic disc defect & field defect
(3) Pathological disc cupping /asymmetry $\geq 0.2$	(3) IOP >22 and suspect optic discs
Additional referral criteria	
(1) Optic disc change or haemorrhage	(2) Signs of secondary glaucoma
(3) Pigment dispersion	(4) Pseudoexfoliation and uveitis
(5) Rubeosis	(6) Angle closure

Figure 3: All-Wales Glaucoma Filtering Criteria

## Can a GRFS be run from your own department?

The best location of the GRFS will depend locally on the availability of interested and suitably equipped optometrists (or other health care professionals (HCP)), so there will be circumstances where running the GRFS within the acute Trust may be desirable.<sup>46</sup> It may be a large leap to instigate a GRFS from scratch in the community, but commencing in a HES department (in high population density areas) or any satellite clinic locations (in more rural settings) can make initial training, equipping and clinical governance issues much easier to navigate. The scheme can then be moved out into the community when established. Breaking the process down makes it easier.

*It may be a large leap to instigate a GRFS from scratch in the community, but starting in your department can make initial training, equipment and clinical governance issues much easier to navigate*

## Total Service Redesign

In Wales, the Welsh National Implementation Plan 2015, states that Ophthalmology accounts for >10% of all hospital OPD attendances each year, and is orientated towards looking for the best value interventions and prioritising these, whilst driving primary / secondary care integration and quality.<sup>66</sup>

Towards these three target areas, the Welsh Health Boards are to monitor and report on the number of glaucoma referrals into secondary care, the number and proportion of OHTs seen in primary care settings and the number of delayed glaucoma follow ups as well as patient reported outcome measures (PROMS).<sup>66</sup> Thus comparison around the country will be possible, and quality improvement fuelled by this data collection. Figure 4 lays out the glaucoma pathway redesign from the NHS Wales Delivery and Support Unit which aims to ensure that the Implementation Plan targets of keeping as much OHT in the community, and as few secondary care referrals each year are met.

This pathway may not be one that can be replicated in a locality outside of Wales, where national leadership is promoting this whole-service thinking. Formal outcome measures may however drive similar service redesign elsewhere (although the current training is not necessarily NICE compliant).

## Interview responses regarding referral filtering

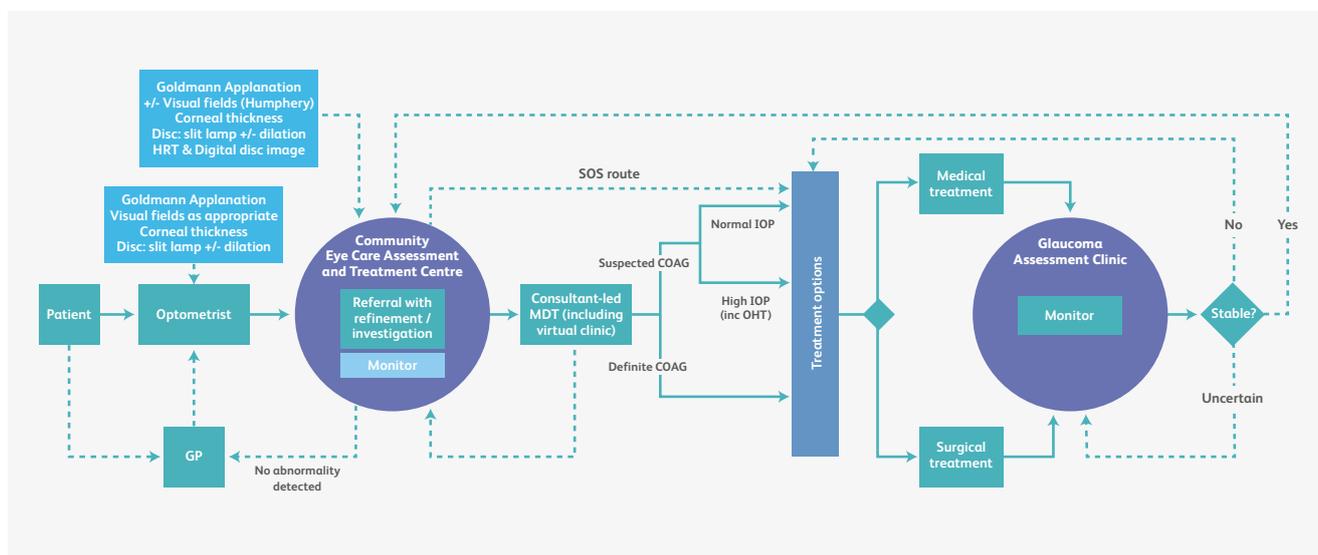


Figure 4: Total service re-design with strong primary / secondary care relations and interface

There were examples of good and poor primary / secondary care communication -

**Good example** - a consultant in England reported that hospital consultants had run the training for the Local Optical Committee (LOC) recruited optometrists, the CCG had bought Goldmann tonometers for every optometric practice, and agreed an enhanced optometric fee for the scheme (GL28).

**Poor example** - "referral 'refinement' with community optometrists has been started up for the third time, and has resulted in increased referrals! They didn't ask us or even tell us: why they don't consult with us from the CCG I don't know."(GL15)

Interviewee's views on **perceived efficacy** varied - "local optoms doing referral 'refinement' has not made any noticeable impact on the referrals as far as I can see" (GL3); others cited that referral filtering was one thing they would definitely reproduce if they were to move to another similar unit. (GL9)

The potential for bias in our finding that involvement of secondary care consultants in the creation of such schemes was associated with better reports of the scheme makes it hard to suggest this as evidence, but it would seem intuitively probable that collaboration would promote effectiveness and long term viability of any such schemes.

Where creating an optometric community based GRFS had been problematic, some units had set up an in-house scheme. A nurse-run GAT referral filtering clinic was described into which “patients referred solely on the basis of elevated IOP on NCT were diverted) which removed 50% of such patients from requiring to be seen in a glaucoma clinic” (GL25).

Geography and local commercial pressures were found to influence community based GRFS and some had closed due to lack of interest (GL22). “Our scheme only works because of sufficient volume of work going to the optometrists” (GL27), Changes in CCG policy can have an indirect negative effect - “When the CCG stopped funding direct cataract referrals, the optometrist stopped engaging and no longer participated in the GRFS.”(GL 42)

.....  
*There was a wide range of sentiment and differing success expressed at interview about GRFS*  
.....

**Many respondents stated that it was too early to tell if the GRFS had had any positive impact.**

.....

*Those who have set up or commissioned schemes should evaluate them to ensure that they are a) cost effective and b) releasing ophthalmologist time and HES clinic space.*

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## Referral based on abnormal OCT scans

When visual field testing was introduced into optometric practice, false positive referrals increased.<sup>49</sup> As more community optometrists acquire OCT scanners there will, as with IOP measurement, disc assessment and field tests, be false positive abnormal results that trigger referral as well as useful true positives. This will add to the secondary care workload, particularly as older machines persist in the community into the future. The role of OCT as a screening / referral tool is untested.

Clear agreement for a policy of virtual review of isolated abnormal scans by a prior arrangement with an ophthalmologist is advisable for optometrists utilising imaging technology to detect glaucoma.

## Scottish referral guidelines and implementation

The requirement for GRFS pre-supposes that the referrals need refining. This may not be true in all locations where the community optometrists are empowered to filter their own referrals (figure 2) The Scottish Intercollegiate Guidelines Network (SIGN) guidelines, “Glaucoma referral and safe discharge”, were published in 2015.<sup>67</sup>

Additionally, community optometrists in Scotland have been resourced with the equipment and GOS remuneration to do

- Goldmann applanation tonometry (GAT)
- Disc images
- Corneal pachymetry
- Angle assessment
- Two visual field tests.<sup>67</sup>

Optometrists in Scotland are also supported to work towards independent prescriber (IP) status funded centrally.

Hence with a resourced and up-skilled optometric community (**although NICE compliant training not currently required for Scotland**) and clear guidelines, the need for further referral filtering is much reduced. In addition to empowered optometrists, with improved IT connectivity, and all optometrists having secure @nhs.net emails, one Scottish glaucoma lead describes personally assessing, in his own

time, all new glaucoma referrals, which are e-referrals with disc images and fields attached (GL39). This produces a very low false positive rate, with patients assigned to appropriate clinics (250 new patients and 750 follow-ups each year) and seen by community optometrists (who should be trained and qualified in accordance with NICE requirements) rather than by this single consultant in a 6500 patient per year glaucoma service)(GL39). Time for virtual clinic work should be agreed in advance with Trusts for such work to be sustainable.

Good image quality is, however, essential. One consultant in Scotland found that images were not imported into the hospital IT system at a meaningful resolution to make assessment possible (GL41).

### Is the window for creating referral filtering schemes closing?

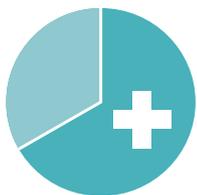
Alongside the growth in the numbers of GRFS, there has been a proliferation of glaucoma virtual clinics in secondary care. The “win” with GRFS is that seeing a patient in the community is less expensive than seeing a patient in the HES and saves valuable HES clinic time. However with the advent of virtual glaucoma clinics, and in particular their use for new patients,<sup>68,69</sup> neither of the conditions that made setting up GRFS desirable are as pressing as they once were.

It may be that the effort of setting up a GRFS no longer seems worthwhile to those paying, or those participating. An interesting case study of this effect was published from Rotterdam describing in detail the drivers that led to failure to develop community glaucoma services, and it concluded that the task of shifting work from ophthalmologists to optometrists, and from the hospital to the community, was only possible prior to the inception of the glaucoma virtual monitoring unit in the hospital. Whilst this is a non-UK environment, the lessons are very much applicable.

This was a two-step task shifting process; first task-shift from ophthalmologist to optometrist within the HES, then shift the location from HES to community. Even with strategic, incremental implementation of this task shifting, it will be hard to compete with the efficiencies of a virtual glaucoma service and success is accordingly less likely.<sup>70</sup>

.....  
*With the advent of virtual glaucoma clinics, the conditions that made setting up GRFS desirable are no longer as valid as they once were*  
.....

