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EVIDENCE REVIEW: Cataract Surgery

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INTRODUCTION

Cataracts are associated with old age and around one third of 65-74 year olds will develop an opacity in their lenses. According to a Cochrane review¹ cataract is a major cause of blindness (up to 80% of cases) and is responsible for other symptoms including glare and blurred vision. Over the last 10 years, day case surgery has become the norm and is thought to be equally effective and possibly cheaper than inpatient treatment.²

Although the majority of procedures are performed on a single eye, a substantial proportion of patients will receive treatment in both eyes. This is in keeping with national guidance which encourages this practice.^{3;4} An early randomised trial, published in the Lancet (1998) in 208 patients concluded that although second eye surgery produced no demonstrable benefits in visual acuity or contrast sensitivity, there were significant improvements in symptoms, visual function (especially stereo-acuity) and quality of life measures.⁵

This report is a review of the evidence regarding the effectiveness and cost effectiveness of cataract surgery. Whilst summarising the impact of surgery, it focuses on referral criteria and takes into account the place of visual acuity.

METHOD

Medline and Embase searches (from 2000 to present) were performed using key words including cataract, demand management, restrict/reduce, ration/rationalise and prioritisation/prioritization. Other data sources such as the Cochrane database, Scottish Intercollegiate Guidance Network (SIGN), National Institute for Health and Clinical Excellence (NICE) together with NHS Evidence and the South Central Priorities Unit's policies were also searched.

CURRENT PROCEDURE RATES

Guidance published by the NHS Executive in 2000³ suggested that cataract replacement procedures should rise to 3,200 operations per 100,000 per annum in those aged 65 years and older. This was recommended to "bring about real improvement to the lives of millions of elderly people."

This theme was developed by the Eyecare services steering group in 2004⁶ which stated that a 47% increase in procedures (since 1999) would be required to reach this target and recommended modification of the current treatment pathway to include referrals by optometrists.

IMPACT of SURGERY

Improvement in visual acuity has often been used to judge the outcome of surgery. Surveys have shown that in 1990, 9% of eyes had a pre-operative visual acuity of 6/12 or better. By 2009, this had risen to 43%.⁴ Thus with the large increase in procedures over the last 20 years, it would appear that eyes with better acuity are now being operated on. The potential for benefit, from a visual acuity point of view, therefore, is decreasing.

Postoperatively, a 2002 New Zealand study (488 eyes) found that almost 90% of patients obtained a visual acuity of 6/12 or better with 5% experiencing an intraoperative adverse event, and 1.5% a decreased visual acuity.⁷ However, the mean visual acuity was approximately 6/48 pre-operatively.

An editorial in the British Journal of Ophthalmology described another survey in Sweden which reported that 8% of patients were dissatisfied with the outcome of surgery, 7% reported no change and 9% reported increased difficulty at 6 months.⁸ The editorial raised the question whether overprovision of cataract surgery is now the case and warned of the dangers of operating on eyes that don't really need surgery.

A cohort of 861 patients from various treatment centres in the UK investigated whether the rise in procedures was accompanied by a rise in the number of inappropriate operations.⁹ The VF-14 (a visual function questionnaire) was used pre- and post-operatively. The authors calculated that 70% of patients experienced a slight improvement and 51% of patients experienced a much larger improvement. This could mean that the threshold for intervention has dropped.

Around 25% of questionnaire responses indicated that vision had either deteriorated or remained unchanged. Those patients experiencing poor overall health status *increased* by 5%.

Despite this, around 90% of respondents still rated the experience as a good one which led the authors to conclude that VF-14 is unsuitable as an indicator of appropriateness. The authors further concluded that there is still a need for an instrument to measure impact of cataract surgery on vision and quality of life. Based on this advice, the Department of Health have not included cataract as one of the areas in its Patient Reported Outcomes Measures (PROMS) programme.

Finally, there is some evidence that cataract removal is associated with a reduction in driving-related accidents. Using a computer model, an estimated 21% reduction in collisions and fatalities is thought to occur if surgery is completed sooner rather than later.¹⁰ In a real-life study in Australia, a retrospective comparison using 27,827 police reports (1997 to 2006) observed a 12.7% reduction in crashes following cataract surgery.¹¹ This is at a cost saving of around £18,000 per crash.

