

<b>Institution:</b> University College London		
<b>Unit of Assessment:</b> 4 - Psychology, Psychiatry and Neuroscience		
<b>Title of case study:</b> Transforming clinical practice and bringing significant cost savings in the treatment of glaucoma		
<b>Period when the underpinning research was undertaken:</b> 2016 - 2020		
<b>Details of staff conducting the underpinning research from the submitting unit:</b>		
<b>Name(s):</b>	<b>Role(s) (e.g. job title):</b>	<b>Period(s) employed by submitting HEI:</b>
Gus Gazzard	Professor of Ophthalmology (Glaucoma Studies)	2002 - Present
<b>Period when the claimed impact occurred:</b> 2018-2020		
<b>Is this case study continued from a case study submitted in 2014?</b> N		
<b>1. Summary of the impact</b>  <p>Glaucoma affects an estimated 76,000,000 people worldwide, including over half a million in the UK where it is a leading cause of visual morbidity (accounting for 12% of blind registrations) and a significant cause of falls and loss of independence in the elderly. Research led by UCL has demonstrated the clinical- and cost-effectiveness of selective laser trabeculoplasty (SLT) over current treatment of eye drops and surgery. These findings have been incorporated into the globally influential European Glaucoma Society Guidelines and the American Academy of Ophthalmology's Preferred Practice Patterns. Similar changes to relevant NICE guidelines are planned but have been temporarily delayed by the impact of COVID-19.</p>		
<b>2. Underpinning research</b>  <p>Glaucoma, a group of conditions characterised by progressive damage of the optic nerve head and loss of visual field, is the second leading cause of blindness worldwide. Glaucoma monitoring and treatment take up a major proportion of hospital eye service outpatient appointments, with &gt;1 million glaucoma-related hospital eye service visits annually in the UK. In 2012 alone, &gt;8 million glaucoma treatment related items were dispensed in the community, costing the health service &gt;GBP105,000,000.</p> <p>Ocular hypertension (OHT), a state of raised intraocular pressure (IOP) in otherwise healthy eyes, is a risk factor for developing glaucoma that affects 1.2 million individuals in the UK. The traditional first-line treatment for glaucoma and OHT, IOP-lowering eyedrops, have a variety of side effects with impacts on quality of life, outpatient numbers, and the potential success of further glaucoma surgery.</p> <p>An alternative to reducing IOP is selective laser trabeculoplasty (SLT), a quick and painless outpatient procedure. SLT outperforms earlier forms of laser trabeculoplasty in terms of safety margin and repeatability, offering potential IOP control for glaucoma and OHT patients without eyedrops, and with significant benefits for patient quality of life and for NHS expenditure. A Cochrane systematic review published in 2007 highlighted the need for research to compare the clinical efficacy and cost-effectiveness of SLT to IOP-lowering drops for the treatment of open angle glaucoma (OAG) or OHT.</p> <p>Two meta-analyses published in 2015 showed that 360-degree SLT gives a similar IOP reduction to either prostaglandin-analogue monotherapy or combination therapy. The studies analysed had adopted various follow-up periods and a wide range of success criteria. No direct measurements of cost were available since the studies did not include this measure; however, in terms of cost-effectiveness economic modelling showed SLT to be effective compared to pharmacological lowering of IOP; SLT has also been predicted to be cost-effective when repeated once within three years of initial application compared to mono- or multiple drug therapy. The previous economic data available have been based on the Canadian, US or Australian healthcare system.</p>		

Professor Gus Gazzard (UCL Institute of Ophthalmology and Moorfields Eye Hospital) led the Laser in Glaucoma and Ocular Hypertension Trial (LiGHT) [R1] through the UCL PRIMENT clinical trials unit. This pragmatic randomised controlled trial compared initial SLT followed by routine medical treatment with routine medical treatment only. A total of 718 treatment-naïve patients with OAG or OHT were recruited between 2012 and 2014 across 6 NHS sites. A further application for extension funding to the NIHR HTA was successful and the study extended follow-up by a further 3 years, concluding in late 2020.