## Adjusting delivery of Hospital Eye Service: optimising capacity in glaucoma care:



With the number of patients expected to grow by 22% in the next 10 years, but the number of ophthalmologists remaining relatively steady, either ophthalmologists need to see more patients per week, or someone else is going to need to contribute to patient care, either within the HES or in the community. **Two thirds of the cost of glaucoma care is spent on clinical care rather than drugs.**<sup>71</sup>

### Non-Ophthalmologist Involvement in HES Glaucoma Services

The possibility and need for non-ophthalmologist involvement in hospital glaucoma care has long been recognised as a way of improving cost-effectiveness. Examples of, what would now be referred to as a virtual clinic, with nurses or technicians acquiring VA, disc photos, IOP and visual fields which are subsequently reviewed by a consultant who writes to patient and GP with their conclusions, date back to the 1990's.<sup>72</sup>



What was the exception 20 years ago<sup>73</sup>, has now become the rule. The majority of clinics (88% (45/51)) have incorporated non-ophthalmologists into their glaucoma services at some level beyond just recording VA and performing automated perimetry. The roles can be divided into three categories (figure 5).

Data Acquisition only - data then reviewed by ophthalmologist	Stable treated glaucoma / OHT monitored - concerns flagged up	Full Management
1. Nurse / Ophthalmic technicians/practitioners:	2. Optometrists / Nurse Practitioners/ Orthoptists	3. Optometrists / nurse practitioner/nurse consultant with Glaucoma Qualification +/- IP
<ul style="list-style-type: none"> <li>• VA, Visual Field</li> <li>• IOP (GAT)</li> <li>• Pachymetry</li> <li>• Disc (HRT/OCT/photo)</li> <li>• +/- gonioscopy</li> </ul>	<ul style="list-style-type: none"> <li>• Running clinics alongside consultant</li> <li>• Treatment variation according to protocol</li> <li>• Seeking help appropriately for review / prescribing</li> </ul>	<ul style="list-style-type: none"> <li>• Running independent clinics or alongside consultant</li> </ul>

Figure 5: Non-Ophthalmologists Involvement in HES Glaucoma Services

Clinical data can be acquired from patients which is then fed to the ophthalmologist /glaucoma qualified HCP for evaluation (either face to face or virtually) and treatment changes (model 1 Figure 5). Beyond this, the key to organising a glaucoma service for a multi-disciplinary team (MDT) depends on stratification of patients into low, medium and higher risk categories. These have been defined in the NICE accredited RCOphth glaucoma commissioning guideline, along with the training and qualifications appropriate for caring for people in these risk categories. Low (OHT/Suspects) and medium ('stable' treated glaucoma patients) risk patients can be managed via a virtual service (model 1 in Fig 5) or by HCPs as in model 2 figure 5 with consultant input provided as required. Medium risks patients can be managed independently by HCPs who have a glaucoma qualification (CoO Diploma in Glaucoma level) either without or with consultant presence. High risk, complex cases are seen by ophthalmologists, commonly with a sub-specialty interest.

The supervising glaucoma consultant determines what level of clinical risk is appropriate for the various team members, according to their training and skill level with qualified and experienced HCPs often reported to be competent and confident to manage moderate risk patients with relatively loose supervision. OLGA (Optometrist Lead Glaucoma Assessment) clinics have run for many years seeing medium risk patients, and engagement of the trained optometrist or other HCPs in the management of high risk patients also provides opportunities for direct clinical teaching by the consultant promoting job satisfaction as well as boosting capacity for higher risk patients (GL 9).

## Clinic Models

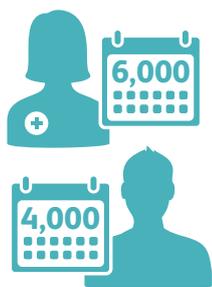
### 1 Treatment Response Clinics

Even where traditional services (with exclusively ophthalmologist delivered face to face appointments) are still coping with the current demand, it may be worth building capacity to pre-empt the increase in numbers forecast due to the demographic changes.

One idea reported was the construction of Treatment Response Clinics (GL31). Whenever a patient has started pressure lowering treatment for the first time, or has their medical management altered, a follow up can be arranged in a Treatment Response Clinic staffed by a non-medical eye health HCP who simply checks IOP. The ophthalmologist instigating the change sets the level of acceptable pressure to be attained, and the next step in treatment progression if it is not attained. It is then a technical process to check the IOP and follow the protocol. The same clinic can filter patients referred solely on the basis of an elevated IOP with appropriate training, protocols and oversight.

### 2 Face to face HCP clinics with stratification based on clinical risk

In this format there is an incrementally more devolved progression of HCP clinical activity (Fig 6). There is a certain proportion of specialist glaucoma work, particularly around unstable and complex cases, younger patients and surgical management that requires an ophthalmologist's input. This work is time consuming



and needs specialised skills but forms a sizeable minority of the glaucoma numbers seen (estimated as 20% by two experienced glaucoma consultants). One department with a well-developed nurse specialist service reported having 6,000 glaucoma appointments each year with the nurses, compared with 4,000 with the doctors (GL 6). Another reported that of their 372 annual glaucoma clinics, 210 are with optometrists (GL44). This suggests that it may be possible to double capacity with appropriately trained HCPs working alongside ophthalmologists, hence some departments have just one glaucoma consultant for 6,000 – 8,000 patients with glaucoma by running large HCP teams (GL 7, 8, 14). The importance of the leadership that the ophthalmologist provides within these teams should be strongly emphasised.

- Most consultants were very enthusiastic about the MDT, some even advocated ‘cloning’ key team members (GL 47)

- Not every department was able to recruit the right staff. Some HCP clinics had to be closed as they were not sufficiently productive.

- Productivity varied greatly; as with doctors, some HCPs work much faster than others; HCPs were generally seeing 7-10 patients per clinic but up to 12 slots were reported for the most productive team members. One consultant with 5 HCPs doing glaucoma clinics reported that 2 functioned like experienced middle grades, whilst the other three work at junior trainee level seeing only 6-8 patients per clinic (GL 29). The numbers for slower team members, with support and training, could be slowly increased over time. This emphasises the importance of clarifying training and roles of HCPs to carry out different tasks (as per the Common Competency Framework)

- With training of non medical eye HCP staff, particularly from a nursing background, being time-intensive, retention of trained staff is essential; if there is a high staff turnover, MDT development might prove a difficult option and virtual clinics may be a better option. One unit spent a lot of time and money training four nurse practitioners, three of whom soon left (GL 51).

.....  
*One unit spent a lot of time and money training four nurse practitioners, three of whom soon left (GL 51)*  
 .....

- Growing the MDT increases the possibility of decentralised care to peripheral hospital or community clinics. One unit services 5 satellite clinics around the county with their team of HCP; a service which would not be possible otherwise (GL 52).

- With suitably trained and qualified HCPs clinics can run without (as in OLGAs) or with ‘alongside’ consultant supervision with the advantage of the latter being an instant second opinion where necessary.

- Full independent practice was reported by Optometrists with glaucoma qualifications and IP, or nurse prescribers, but a degree of autonomy was provided for others by prescribing via patient group directions (PGD) by writing to the GP to request a change in repeat prescription to be made, working within strict protocols

### 3 Consultant Efficient Models: intensive joint clinics with MDT members

It has been shown that obtaining a senior opinion early is effective in improving efficiencies (shorter patients stays, less admissions) in main A&E departments and acute medical settings.<sup>74-77</sup> Similarly, consultant ophthalmologists are more likely to opt for longer follow up intervals than other grades of

ophthalmologist or other HCP.<sup>1</sup> Thus consultant involvement promotes optimisation of capacity by avoiding unnecessarily early reviews.

The ultimate supervisor model - One interviewee described their clinic set up involving junior doctors and HCPs (glaucoma nurses in this instance) each seeing their own list of 10-15 patients, with the consultant (without a list) moving from room to room spending 2-3 minutes with each patient (figure 6). Thus the consultant sees 50 patients face to face in one clinic whilst adding value to the training experience of the clinic (GL6). This model clearly creates issues in terms of capacity to perform visual field testing and other support services and makes one-stop clinics harder to realise, but has permitted some of the efficiencies of a virtual system and a high volume teaching environment.

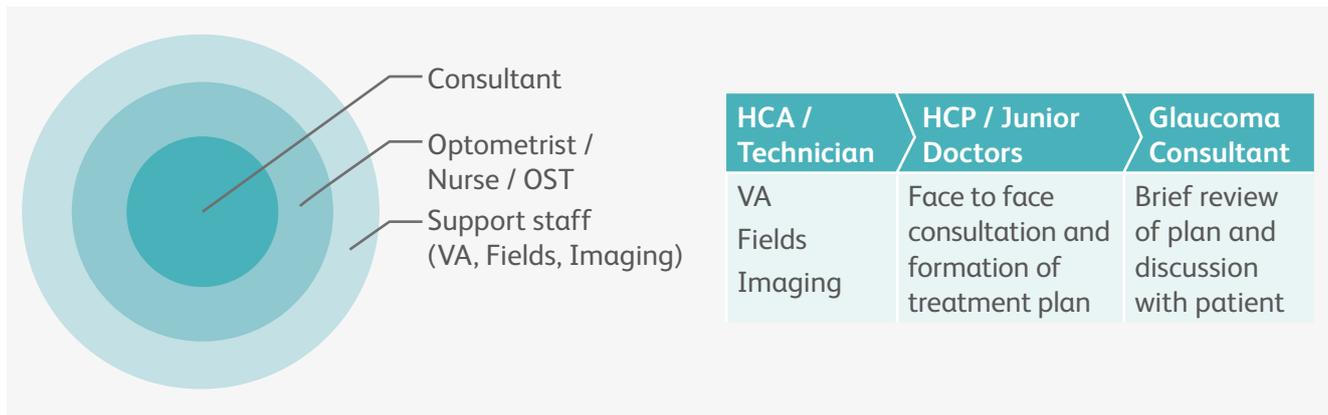


Figure 6: Large MDT with one consultant giving input to each case (GL 6)

In this model it is possible for the consultant to be either underemployed or overstretched. Other models of clinic organisation, may be more flexible where experience with the team allows the consultant to alter the numbers of patients on his/her list dependant on the number and grade of personnel in a particular clinic with only certain patients being seen directly by the consultant in response to a direct request by the MDT member.