A major problem in measuring outcome is that there is no generally recognised instrument which combines impact on quality of life and vision. However, it is still apparent that there is wide satisfaction amongst patients.

COST EFFECTIVENESS

Estimating the cost per Quality -Adjusted Life – Year (QALY) is also problematical because of the lack of a standardised assessment tool. A number of QALYs have been calculated and are shown in table 3.

Table 3: Cost per QALY for cataract in a variety of contexts

Study group	Context	Cost per QALY	Year
239 women aged >= 70	2 nd eye only. UK study.	(a) £44,263 (1 year) (b) £17,299 (modelled over life time)	2010 ¹²
306 women aged >= 70	1 st eye. UK study Outcome was falls	(a) £35,704 (1 year) (b) £13,172 (modelled over lifetime)	2007 ¹³
250 patients with low predicted probability of improvement	1 st eye. US study. 6 months.	(a) £23,750 (overall) (b) £33,180 (very low probability of improvement)	2006 ¹⁴
219 patients.	1 st and 2 nd eye. Finnish study	(a) £4,345 (both eyes) (b) £6,959 (one eye)	2006 ¹⁵

The QALYs in table 3 range from £4,345 to £44,263 depending on context which included one or both eyes, outcome, potential for improvement and location. Data from table 3 suggest that in the short term, removal of cataract is not cost effective as the costs per QALY range from £35k to £44k ie above the £30k threshold (which is deemed cost-effective by NICE). When remodelled over the patient’s lifetime, these costs per QALY reduced by 50% which brings them below the “cost-effective” threshold.

From a pragmatic point of view, the best “real life” estimate of a QALY is provided by the Finnish study ¹⁵ which calculated the cost per QALY in a routine setting (for one eye) to be almost £7k.

However, the most recent cost utility study was conducted in the USA using previously published patient outcomes data. ¹⁶ The cost per QALY for unilateral surgery was calculated to be \$1,636 (about £1,000). This gave an extraordinary financial return on investment of over 4,000%. Operational costs were about one third less expensive than in the year 2000.

In conclusion, from a population perspective, cataract procedures are a cost effective and derive a high level of patient satisfaction.

REFERRAL CRITERIA

A 2010 study in Spain (4,043 patients) applied a retrospective priority score in 4 different regions and discovered significant differences between regions with no apparent correlation between allocation of surgery and benefit. ¹⁷ The authors called for explicit, standardised criteria to reduce unnecessary variation.

Two earlier studies attempted to identify what these criteria could be. The first, a panel of 11 ophthalmologists using a Delphi technique, agreed that pre- and anticipated post operative visual acuity with visual function should be key.¹⁸

The second study utilised three panels of patients, public and professionals (771 in total) who identified a list of selection criteria which included visual acuity, impact on daily activities, ability to work and whether the patient was a carer or being cared for themselves.¹⁹ The order of priority differed depending on which panel's score was being used.

One review concluded that cataract surgery unequivocally improves vision specific functioning and several aspects of vision specific quality of life.²⁰

Visual Acuity

The Royal College of Ophthalmologists' guidance⁴ recommends that visual acuity alone should not be used to gauge patient selection. Their referral criteria include:-

- The cataract should be responsible for visual symptoms,
- The cataract should affect lifestyle
- The patient should be provided with written information and the risks and benefits should be discussed
- The patient should still be willing to undergo surgery.

This information is echoed by the Clinical Knowledge System (Prodigy) database for GPs.²¹ One exception is in the area of diabetes where cataract extraction should not be delayed especially when sight-threatening retinopathy cannot be excluded.²²

Yamaguchi offered an explanation regarding how cataracts can impact on visual quality while still maintaining a reasonable acuity. He suggested that the microstructure of the lenticular opacities is variable causing a combination of different effects on the incident light rays which can be refracted, reflected, absorbed or scattered. Thus, in some cases, patients with good visual acuity may still complain of disturbances in vision quality.²³

Finally, a 2014 review of the quality of vision after cataract surgery concluded that outcomes generally yield highly satisfactory results.²⁴ The authors suggested that the way visual acuity is assessed should be changed and are currently developing a system which tests this in timed, real-life scenarios of daily life using an automated instrument.