The LiGHT study shows that patients newly diagnosed with glaucoma or OHT can be safely treated with SLT and achieve predominantly eyedrop-free IOP control over at least 3 years, with less intense treatment, fewer Adverse Events and a reduced need for glaucoma and cataract surgery, compared to patients treated with routine medical treatment only [R2, R3, R4]. This can be achieved at a lower cost per Quality Adjusted Life Year (QALY) than standard medical therapy alone and with a similar effect on generic health-related quality of life (as assessed by the EQ-5D-5L) [R2, R4], while better preserving vision [R5]. Primary SLT is a cost-effective, repeatable [R6] alternative to eyedrops that can be offered to patients with OAG or OHT who need IOP-lowering treatment.

### 3. References to the research

- [R1] Gazzard, G., Konstantakopoulou, E., Garway-Heath, D., Barton, K., Wormald, R., Morris, S., [...] & Bunce, C. (2018). Laser in glaucoma and ocular hypertension (LiGHT) trial. A multicentre, randomised controlled trial: design and methodology. *The British Journal of Ophthalmology*, 102, 593-598. doi:[10.1136/bjophthalmol-2017-310877](https://doi.org/10.1136/bjophthalmol-2017-310877)
- [R2] Gazzard, G., Konstantakopoulou, E., Garway-Heath, D., Garg, A., Vickerstaff, V., Hunter, R., [...] & Buszewicz, M. (2019). Selective laser trabeculoplasty versus drops for newly diagnosed ocular hypertension and glaucoma: the LiGHT RCT. *Health Technology Assessment*, 23(31), 1-102. doi:[10.3310/hta23310](https://doi.org/10.3310/hta23310)
- [R3] Garg, A., Vickerstaff, V., Nathwani, N., Garway-Heath, D., Konstantakopoulou, E., Ambler, G., [...] & LiGHT Trial Study Group. (2019). Primary selective laser trabeculoplasty for open angle glaucoma and ocular hypertension: clinical outcomes, predictors of success and safety from the Laser in Glaucoma and Ocular Hypertension (LiGHT) trial. *Ophthalmology*, 126(9), 1238-1248. doi:[10.1016/j.ophtha.2019.04.012](https://doi.org/10.1016/j.ophtha.2019.04.012)
- [R4] Gazzard, G., Konstantakopoulou, E., Garway-Heath, D., Garg, A., Vickerstaff, V., Hunter, R., [...] & LiGHT Trial Study Group. (2019). Selective laser trabeculoplasty versus eye drops for first-line treatment of ocular hypertension and glaucoma (LiGHT): a multicentre randomised controlled trial. *Lancet*, 393(10180), 1505-1516. doi:[10.1016/S0140-6736\(18\)32213-X](https://doi.org/10.1016/S0140-6736(18)32213-X)
- [R5] Wright, D. M., Konstantakopoulou, E., Montesano, G., Nathwani, N., Garg, A., Garway-Heath, D., Crabb, D. P., Gazzard, G., & LiGHT Study Group (2020). Visual field outcomes from the multicenter, randomised controlled Laser in Glaucoma and Ocular Hypertension trial. *Ophthalmology*, 127(10), 1313-1321. doi:[10.1016/j.ophtha.2020.03.029](https://doi.org/10.1016/j.ophtha.2020.03.029)
- [R6] Garg, A., Vickerstaff, V., Nathwani, N., Garway-Heath, D., Konstantakopoulou, E., Ambler, G., [...] & Gazzard, G. (2019). Efficacy of repeat selective laser trabeculoplasty in medication-naïve open angle glaucoma and ocular hypertension during the LiGHT trial. *Ophthalmology*, 127(4), 467-476. doi:[10.1016/j.ophtha.2019.10.023](https://doi.org/10.1016/j.ophtha.2019.10.023)

#### 4. Details of the impact

##### Influencing international guidelines on glaucoma treatment and clinical practice:

**UK:** Following the publication of a Health Technology Assessment (HTA) report using results from the LiGHT clinical trial, the National Institute for Health and Care Excellence (NICE) took the decision to review the trial's evidence on SLT treatment in glaucoma and OHT [S1, S2].