Although there is the need for MDT working, there is a limit to the reduction in proportionate consultant numbers that can be sustained. **One consultant stated that in their health region they are running on less than 1 ophthalmologist per 80,000 population, which is proving unsustainable and has resulted in routine use of expensive weekend waiting-list initiatives and extensive, clinically unsafe backlogs** (GL 23).

### Training of non-ophthalmologists

Almost all departments had done their own in-house training for nurses, optometrists and to a lesser extent orthoptists. Optometrists particularly were often encouraged to obtain practitioner certification, and to have done the College of Optometrists Glaucoma Diploma (parts A and B, now reformulated into the Glaucoma Professional Certificate, the Higher Professional Certificate and finally the Glaucoma Diploma). This training and accreditation is also open to other professionals.

Training non-medical eye HCPs is labour intensive, and the comment was made that staff turn-over can lead to frustration as hard won skills are lost to the department. The learning curve, and therefore the disappointment of losing team members, was described as much shorter for optometrists than other cadres recruited. One department had started with one optometrist in glaucoma clinic 14 years ago, and now had 7 optometrists working independently, including listing patients for SLT and YAG PI as needed. These optometrists see about 8 patients per clinic each (GL 9).

.....

*We have a growing national resource of those experienced both in running virtual glaucoma services, and in the process of setting them up... a resource that should be tapped*

.....

The relationship with HCPs is long term, and different individuals have different ceilings on their function; *“some of our optometrists*

are like ST1 and others are like experienced middle grades” (GL 29). Knowing team members, and tailoring responsibilities to individuals may be an important part of retaining valuable HCP; one consultant commented about senior HCP in his clinic, “the people who want to do these advanced roles, if they are good, get bored seeing the routine monitoring, so we rotate them through consultant clinics so they stay stimulated and motivated” (GL 16).



**Nurses, orthoptists or optometrists?** – There were many consultants who were very happy with whichever cadre of staff they had recruited into their service, but interviewees were also asked whether they had any examples of attempted innovations that had not worked. Several had attempted training nurses into the role of glaucoma nurse practitioner, but found that the throughput, quality of decision making and capacity to work independently was inadequate to make the service sustainable so they had been closed down.

The optometric community is, of necessity, geared towards independent working, with a recognition of the need to get through a set number of patients in a given time in high street practice. This independent practice is less inherent to nursing roles in the wider UK health care setting. Hence the success or failure of attempts to launch nurse based glaucoma clinics will be more likely to hinge upon the recruitment of specific individuals. More than one consultant had moved over to recruiting optometrists, as they are already conversant with full slit lamp examination, tonometry, and fundoscopy. The situation for other HCPs could soon be improved however as the RCOphth, with other partners, has developed a **Common Competency Framework for non-medical eye HCPs which should help the formalisation of training and accreditation and ensure a consistent level is achieved for all HCPs regardless of professional group or starting point.**

*“it is essential that we have competency based banding, so you never have a band 6 doing a visual field, and you never have a band 5 doing just a Visual Acuity” (GL 16)*

### Quality Assurance in Multi-Disciplinary Teams

The main concern in the re-configuration of services to adapt to less dependency on senior ophthalmic input is the increased risk that glaucomatous visual loss will progress without coming to the attention of the responsible consultant.

- Different models of quality assurance may be appropriate at different stages of evolution of a service; one consultant has recruited 7 optometrists to deliver a total 21 Optometry based glaucoma clinics each week – the first 40 cases each saw were individually reviewed by the consultant before they were signed off (GL 25). This approach is effective in getting a MDT service started where patients are seen by HCPs alongside the consultant. Such arrangements facilitate training and help HCPs develop more quickly through the NICE required skill levels and associated professional qualifications such as those of the CoO.
- Some have constructed rigorous audit of notes, taking a sample each year; however, most felt that routine on-going QA was unnecessary after working alongside staff members for many years and being happy with their clinical decision making and their threshold for seeking senior input when they are unsure. The development of a good working relationship between professionals is clear.
- The dominant model reported was of apprenticeship style training that was employed historically with medical staff. The RCOphth led Common Competency Framework for non-medical eye HCPs should help formalise this process. In the context of glaucoma related work the CoO have made significant progress with their suite of qualifications and these will be expected to feed directly into the Common Competency Framework.

Whatever model of Quality Assurance / Clinical Governance is applied, this must be explicit. It is unlikely that a high volume service will escape the problem of individual patients being left longer than they perhaps should, and the governance structures will then come under review. However when the alternative is delayed appointments for high risk patients, the advantages of working with a MDT is likely to outweigh the potential disadvantages.

**MDT Quality Assurance: case example** – Five optometrists, trained in-house, work in the glaucoma service in one unit. They do glaucoma clinics alongside a glaucoma consultant and also run a stable OHT/glaucoma service. A care plan is clearly set in notes, and the examination schedule is systematised such that they do gonioscopy every 2 years and dilated fundus and disc examination every 2 years. IOP parameters are set in the care plan to trigger referral back to the consultant, but 3 repeated measurements confirming that referral is needed are taken before triggering consultant review. This is a one-stop service and manages 2500 patients. The consultant reviews 10% of the notes and data from this service routinely as an audit, primarily looking for false negatives. Also, every 2 years, each set of notes is reviewed by the consultant, even if totally stable, in order to confirm the care plan.(GL18)

#### 4 Virtual Clinics



Of glaucoma leads interviewed, 24/52 (46%) said they had established virtual clinics in order to boost their capacity. Comparing numbers of glaucoma clinics which have a problem with backlog, and those who see patients at their intended follow up interval, of the 28 with no backlog, 13 (46%) had set up Virtual clinics compared to 65% (11/17) of those who reported having a backlog (Chi Square 1.4198,  $p = .23$ ). This might suggest that whilst departments are able to cope with demand using traditional face to face clinics, this is the default option, but once the system decompensates, virtual clinics are seen as a good alternative.

Staff	Tests	Consultant Review Description	Cases reviewed per hour	Ref
Ophthalmic Science Practitioners	VA/VF/OCT/GAT	Dictate letter to patients / GP	10	(GL9)
Ophthalmic Science Practitioners	VA/GAT /VF/HRT/Gonio	Letter to GP / patient	10	(GL10)
Ophthalmic Technicians	VA/VF/OCT or HRT/GAT	Patients contacted if change indicated	12 (paper based)	(GL12)
Nurse (Band 2,6,7)	VA/VF/HRT/GAT/ Disc photo	Electronic Patient Record (EPR) produces letter		(GL40)
Nurse (Band 2 + 5)	VA/VF/GAT/Disc photos	Standard letter format	20 (paper based)	(GL41)
Nurse (Band 2 + 5)	VA/ VF/GAT/OCT pachymetry/Gonio	Dictate letter to GP / Patient	6	(GL51)
Ophthalmic nurse practitioners	VA/VF/GAT/Disc photos/ HRT	Tick box standard letter	12	(GL50)
Nurse (Band 2,5,7)	VA/VF/disc photo/ OCT/ GAT/ gonio	Dictate letters	10	(GL45)
Nurses	VA/VF/OCT/GAT	Dictate letter to GP / Patient	8	(GL42)

Figure 7: Virtual Clinic examples (training of staff not always specified and may, or may not, be in keeping with NICE accredited RCOphth Glaucoma Commissioning Guidance<sup>54,59,65</sup>). VA - visual acuity VF - visual field OCT - optical coherence tomography GAT - Goldmann applanation tonometry HRT - Heidelberg retinal tomography

Some, who are not currently running a virtual clinic, expressed concern about this concept as it removes the human element of clinical decision making, such as discussion of compliance or explaining the disease or the treatment. However when asked, those running virtual services felt this was not proving to be a problem - an impression echoed in the literature.<sup>78-80</sup> Some felt that patients preferred it to a traditional glaucoma clinic as the total visit duration was less, and where attention to the dangers of the potential “facelessness” has been paid, the attending HCP might cover details about compliance and drop side-effects more effectively than is achievable in a late-running consultant face to face clinic.

### Data acquisition

Virtual Clinics follow the now well-known paradigm of data acquisition +/- protocol driven history and examination for later review by an ophthalmologist. Staff generally work in teams including ophthalmic nurses / technicians or specifically trained ophthalmic healthcare science practitioners with roles divided according to competency.

This work was reported to be potentially very satisfying for HCPs and can involve significant patient interaction and education but no management decisions. Depending on auxiliary support and the extent of data gathering that was arranged, practitioners were reported as seeing 5-12 patients per session (figure 7). The more efficient models had people operating at the top of their grade with health care assistants doing VA, fields and disc imaging/photos then higher banded staff doing tonometry, slit lamp examination and discussing compliance, side-effects and related issues.

.....  
*“Our virtual clinic provides a same day service which patients like, and there’s a really good team feeling - great job satisfaction for the virtual team as everyone feels valued” (GL51)*  
.....

### Data review and communication patterns

The few consultants still using fully paper based systems did seem able to review more sets of notes per hour. **IT related inefficiencies were common; however the functionality of IT for reviewing longitudinal data with computerised assessment of progression or data from remote centres make computer based image and data review the clear option for the future.**

Reviewing sets of notes in long sessions was frequently reported to be mentally challenging. One consultant reviewed up to 50 sets of data in a 4 hour session, although the intensity of this led to “wanting to scream” (GL10). Another consultant, for the same reason, reported doing the virtual review in smaller batches, and was able to do up to 10 cases per hour (GL17). One department closed down their virtual clinic as the consultants were not given space in job plans to do reviews, and are having to re-launch with a new job planned review session based system (GL 40).

.....  
*Another consultant, for the same reason, reported doing the virtual review in smaller batches, and was able to do up to 10 cases per hour*  
.....

With regard to clinic letters, some targeted efficiency, with standard letters and tick boxes, others dictated a letter to the patient with the GP copied in for each case, or the letter was generated automatically by the EPR.