The Royal College of Ophthalmologists released a statement in January 2013 categorically stating that visual acuity measurement is only one part of the assessment of visual performance as this does not take into account other elements which impact on patients' quality of life. The statement continues to say patients with cataract can experience other serious symptoms such as double vision or disabling glare from lights even though their visual acuity is relatively unaffected. This has a serious impact on quality of life and patients still require access to treatment.

Second Eye Surgery

The Royal College statement above also raises concerns about restriction of second eye surgery. The College's "cataract surgery guidelines (2010)" point to numerous benefits of this bilateral procedure.⁴ The only controversy relates to the timing of the second cataract removal i.e. immediately or sequentially. Further, a recent systematic review (2013)²⁵ found moderate evidence which supports improvement in visual depth perception, visual acuity, contrast sensitivity and self-reported visual functioning.

Prioritisation Tools

Substantial work in this area has been conducted in Spain,^{17;26;27} with other work in New Zealand²⁸ and Canada.²⁹ The Canadian study compared three different prioritisation scores which correlated with each other yet assigned different scores to the same scenario. A New Zealand study compared a cataract prioritization score (CSP) with a visual analogue scale and found great variation in the analogue scale.³⁰

Elsewhere, there is some evidence that prioritisation scores can reduce variation.³¹⁻³³ However, the general assertion remains that an improved assessment tool is required⁹ and there isn't an adequate tool for routine use in the NHS.⁴

CONCLUSIONS

1. Cataract procedures have significantly increased over the last decade probably as a result of Department of Health influence coupled with an increase in capacity.
2. It is clear that more "healthier" eyes (in terms of visual acuity) are now being operated on. From this perspective, therefore, the potential to benefit has decreased.
3. There is no adequate questionnaire or measurement tool which can be used to screen or measure the impact of surgery.
4. Visual acuity should not be the only criterion used for preoperative screening or to gauge potential impact of surgery.
5. Referral for cataract surgery should be based on symptomatic deterioration of vision e.g. difficulty reading, seeing TV, driving or visual disturbance e.g. glare/dazzle with bright sunlight or oncoming headlights. An example of a referral template for use by optometrists is given in appendix 1.
6. There is good evidence that bilateral cataract replacement is beneficial.

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APPENDIX:
Suggested template for cataract referral

Referrals for cataract should only be made in the following context:-

1) ASSESSMENT OF VISION AND QUALITY OF LIFE

Please gather the following information in the table below.

<u>Questions</u>	<u>Responses (✓)</u>		
	(a)	(b)	(c)
1. How well can patient see objects in the distance ?	without difficulty	with slight difficulty	with great difficulty
2. How well can patient read writing on the TV and/or road signs?	without difficulty	with slight difficulty	with great difficulty
3. How well can patient recognise people on the street ?	without difficulty	with slight difficulty	with great difficulty
4. How well can patient read from newspapers/books?	without difficulty	with slight difficulty	with great difficulty
5. How often does patient suffer from glare ?	Rarely/Never	Occasionally	Most of the time

Interpretation

- If answer to question 4 is b or c, this is often an indication of macular problems rather than cataract. If this is the only problem, referral for cataract surgery is inappropriate. However, referral for an opinion on maculopathy might be required.
- If answers to one or more of questions 1 to 3 are (c), this is probably cataract-related and referral may be appropriate.
- If glare is the ONLY problem (question 5), the referrer (after discussion with the patient) will need to make a judgement as to the potential impact of cataract removal before deciding whether surgery is appropriate.

2) FITNESS FOR SURGERY

Is the patient medically fit for surgery?

3) RISKS AND CONSENT

Has the potential to benefit been explained?

Have details of the procedure and risks been explained to patient?

Is patient still willing to proceed?

The referrer should be satisfied that the criteria outlined in (1) to (3) have all been met before referring.