NICE did not find any clinical studies related to the clinical- and cost-effectiveness of SLT conclusive until the publication of the LiGHT trial results. A cost-effectiveness evaluation of SLT as a first-line treatment showed an improvement in QALY for a lower cost compared to pharmacological treatment, reporting that SLT is 97% likely to be cost-effective at a willingness to pay of GBP20,000 to GBP30,000 per QALY [S2]. NICE's exceptional surveillance report found that *'based on the effectiveness and cost-effectiveness findings from the study (...) patients newly diagnosed with OHT or COAG should be offered SLT as a first-line option'*. The report further concluded that *'there is an impact on the recommendations within the NICE guideline. For this reason, we will update it'* [S2]. Correspondence with NICE in December 2020 confirmed that the LiGHT-induced guideline change is scheduled for spring 2021, having been delayed by the extensive impact on the health service of COVID-19 [S3].

Evidence of LiGHT's impact on clinical practice can already be seen in the relevant Hospital Episode Statistics (HES) data for NHS hospitals in England: the number of laser trabeculoplasty (LT) appointments made rose by 29.6% in the year following publication of the trial (from 8246 to 10,978), compared to an average 15.7% annual rise over the five previous years [S4]. It is highly likely that the steady increase in LT procedures prior to publication can also in part be attributed to awareness among the ophthalmological profession of the results of the GBP1,700,000 NIHR-funded trial.

**Europe:** The 5<sup>th</sup> edition of the European Glaucoma Society's (EGS) Terminology and Guidelines for Glaucoma were published in December 2020. One of its 16 key questions and recommendations reads: *'Is selective laser trabeculoplasty (SLT) recommended as initial treatment?'* and the corresponding 'strong' recommendation that *'SLT can be offered as a first choice treatment for open angle glaucoma'*. The related commentary reads: *'One high quality trial showed that SLT is at least as effective as eye drops and SLT should be considered as an option for initial treatment in patients with mild or moderate open angle glaucoma or OHT (LiGHT trial)'* [S5]. The EGS guidelines are described by the Society as *'a handbook for providing glaucoma care around the world [...] translated into 12 languages, including Russian, Chinese, and Arabic'* [S6].

**US:** Published in November 2020, the American Academy of Ophthalmology's 'Preferred Practice Pattern' for Primary Open Angle Glaucoma (POAG) has also been revised considering the LiGHT trial and its implications for best clinical practice. It states that *'Laser trabeculoplasty may be used as initial or adjunctive therapy in patients with POAG'*, citing LiGHT as part of the relevant body of evidence and noting the trial's finding that *'Selective laser trabeculoplasty was associated with better cost-effectiveness than medical therapy over 3 years and resulted in similar IOP lowering and quality of life scores'* [S7]. The AAO Preferred Practice Patterns are revised on a 5-year schedule and constitute the primary authority determining US ophthalmological practice and associated insurance claims.

##### Reducing healthcare costs

Glaucoma monitoring and treatment take up a major proportion of hospital eye service outpatient appointments in the UK with more than a million glaucoma-related hospital eye service visits annually. The treatment of glaucoma alone incurs significant costs to both the NHS and patients. The most recent England-wide analysis of expenditure on problems of visions, a 2014 RNIB study, found that 8,300,000 glaucoma treatment related items were dispensed in the community in England costing GBP105,200,000. In addition, as of 2012 annual increases in the total number of items prescribed and their cost had been reported for more than a decade, in part a consequence of the ageing population, and due to this ongoing demographic shift this expenditure will have continued to grow in the years since [S8].