### The Process of Conversion to a Virtual Service – sharing experience

One consultant, who had managed the transition to a virtual service single handedly, said that access to someone who had been through the experience would have been very useful, and commented that they would be happy to offer their support to others making this transition (GL12). Visits to other departments are excellent CPD and a legitimate use of Study Leave and requests for help from colleagues elsewhere are likely to be looked upon favourably.

.....  
*Visits to other departments are excellent CPD and a legitimate use of Study Leave*  
.....

Any service set up to care for low-risk patients, such as virtual clinics or shared care schemes (see below), comes at the risk of retaining patients who ought to be discharged. If the only gateway to a virtual scheme is from a consultant ophthalmologist, then the process of identification of suitable patients may be helpful in identifying criteria for discharging patients.

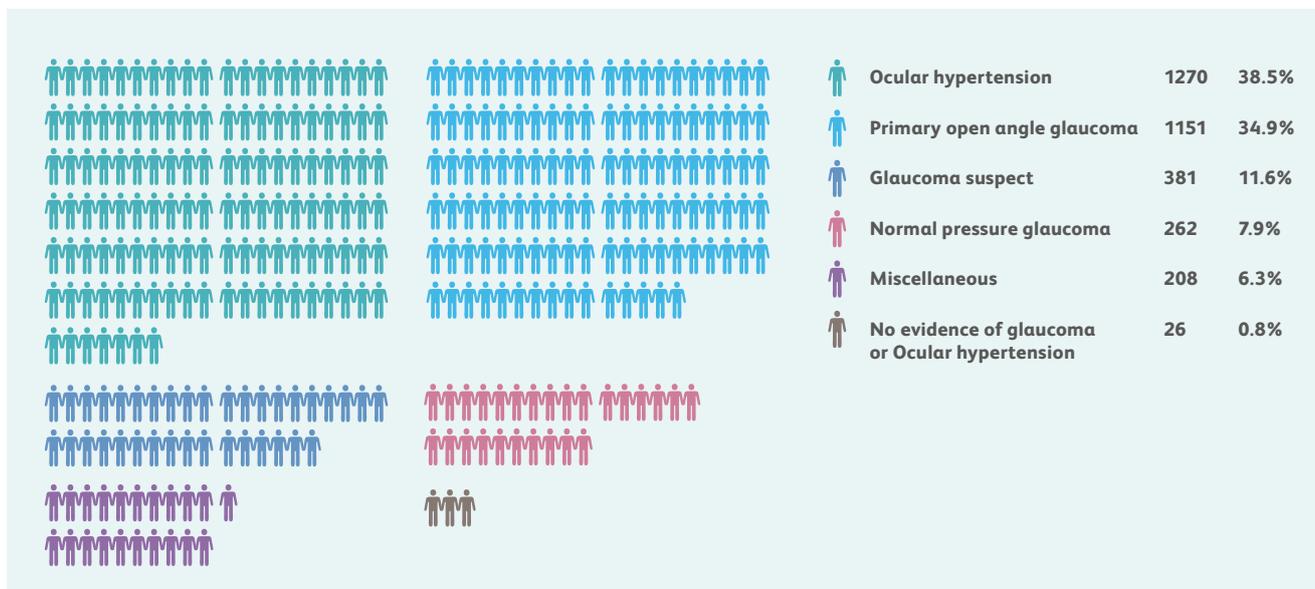


Figure 8: Consultant diagnoses in a mature virtual clinic service (GL 10)

Those who inherit low-risk schemes of any description or where there has been a lack of senior input may be disheartened by the large number of healthy patients attending who would have benefited from discharge. One consultant reported shutting the scheme down as a result (GL 6).

This emphasises the need for clear protocols that reflect evidence and good supervision by consultants.

Low-value review can be avoided with consultant involvement. A mature virtual service, such as that shown in figure 8 which has been running over 20 years, found just 26 patients out of over 3,000 seen in one year that had evidence of neither persistent OHT nor glaucoma (GL10).

## Information Technology

IT was frequently cited as a major source of frustration by some, but as a source of joy by others. It has previously been identified by the Clinical Council for Eye Health commissioning as a priority area for improvement if more efficient, better integrated eye care is to be realised.<sup>81</sup> For those with decentralised or multi-centre services, the benefits of good IT were made clear at interview. *“If someone needs my input from the other hospital, they send me an email, I review the patient virtually and give a reply straight away”* (GL7). Consultants can supervise non-ophthalmologists in remote settings “live”, and notes do not go missing. Letters can be written immediately, and where EPR is set up to email clinic letters, GP’s receive same day communications routinely, and patients can receive copies of their clinic letters by post in due course with minimal secretarial support.

Whilst robust IT is important for virtual review of patients, examples exist that prove it is not essential. One of the departments running a Glaucoma Monitoring Unit for data acquisition (VA/VF/IOP /HRT or OCT) seeing more than 2,000 patients annually, runs entirely using paper records. The danger of this system is missing notes or those notes removed from the review pile that might go unnoticed, and the deployment of a “failsafe officer” to mitigate this risk was advocated (GL12). Another unit similarly runs a paper based virtual clinic to circumvent the problems of slow IT, and the consultant can assess 20 sets of notes per hour, with all the images on printouts and utilising a standard letter (GL41). Although cost is a barrier to departments finding IT solutions for their virtual clinics, there are notable hidden costs of paper-based systems as a greater burden is placed on administrative and secretarial staff retrieving notes, filing and printing costs.

## Shared Care

Good evidence exists to show that that appropriately trained community optometrists’ clinical examination of key parameters and resultant decision making can correlate well with glaucoma consultants.<sup>57,82-86</sup> This obvious potential community workforce therefore presents itself to us as an option for capacity expansion.

This will particularly be the case where work has already been done to train community optometrists to CoO Professional Higher Certificate (previously part A) in diagnosis of OHT and glaucoma suspect status for a glaucoma referral refinement scheme as described above. One consultant lead whose local shared care scheme is faltering and may well shut down commented that, “we have to be able to find a way to make use of the fact there are all these optometrists out there with equipment and skills who could be seeing glaucoma patients.”(GL41) **Independent monitoring of patients with a diagnosis of glaucoma (which must be established by a consultant ophthalmologist) is permitted and encouraged by NICE for those optometrists and other HCPs with training, skills and experience to the level of the CoO Professional Diploma in Glaucoma** (previously part B). For OHT and suspected chronic open angle glaucoma (COAG Suspects) independent monitoring and management (i.e. changes to the management plan) can be done with training and qualifications to the CoO Professional Higher Certificate level, and monitoring (but not management) can be done by those with the Professional Certificate. Independent prescribing may be layered across these glaucoma specific qualifications, but it must be understood that independent prescribing alone is not sufficient to care for people with OHT, suspected COAG or COAG.

.....

*Independent prescribing alone is not sufficient to care for people with either OHT, suspected COAG or COAG.*

.....

There are many who are making it work:

- One department has 7,000 glaucoma patients on their books generating 14,000 outpatient events annually within the HES, and a further 3,000 held under an HES governed community shared care scheme; with the scheme running successfully, discussion has commenced to negotiate the governance responsibilities for this scheme being transferred from HES to LOC (GL 6)
- Although HES supervision of community optometry OHT or stable treated glaucoma schemes is not universal or essential, one consultant interviewed felt it was important that the only portal into the shared care scheme was by referral from HES with a clear plan, “so it is not just a holding bay for people with nothing wrong with them. Optometrists do it for interest rather than money and there has to be a sufficient volume of work coming to the optometrist. They follow NICE Guidance so OHT - 3 annual visits - then discharge back to their own optometrist”(GL 17)
- It was also noted that the incentive to keep reviewing patients at minimal risk of glaucomatous reduction in life quality by independent sector ophthalmology providers is also significant; clinics full of easy patients remunerate at the same rate as the complex ones seen in traditional NHS providers (GL 18)

A survey from 2006 found ~50% of eye departments to have some form of shared glaucoma care although only 14/66 (21%) were in the community, the majority being in-house.<sup>73</sup> The Department of Health ran a glaucoma services pathway pilot which concluded in 2007 with four different shared care schemes included.<sup>87</sup> There is therefore significant national knowledge about what does and does not work in a particular context.

Published examples of shared care schemes from more than 20 years ago of glaucoma shared care with community optometrists having shown them to be possible, effective and appreciated by patients,<sup>83,88,89</sup> although not necessarily less expensive<sup>90</sup> than hospital care based on the clinical practice models at that time. It should be noted that the way clinics were run historically made estimates of HES glaucoma clinic costs much lower than they could conceivably be put today<sup>43</sup> and contemporary economic analysis of shared care can be more favourable,<sup>91</sup> but not if community appointments are more frequent than that which would have been arranged by the HES.<sup>92</sup> Shared care may especially be cheaper if run within a hospital context to minimise the overheads which can be punitive in the community setting, although the relocation to hospital premises negates some of the benefits of shared care.<sup>93,94</sup>

.....

*Shared care schemes have been proven to be possible, effective, appreciated by patients, although not necessarily less expensive*

.....

Support for such schemes also exists in the publishing of a Community Ophthalmology Framework by the Clinical Council for Eye Health Commissioning,<sup>95</sup> but one obstacle to such shared care schemes will be

the optometric community’s need to fit the clinical care pathway into their business model in a way that permits them to retain profitability.<sup>96</sup> This may be based on the utilisation of unfilled appointments in their clinics, and hence have a capacity ceiling.<sup>97</sup> Patient satisfaction is expectedly high.<sup>91</sup> A qualitative study of enhanced optometric services in London and Manchester found good levels of support for enhanced schemes from participating optometrists, ophthalmologists and GPs, although anyone not supportive would naturally have excluded themselves from a study of this nature.<sup>96</sup>

The optimal intervals and modalities for surveillance of ocular hypertension was the subject of an NIHR funded Health Technology Assessment published in 2012, which merits consideration in the construction of such schemes.<sup>98</sup> Historically, both HES and community services had the potential to recruit patients on the basis of an elevated IOP at some point, following which the patient remains on review for the rest of their life. More than one interviewee reported starting a new post and being able to discharge a lot of patients who had been followed up unnecessarily for many years. Shared care schemes need in built protection from this concern, such as one consultant who had agreed that *“OHT patients will be discharged to the scheme for 5 years of monitoring with a plan and re-referral criteria, then after 5 years referred back to HES before discharge.”*(GL 42)

### Outside providers facilitating capacity expansion by use of hospital based shared care model

For those looking for an off-the-peg solution to their capacity issues, contracting an external provider is an option that has some support from published reports, and was also spoken of positively at interview for this project by those who had gone down this route for running services in the main hospital or community setting.<sup>1</sup>

There are certain problems that an external provider should solve instantly. Frequently repeated themes in interviews across all disease areas were the difficulty of recruitment and retention of quality non-medical eye HCP staff and IT related issues. Large amounts of time invested in training individuals can then be negated by failure to retain those key staff members; *“I used to work in another Trust where we had a really stable staff population, but here, we train them up then they leave!”*(GL 46).

Although well connected quality IT was reported as a huge asset by some, with 3/51 interviewees citing their IT set up as the best part of their glaucoma service, the very opposite opinion was expressed when the IT was poor or lacked functionality with 5/51 consultants citing it as their major frustration that they would like to change.

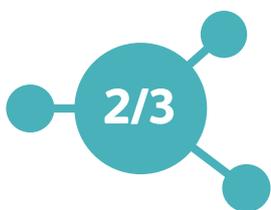
Two departments who are using an external provider had their glaucoma leads observing that this solution instantly removed any issues around staff training, recruitment and retention, IT solutions and also clinical governance and audit of the shared care system. (GL38)

Assigned categories						
Count	Glaucoma specialists					Total
	Normal	Stable	Low risk	Unstable	High Risk	
Optometrist						
Normal	531	49	28	17	0	625
Stable	267	4,162	542	149	0	5,120
Low risk	90	1,303	10,661	833	5	12,892
Unstable	21	66	1,334	4,067	8	5,496
High risk	0	0	0	3	121	124
<b>Total</b>	<b>909</b>	<b>5,580</b>	<b>12,565</b>	<b>5,069</b>	<b>134</b>	<b>24,257</b>

Figure 9: Consultant Agreement with optometrist grading<sup>1</sup>

A 2014 publication of one English department's experience of recruiting an outside provider to help with a backlog of 4,000 patients who were felt to be at risk is strongly positive. The glaucoma specialist retains control of their patients as the external provider delivers the staff, equipment and support infrastructure to do both data acquisition and clinical grading by specialist optometrists such that patients were assigned to one of five risk categories and followed up at an appropriate interval.<sup>1</sup> Of 24,257 outpatient attendances, all of which were reviewed virtually by glaucoma specialists over a 31 month period the levels of agreement between the optometrists grading and the glaucoma consultant was felt to be acceptably high (figure 10). Another consultant had audited the decisions of the external providers staff and found he concurred in 85% of cases, could relax the follow up interval in 10% but expedited the follow up interval in 5% which he was happy with (they also reported a DNA rate of <3%) (GL 38). Recruitment of external provision such as this will, of course, take the majority of the tariff for each case in a payment by results (PbR) setting and hospitals utilising such services should ensure that all data collected by the outside provider is integrated into the existing hospital record system, either by filing in paper notes or entry into the local EPR, depending on the local mode of working. Transfer of electronic visual field data should likewise form part of any contract with an outside provider brought in to 'bail out' a service with high levels of delayed visits. Without careful retention of the patient data collected by the outside provider key information can be lost from the patient's hospital record with clinical governance risk and potential adverse patient care consequences.

## Decentralisation



Two thirds (30/45) of consultants described having decentralisation of their services to locations outside of the main trust hospital(s). Various models of decentralisation, primarily established to reduce transport times for patients and companions and thereby reduce costs<sup>99</sup> and improve equity of access, were encountered. There was one description of a well-equipped mobile glaucoma clinic in a truck, and although economic analysis had shown this to be cost-neutral to run once established, the significant set up cost (estimated at ~£250,000) makes this a model that would not be easy to roll out to other areas with similar geography (GL 24).

The majority of decentralisation was to existing health facilities, often described as cottage hospitals, or to GP practices, other general hospitals or community clinics. Of those with decentralised services, most had at least a visual field machine (28/30), and half had disc imaging equipment (15/30), some of which was networked so that virtual review by the consultant at the base hospital was possible.

## The Equipment Challenge

A challenge for many was the issue of having to replicate relatively expensive equipment. Anecdotally, many visual field machines are deployed in UK eye departments that pre-date the consultants running the services and these are running perfectly well. Pachymeters are relatively inexpensive. However, disc imaging has moved on rapidly with HRT and GDx giving way in many cases to OCT. If multiple satellite units are being run and equipped, this evolution becomes an expensive exercise.

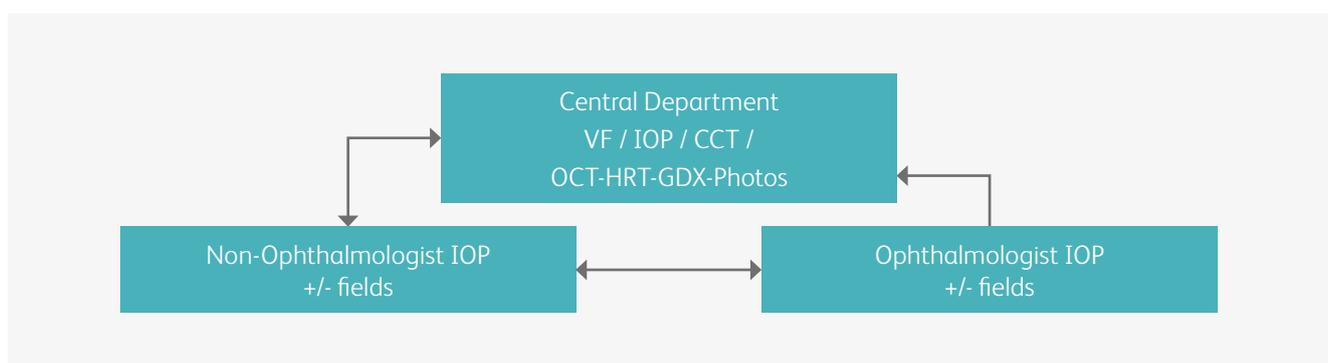


Figure 10. Hub and spoke alternating clinic appointments 6-12 monthly

## Can portable equipment be utilised?

No example of portable equipment was found to be functioning. The most common solution to diminish the negative impact of the inability to equip all peripheral units fully was alternating clinic appointments between spokes and the hub (figure 10). This is particularly the case where non-ophthalmologists are doing the alternate peripheral clinics. Although one unit had 7 cottage hospital style peripheral sites, each with fields and most with disc imaging capacity (GL6), the more sparsely populated the area, the greater the tendency to having more sparsely equipped peripheral sites.

.....  
**No example of portable equipment to peripheral units was found to be functioning**  
.....

Whatever model is pursued, some evaluation of the value is needed, and one unit had run a pilot of three community sites, but had to shut them down as they were not financially sustainable. However, as the HCP glaucoma team grows, or as IT improves to permit easy virtual review, it should become increasingly possible to run economically viable community services without direct consultant attendance.

## If we remove all the more straightforward cases to Virtual or Shared Care, will the tariff for Ophthalmic consultant lead OPD attendance have to rise to reflect the progressive shift to higher complexity?

The standard out-patient appointment tariff is set at a level that accounts for the variation in complexity of the various presentations that might be encountered. Cases which are clinically simpler or quicker, could be priced much cheaper.<sup>43</sup> It is the existence of these relatively straightforward appointments that currently keeps the whole system at the cost it is. In a PBR setting, removing simple cases increases therefore the true average cost of an outpatient attendance in a department.

Previously when there were fewer clinical tests available, less thorough record keeping requirements and less demanding patients, ophthalmologists saw more patients per clinic than is possible today. The same tariff that used to run an eye department where doctors saw an average of 15 patients per 4 hour clinic cannot therefore run an eye department where the doctors average 10 patients. This shift towards higher complexity and increased interaction with the patient suggests that tariff alteration to reflect complexity will need to be negotiated if a PBR persists.

## Could MDT working go too far in glaucoma?

With increasing subspecialisation, more glaucoma patients and suspects will be managed under the care of a glaucoma specialist. One consultant commented that, *"I don't want to spend my consultant career seeing ocular hypertensives and stable treated glaucoma patients"*(GL 10). Maintaining a motivated senior workforce is important to all stakeholders. In the NHS the consultant's time is best utilised doing work that others cannot do. It seems logical therefore to utilise the MDT to assist in this aim. However there is a clear need for the consultant ophthalmologist to be at the centre of the eye care team, leading and providing governance for any devolution that occurs.

.....  
**Ophthalmologist leadership and ownership of services is the single most important factor that determines the success of any service design**  
.....

The Joint Commission on Allied Health Personnel in Ophthalmology (JCAHPO) has been established in North America as a certifying body for allied health personnel for ophthalmology, offering certification and structured career progression ([www.jcahpo.org](http://www.jcahpo.org)) in collaboration with the Association of Technical Personnel in Ophthalmology ([www.atpo.org](http://www.atpo.org)). In the UK, the Association of Health Professions in Ophthalmology (AHPO) has been formed ([www.ahpo.net](http://www.ahpo.net)) with similar aims. The RCOphth is collaborating with the Royal College of Nursing (RCN), College of Optometrists, British and Irish Orthoptic Society (BIOS) and the

Association of Health Professions in Ophthalmology (AHPO) in the process of formalising a Common Competences Framework for non medical HCPs in ophthalmology in the UK. The opportunity exists for the Ophthalmologist community to lead the process, keeping high clinical standards and cost-effectiveness at the heart of the task-sharing, rather than allowing purely economic drivers to drive change with commissioning bodies looking for what they perceive to be cheaper alternatives.

One consultant with over a decade's experience of growing MDT working in the HES and in the community stated, *"It is important for the ophthalmologists to be steering service developments, to retain oversight of training and accreditation of staff, establish protocols for clinics, audit and review the service over time. The leadership they can provide is essential to running a safe and productive team. Over time the ophthalmologist may need to develop new models of clinical care that can dovetail with existing provision. For example in a tertiary referral unit, patients with different risk levels could attend different models within an integrated service moving between them if their risk level changed. Optometrists working under a consultant in complex tertiary referral clinics can then independently run the moderate risk clinic, with low risk patients seen by virtual review and have a GRFS in place too."* The road to achieve all these services may be long, but the alternative is an increasing number of adverse outcomes due to an overloaded system that is not fit for the purpose of delivering the quality and quantity eye care in the evolving health care delivery context.