Use of SLT as the first-line treatment results in a significant reduction in the cost of surgery and medication for ocular hypertension and OAG. The overall cost saving to the NHS totals GBP451 per patient in specialist ophthalmology costs. For every patient given SLT first instead of eye drops, the funds saved are equivalent to the cost of five additional ophthalmology specialist appointments [R2]. Considering that there are approximately 1,200,000 people living with IOP or glaucoma in England alone [R5], the cost saving would be more than GBP524m. The increase in the number of SLT appointments following the publication of the trial (2,732 more year on year) represents savings of over GBP1,200,000 already achieved.

### Impact on patients

It is estimated that a third of patients prescribed eye drops for glaucoma stop collecting their prescriptions within the first year, often because of difficulty in using the drops [S9]. The problems with adherence are mitigated by offering SLT. A patient with glaucoma commented on the choice of treatment and its results: *'I was (...) pleased to be told I'd be having laser treatment, as taking daily drops would be a nuisance. (...) I didn't feel a thing, but straight afterwards my eye pressure had fallen from 28mmHg to 14mmHg — 'normal' is less than 22mmHg (...) I had no side-effects and was told to carry on as normal. (...) I so appreciate what's been done for me at Moorfields. I really hope it can help others with glaucoma as it has me'* [S10].

### 5. Sources to corroborate the impact

- [S1] Gazzard, G., Konstantakopoulou, E., Garway-Heath, D., Garg, A., Vickerstaff, V., Hunter, R., Ambler, G., Bunce, C., Wormald, R., Nathwani, N., Barton, K., Rubin, G., Morris, S. & Buszewicz, M. (2019). Selective laser trabeculoplasty versus drops for newly diagnosed ocular hypertension and glaucoma: the LiGHT RCT. *Health Technology Assessment* 23(31). [doi.org/10.3310/hta23310](https://doi.org/10.3310/hta23310)
- [S2] 2019 exceptional surveillance of glaucoma: diagnosis and management (NICE guideline NG81). NICE Surveillance Report. NICE. 12<sup>th</sup> September 2019. <https://www.nice.org.uk/guidance/ng81/resources/2019-exceptional-surveillance-of-glaucoma-diagnosis-and-management-nice-guideline-ng81-pdf-8944833593797>
- [S3] Email from NICE confirming delay to guidelines due to COVID
- [S4] NHS Hospital Event Statistics data, outpatient laser trabeculoplasty procedures 2009 - 2020
- [S5] European Glaucoma Society Terminology and Guidelines for Glaucoma, 5<sup>th</sup> Edition
- [S6] Online video: *A closer look at the European Glaucoma Society*. <https://www.eugs.org/eng/showpage.asp?id=3404>
- [S7] Gedde, S. J., Vinod, K., Wright, M. M., Muir, K. W., Lind, J. T., Chen, P. P., Li, T., Mansberger, S. L., & American Academy of Ophthalmology Preferred Practice Pattern Glaucoma Panel (2021). Primary open-angle glaucoma Preferred Practice Pattern®. *Ophthalmology*, 128(1), 71–150. [doi.org/10.1016/j.ophtha.2020.10.022](https://doi.org/10.1016/j.ophtha.2020.10.022)
- [S8] Slade J 'Eye health data summary - A review of published data in England' published in February 2014 (p7 and 37).
- [S9] Gray, T. A., Orton, L. C., Henson, D., Harper, R., & Waterman, H. (2009). Interventions for improving adherence to ocular hypotensive therapy. *The Cochrane database of systematic reviews*, 2, CD006132. [doi.org/10.1002/14651858.CD006132.pub2](https://doi.org/10.1002/14651858.CD006132.pub2)
- [S10] 'Me and my operation: Laser for glaucoma, a painless blast of light to stop you going blind'. Mail Online. 26<sup>th</sup> August 2019. <https://dailymail.com/health/38Szf8G>