## Discharging glaucoma patients: how to avoid the revolving doors - is this possible in the glaucoma service?

It is a well-known phenomenon, as shown in figure 1, that certain patients who were referred as glaucoma suspects, determined not to have a progressive optic neuropathy and then discharged, will reappear in clinic over the next few years. The SIGN guidelines provide a clear framework for who, and how, to discharge patients previously referred with possible glaucoma.<sup>67</sup> A key message is that on discharge, a summary of the patient's clinical record with clear instructions as to when re-referral would be appropriate should be created. This should be sent to their optometrist (requires patient consent) and GP, but in recognition of the fact that patients change their optometrist much more freely than they change their GP and that the clinical record does not follow the patient to the new optometrist, a copy of the clinical summary should be given to the patient with instructions to show the document to any future optometrist they see.

*On discharge, a summary of the patient's clinical record with clear instructions as to when re-referral would be appropriate should be created... given to the patient with instructions...*

# Considerations for further action

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## **Responding to the projected growth in glaucoma case numbers:**

- Consider where you feel your glaucoma service currently is on the capacity/demand graph
- Calculate what a 22% increase in glaucoma patient numbers, and 10% increase in OHT and glaucoma suspects will mean for your department over the next 10 years
- Discuss with colleagues and management what the next steps are for your department in; a) reducing inefficiencies (e.g. DNA rates), b) managing demand (e.g. GRFS) c) options for growing your capacity without growing your team of consultant ophthalmologists, d) deciding on what trigger points will cause you to instigate implementation of these plans (how bad does it have to get?)

## **If all new referrals are seen by an ophthalmologist, then false positives are wasting capacity:**

- Contact your LOC and look for opportunities to run educational sessions for community optometrists on glaucoma diagnosis and referral. This will reduce false positive referrals.
- Look at your first visit discharge rate and assess if the false positives are from IOP only, fields only or imaging only referrals - if there is no GAT repeat pressure scheme or no repeat fields scheme in operation, consider collaboration with local optometrists or in house HCPs to set one up. If that is good value and is shown to reduce false positives think about developing it into a full GRFS
- If that is good value and is shown to reduce false positives think about developing it further into an enhanced case finding scheme or a full blown referral filtering scheme.

## **Glaucoma Referral Filtering Schemes offer a potential saving of HES capacity; just because they can work does not mean they will work. In setting one up it is recommended that:**

- HES is fully engaged in the scheme design with consultant or Optometrists with a Special Interest (OSI) triage of referrals so higher risk cases are sent directly to HES to save duplication and delay
- Monitoring and evaluation of the scheme should be built in; setting expectations for referral reduction might be dangerous as it might incentivise under-referring, but secondary care evaluation of the false positive rate and first visit discharge levels are easily performed and can be compared to published results. Such evaluation will prevent poor value schemes draining resources from the health economy.
- False negative rates may take years to be easily auditable (for instance by evaluation of those presenting with manifest glaucoma it can be seen how many had been entered into referral refinement at an earlier time point).
- If you have an established high volume virtual clinic set up, putting all new referrals through this may prove easier than setting up a GRFS from scratch
- Consulting with glaucoma consultant colleagues in other departments who have already established schemes with good audit and efficacy data is likely to be helpful

## **Shared Care**

- A strong team of competent and motivated HES optometrists can be built over time to add some capacity to complex patient clinics, and to independently manage moderate risk patients under your care. This is a long term project, bearing long term fruit.
- Training and progression through the various higher (optometric) qualifications takes time and effort on the part of the shared care staff as well as the consultant and other medical staff. Upskilling is essential for ensuring that patients with various levels of disease complexity are cared for by appropriately qualified and experienced HCPs. In addition, career development helps with staff retention and morale.
- Rather than purely having HES HCPs in your clinics, consider sessions funded for optometrists/HCPs working predominantly in the community or in community clinics. This has advantages for both HES and the community components of their role.

- Set up some glaucoma teaching open to all community optometrists. Investing in glaucoma training of community optometrists has advantages in improving quality of referrals, but also may help you identify individuals who can be developed as OSI, and take on shared care roles for new referrals and follow ups.
- Shared care schemes need to see patients that would otherwise have been in secondary care clinic. If a potentially low-value scheme is running, offer those paying for this scheme to get involved with training and help audit the scheme to ensure it is fulfilling its aim.

## Shared care (outside providers)

- If you see shared care as a good model for capacity expansion in your context but lack the managerial capacity to recruit, train and equip the necessary staff, utilisation of an outside provider may be a way of up scaling in a shorter time whilst also taking care of IT and clinical governance concerns. This can be done without losing control of those patients' care by arranging that the HES consultant does all their own virtual review of the data acquired by this service, and the consultant therefore retains the clinical decision making responsibility. Ensure that all data collected are entered into the clinical notes in the formats currently in use in the hospital. In addition, ensure that all field tests are retained in usable electronic form to allow for possible future developments of longitudinal analysis of field data.

## Virtual Clinics

- Virtual clinics are growing in numbers, and consulting with colleagues who have set one up is likely to make the process easier for those wanting to establish this service
- Ensuring staff are working to the full extent of their banding will keep the cost down (e.g. senior nurses doing simple tasks with automated equipment should be avoided)
- Good IT is essential to productivity in reviewing images and investment in IT might be agreed at inception to avoid frustration
- Once you have a strong virtual clinic system, if your trust covers a wide geographic area, consider what sites exist that might be potential decentralised data gathering centres.
- Offer to do virtual review of potential glaucoma referrals from community optometrists if they can send you images where adequate IT links exist (all optometrists now have access to @nhs.net email addresses).

## Discharge

- On discharge of a patient previously referred with potential glaucoma or OHT, provide them with a summary of their clinical record which includes clear instructions as to when re-referral would be appropriate. Send this to their GP, optometrist (if agreed by the patient) and given them a copy to keep to prevent them returning unnecessarily.

## Training

- Ophthalmologists in training must have sufficient exposure to any scheme to augment their clinical and managerial experience

When considering or developing schemes for glaucoma care every service should maintain a clear primary focus on patient care and use available resources to deliver the best care possible to the population being served. It must be borne in mind that NICE requirements apply directly to England and Wales and that Scotland and Northern Ireland would be expected also to be mindful of NICE requirements. NICE guidance includes the Glaucoma Clinical Guideline - CG85 (update in progress at the time of writing) and the Glaucoma Quality Standard – QS7. In Scotland the SIGN guideline will have particular relevance as it is designed around local Scottish health care arrangements. A skills and services lottery across the 4 Nations would not be appropriate and RCOphth guidance is relevant to all ophthalmological services in the UK, both NHS and independent.

Referring commissioning bodies to the recently published RCOphth Commissioning Guidelines for Glaucoma covers a wide range of these topics.<sup>60</sup>

# Appendix A

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## The 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, to include 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, will necessitate 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 the 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 be 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: (“Glaucoma/economics”[Majr] OR “Glaucoma/epidemiology”[Majr] OR “Glaucoma/ethnology”[Majr] OR “Glaucoma/organization and administration”[Majr] OR “Glaucoma/prevention and control”[Majr] OR “Glaucoma/statistics and numerical data”[Majr]) AND ( “UK” OR “Northern Ireland” OR “Scotland” OR “England” OR “Wales”).

Using PubMed ([www.pubmed.org](http://www.pubmed.org) accessed 12/11/2015), 112 citations were returned of which 61 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 to cater for the wide scope of the project. 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 were produced nationally using case definitions and age stratified data from relevant populations. The epidemiological modelling for glaucoma specifically is discussed in full in appendix B.

## **Interviews with UK consultants leading ophthalmology services to identify good practice examples**

In the rapidly changing landscape of health service delivery in the UK, it is 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

## Epidemiological Modelling of Future Glaucoma

### Population Growth and Ageing Projections for the UK

In order to quantify the expectation of growth in case numbers for the diseases of older age most relevant to ophthalmology (Cataract, AMD, Glaucoma), projections of population growth, as released by the Office for National Statistics (ONS) were taken and prevalence data from population based surveys was applied to these projections. As there is significant variation in the prevalence of ophthalmic diseases between populations of different ethnicity,<sup>8-13</sup> and as the ethnic make-up of the UK is expected to change substantially over the next 20 years,<sup>14</sup> it was also necessary to take this shift into account.

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).<sup>15</sup>

	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. This can also be seen in the life-expectancy figures which rose by 5.4 years (95% CI 5.0-5.8) from 75.9 to 81.3 years between 1990 and 2013.<sup>102,103</sup>

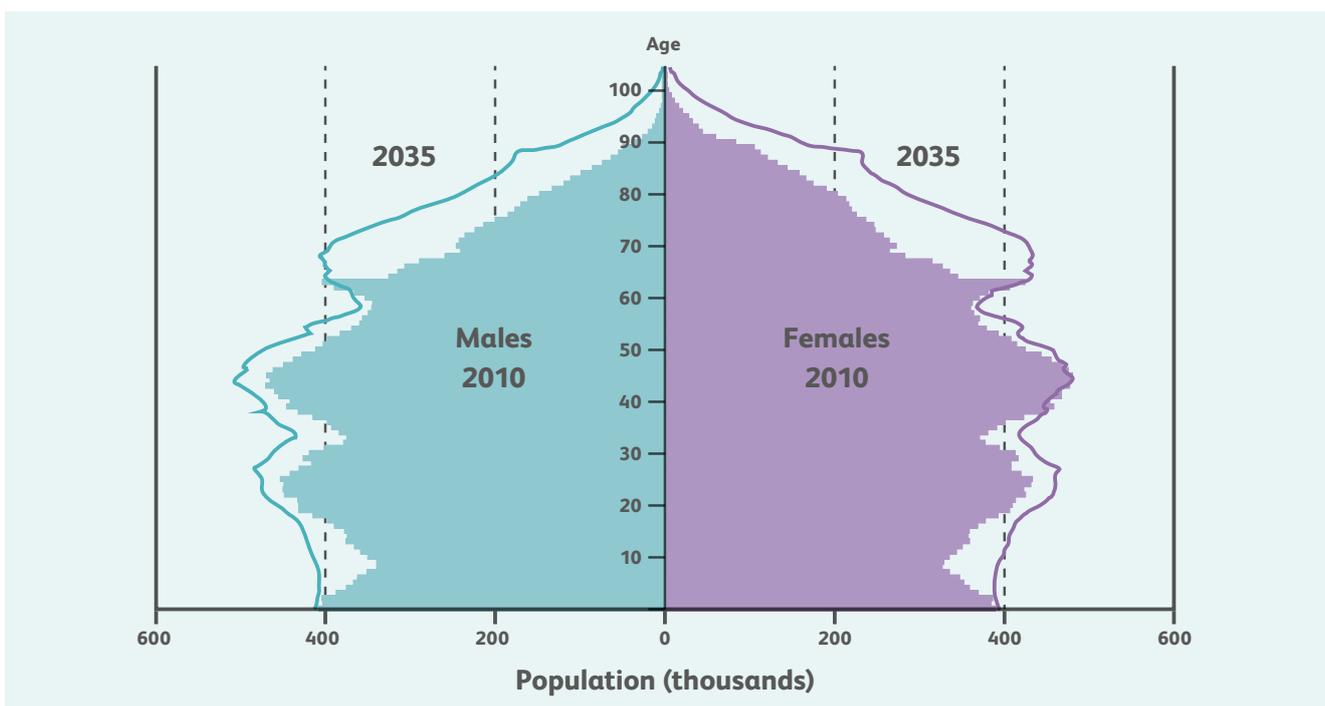


Figure B2. Estimated and projected age structure of the UK population mid-2010 and mid-2035

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 the expectancy is 5.5 years (male) and 6.4 years (female).<sup>103</sup>

## 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.eyehhealthmodel.org](http://www.eyehhealthmodel.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 LOC Support Unit (LOCSU) for hosting the model as an online resource.

Other options for modelling exist, such as using published equations derived from previous survey data that have been shown to be useful in creating predictions of disease prevalence, and these equations have been tested against actual data derived from subsequent surveys and found to be acceptable.<sup>104</sup> However, the NEHEM tool was selected as it permitted modelling to incorporate the shift in ethnographic distribution of the UK population and also provides the added functionality of being readily accessible to those wishing to repeat calculations for their locality, as advocated by the RCOphth.<sup>105</sup>

	2010	2015	2020	2025	2030	2035
30-39	8.48	8.36	8.79	9.36	9.41	9.11
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 prevalence estimates were derived, varied by disease. The source studies will be discussed separately, but in general, it was necessary to select populations with similar exposure to known risk factors, and where ethnic difference in disease prevalence is expected, then source data was required that was broken down by ethnicity as well as age. So for example, given the relative expected sun-exposure of the two populations, 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,<sup>106,107</sup> but more important perhaps is the definition of a “case”, which will be discussed with each disease area individually.

## Ethnicity projections for UK

Projection of eye disease prevalence requires population breakdown by ethnicity at various time points into the future, because of the variation in disease prevalence in different groups. Although there are some detailed short term projections of the growth of ethnic minorities within the UK population which have been prepared at local level in cities or regions of the UK, none has been published at the national level

since 1979 when the Office of Population Censuses and Surveys (OPCS, now ONS) provided the first UK projections of ‘ethnic minority’ populations (Immigrant Statistics Unit 1979).<sup>14</sup> With no official statistics or projections to inform our estimates, the academic literature was searched, and although no study regarding ethnicity distribution within the UK population stratified by age was identified, one study gave UK ethnographic projections for 2031 and 2056, taking 2006 data as a baseline (figure B4).

	2006	2031	2056
White	54,591	55,646	51,715
Mixed	859	2,234	4,207
asian	3,122	8,309	14,010
Black	1,411	2,998	4,789
Other	403	1,748	3,326
Total UK	60,587	70,936	78,047

**Table B4: Estimates and Projections of UK Ethnic distribution mid-2006 to mid-2056 (thousands)**

There was no finer granularity in the projection data, so by interpolation, percentages were produced for the interim and applied at each time point under consideration for this project (table B5).

As age stratified ethnographic projections were not available from either governmental or academic sources, the extrapolated projections presented above (table B5), permitted us to apply them to the age stratified UK population projections, and thereby produce the data needed to supply NEHEM.

	2006 pop.	2006 (%)	2010 (%)	2015 (%)	2020 (%)	2025 (%)	2030 (%)	2031 pop.	2031 (%)	2035 (%)
White	54,591	90.1	88.26	85.9	83.58	81.2	78.9	55,646	78.4	76.6
Asian	3,122	5.2	6.2	7.5	8.8	10.1	11.4	8,309	11.7	12.7
Black	1,411	2.3	2.6	3	3.4	3.7	4.1	2,998	4.2	4.5
Mixed	859	1.5	1.8	2.1	2.4	2.7	3	2,234	3.1	3.3
Other	403	0.7	1	1.3	1.7	2.1	2.4	1,748	2.5	2.8
Total	60,587							70,936		78,047

**Table B5: UK Population Ethnicity Projections**

## Caveats regarding ethnographic projections

A caveat regarding the methodology to create the ethnographic projections broken down by age is that the population pyramid is wider based in immigrant populations due both to the relative younger age of migrants as compared to indigenous population, and to increased fecundity. Whilst the disparity will get progressively less marked with each passing decade, it does have to be noted. The problem is mitigated slightly by the fact that the main ethnic predictor for the disease burdens being estimated is the increased risk of glaucoma amongst the African-Caribbean population, whose representation in the UK population is relatively stable in absolute numbers, with less new immigration, and it therefore conforms to a more representative age distribution than more recently actively migrant groups.<sup>14</sup>

The population projections based on assumptions about immigration and changes in life-expectancy that may not prove to be true, and there many other factors that are not static,<sup>102</sup> such as changes in diet,<sup>108</sup> deprivation indices<sup>30</sup> and smoking habits,<sup>109</sup> that will undoubtedly shift age specific prevalence of the diseases under consideration. Although it is not possible within the terms of this project to coalesce the various trends in known risk factors into one model, it is worth noting that the authors of the NEHEM themselves observe that “in any eye care prevalence estimation it is all too easy to provide spurious precision”,<sup>110</sup> which is the same observation made by other authors who have attempted projections of

UK ophthalmic disease burdens.<sup>11</sup> So the projections produced are there to give us some indication of likely growth in demand for services, which then permit us, and the managers we work with, to prepare structures, both physical and administrative, that are fit to meet the future demands that await us.

## Estimated Populations Served by each NHS Trust

In applying the estimates to a particular eye department, to permit planning, 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 units may by 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 services 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, hence a disproportionate amount of evening and weekend work can be attracted 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, such that the variation caused by factors such as those above can be taken into account and 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.

## Glaucoma Projections 2010-2035

NEHEM utilises age stratified prevalence of glaucoma estimates defining a case as “someone who had an absolute field defect and either a cup to disc ratio of 0.7 or larger or substantial asymmetry of the cups (a difference in cup to disc ratio of 0.3 or larger) between the two eyes”. From the available literature, a meta-analysis which included 46 published observational studies of OAG prevalence (103,567 participants with 2509 cases of OAG) derived from a systematic review was chosen. The analysis covered a wide age range as well as Asian, Black and White populations shown in table B6.<sup>11</sup>

Predicated prevalence of Open Angle Glaucoma (95% Confidence Incidence)			
Age group	White	Black	Asian
30-39	-	1.8 (1.2 - 2.7)	0.4 (0.3 - 0.6)
40-49	0.4 (0.3 - 0.6)	2.9 (1.9 - 4.4)	0.6 (0.4 - 1.0)
50-59	0.8 (0.5 - 1.2)	4.6 (3.1 - 6.8)	1.0 (0.6 - 1.6)
60-69	1.6 (1.1 - 2.5)	7.2 (4.9 - 10.6)	1.6 (1.0 - 2.4)
70-79	3.3 (2.2 - 4.9)	11.2 (7.6 - 16.1)	2.5 (1.6 - 3.8)
80-89	6.6 (4.4 - 9.7)	16.9 (11.7 - 23.3)	3.8 (2.3 - 5.9)
90-95	10.8 (7.2 - 15.8)	22.5 (15.7 - 31.2)	-

Table B6: Prevalence of Open-Angle Glaucoma<sup>11</sup>

## Glaucoma Suspect

NEHEM estimates glaucoma suspect numbers; cases were defined as “those who had an absolute field defect and either a cup:disc ratio of  $\geq 0.5$  but  $< 0.7$  or asymmetry of  $\geq 0.2$  but  $< 0.3$ .” There was very limited material to inform these estimates so the only data was used was from the North London Eye Study which examined a random sample of 1,547 of 1,840 (84%) eligible people aged 65+ (table B7).<sup>112</sup>

Age group	Prevalence (per 1,000)
65-69	69.9
70-74	52.6
75-79	59.3
80-84	105.9
85-100	88.2
All	70.5

Table B7: The prevalence of “glaucoma suspect” in the over 65 population<sup>112</sup>

## Ocular Hypertension

Ocular hypertension, defined as “intraocular pressure greater than 21 mmHg in one or both eyes, without the matching disc and field changes that would classify the case as POAG” was estimated by the North London Eye Study at 3.2% (confidence interval 2.4 to 4.3) for those aged 65 years or above and the Australian Blue Mountains Study (3.7% aged 49 and older).<sup>18 112</sup> Neither study broke down its findings by ethnicity or sex so the UK study was selected.

## UK Glaucoma Case Projections 2010 – 2035

There is clearly a difference between the number of cases that is estimated by extrapolation from population based surveys and the number of patients that will actually present to our eye departments for treatment. Many patients will remain undiagnosed, or present late, which will reduce the burden on services. However there is an equally clear natural linkage between prevalence and actual case load.

	Mean Estimated Glaucoma Cases	(95% CI – High	95% CI – Low)	Glaucoma Suspects	Ocular Hypertension
2001 UK	533,623	753,379	331,601	2,074,807	1,171,446
England	449,847	634,946	280,407	1,734,357	979,429
N. Ireland	12,438	17,581	7,558	53,991	30,754
Scotland	43,911	62,100	26,820	181,641	102,597
Wales	27,427	38,752	16,816	104,818	58,666
2010 UK	636,828	902,631	401,190	2,224,200	1,243,520
2015 UK	693,092	982,898	438,082	2,356,900	1,315,520
2020 UK	762,042	1,084,328	485,363	2,466,100	1,368,000
2025 UK	847,170	1,213,672	544,711	2,597,600	1,429,760
2030 UK	922,583	1,326,557	596,600	2,707,400	1,479,040
2035 UK	998,350	1,435,580	647,087	2,791,700	1,519,680

Table B8: Estimated and projected numbers of cases of glaucoma, glaucoma suspects, and ocular hypertension in the UK 2001-2035

These estimates are for prevalence, not diagnosed cases. Previous projections produced in a report by Minassian and Reidy commissioned by RNIB in 2009 predicted a rise from 265,973 persons in 2010 estimated to have glaucoma (diagnosed) to 327,440 by the year 2020.<sup>16,17</sup> It is frequently quoted that 50% of prevalent glaucoma is undiagnosed.<sup>18-23</sup> The conversion factor between prevalence and diagnosed cases will change over time, and it is hard to predict how this relationship will change, but it is of note that the 2010 to 2020 rise in mean estimated glaucoma cases from table B8 is 20%, which approximates to the 23% rise in the diagnosed cases they project.<sup>16</sup>

Another notable publication attempting to predict the rise in primary open angle glaucoma (POAG) numbers (cases, not just diagnosed cases) by applying prevalence data from existing population based surveys, produced estimates of “definite POAG cases” of 396,000 in England and Wales in 2011, rising to 459,000 by 2021 and 534,000 by 2031.<sup>111</sup> Their reference surveys were mainly white Caucasian populations, and they added the same caveat stated for The Way Forward projections that the definition of a case is subject to such variation as to force caution regarding the exact figures. They emphasised, as we would also wish to, that the percentage anticipates a 16% rise in cases between 2011 and 2021 and a 50% rise in cases in the 30 year period from 2001 to 2031. This compares to a ~70% rise predicted in those same 30 years through NEHEM. This higher figure reflects the inclusion of ethnicity and a broader case definition.<sup>111</sup>

## Application on a local level

Interviews conducted for this project with 38 glaucoma lead consultants asking about the population covered by their hospital and the total number of ophthalmology outpatient attendances (OOA) per annum sat at around 10% of the population figure with glaucoma contributing 15-30% of the OOA depending on the development of other sub-specialities. This is consistent with the estimate of the majority of ophthalmologists in one survey who estimated glaucoma to constitute 10-25% of their outpatient attendances.<sup>83</sup>

The data generated in these disease burden projections can be utilised simply in a manner that any eye department could do for themselves. By looking at the percentage growth in prevalence over the next 10 years, and applying this to current patient numbers, estimates of expected demand growth can be generated.

Hence, taking mean estimated glaucoma cases (table B8), this would predict a 22% increase in the number of glaucoma cases between 2015 and 2025 (44% growth from 2015 to 2035), although as time and technology progress, our ability to detect disease, and to detect it earlier is likely to improve and a more proactive approach to management of earlier disease is also to be expected.<sup>25</sup> It was only in the 1980's that an analysis of the routes to hospital of patients with open angle glaucoma found that over half presented as a result of visual symptoms, and a full 25% had advanced field loss at the point of presentation.<sup>24</sup> So if the trend towards earlier detection continues, the proportion of prevalent cases that are seen in our departments will also increase, which will further augment the case load.

The growth in OHT (9%) and glaucoma suspects (10%) in the same 10 year period will also have an impact on services, but the larger percentage growth in the glaucoma population predicted by the epidemiological model reflects the greater relative prevalence of manifest glaucomatous optic neuropathy in the oldest age brackets, where the proportionate growth in population is projected to be largest. It can be hoped that the same advances in our ability to detect early disease will also aid us in identifying those who do not have early disease, hence permitting more confident discharge or monitoring of those without manifest disease.

# Appendix C

We, as clinical leaders need to understand the interaction between demand and capacity if we are to be able to provide for a future in which demand grows by 22% every ten years up to 2035. The outline of a capacity / demand model below should permit you to map where your service is currently, and also empower future planning on the basis of expected increases.

In reading this, ask yourself;

- 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?

## 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 C1. In publicly funded health care, the managerial drives are more strongly orientated towards avoidance of creating unused capacity (figure C2). 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 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)

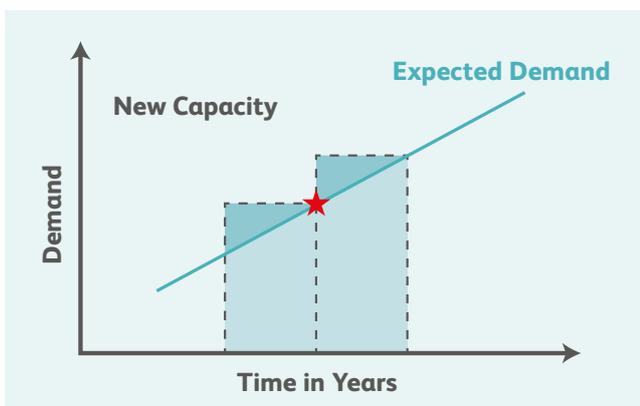


Figure C1: Capacity is incremented in advance of the expected growth in demand

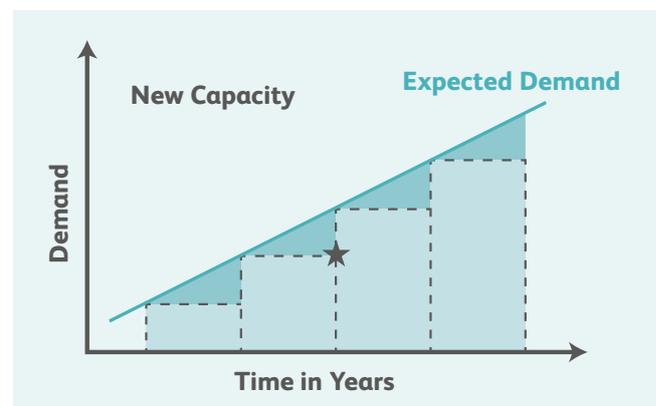


Figure C2: Capacity increments lag behind expected growth in demand

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

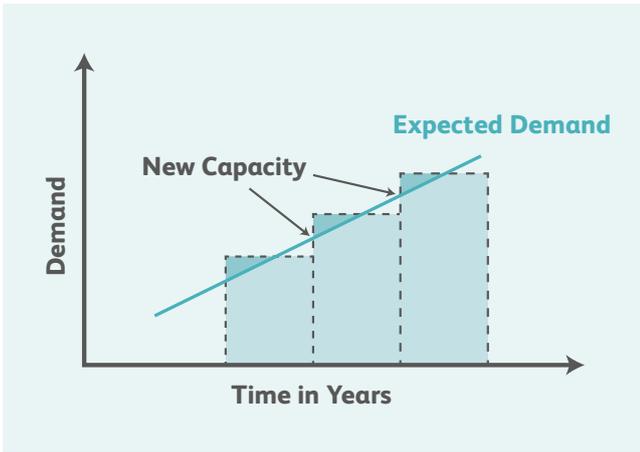


Figure C3: Mean capacity and demand equilibration

(eg 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.<sup>113</sup>

So in figure C3, 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.<sup>113</sup>

## 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 C4).

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 C5). 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.<sup>105</sup> 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.

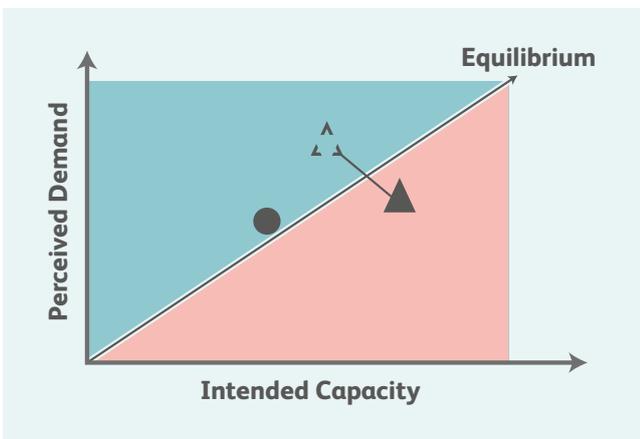


Figure C4: Individual services can be mapped to their current

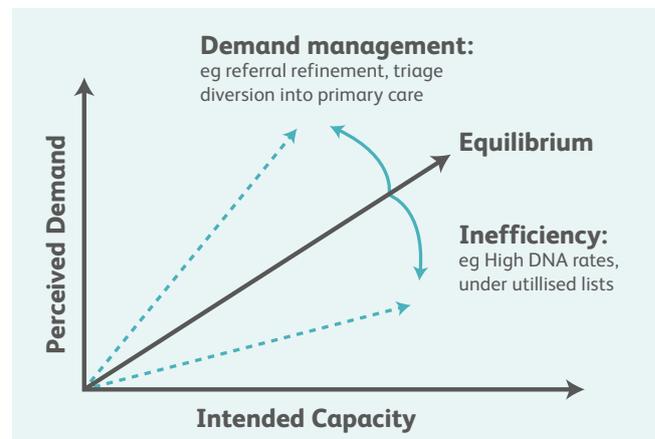


Figure C5: The equilibrium can be shifted to optimise current capacity

## **You will always 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 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 (eg 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 C2) would be determined by the time when the cost of permanent new capacity (eg 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? (eg 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

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## 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.<sup>114</sup> In order to be sustainable, developments must meet the Triple Bottom Line of minimising economic and environmental impact (e.g. waste and carbon footprint)<sup>115</sup> whilst optimising social value (e.g. quality and patient experience).<sup>116</sup> 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.<sup>117</sup>

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 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.

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

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