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Effective Health Care

Bulletin for decision makers on the effectiveness of health service interventions

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Management of Cataract

- Cataract is an opacity in the lens of the eye which progressively reduces visual functioning.
- Cataract rates increase with age. Community studies indicate that there may be significant unmet need for treatment in older people.
- Decisions on need for surgery should be based on levels of visual functioning and quality of life, not just visual acuity.
- Cataract surgery is a highly effective and cost-effective procedure which leads to improved levels of visual acuity and/or functioning in 80% to 95% of patients.
- Surgery on a second affected eye results in significant benefit which may be nearly as great as from surgery on the first eye.
- About 20% of patients need laser treatment for opacification of the posterior capsule within 2 years of surgery. This should be taken into account by purchasers.
- Day case surgery is as effective as inpatient care, about 30% cheaper, and acceptable to patients. Around 80% of cataract operations could be done as day cases, almost four times the current UK average.

A. Background

Cataract is an opacity in the lens of the eye which progressively reduces visual functioning.

The lens of the normal eye is clear, and helps to focus light onto the back of the eye. Cataract is an opacity in the lens which can block or scatter light (Fig. 1). Vision may become blurred or cloudy, colours may be seen differently, and people may experience problems with glare from the sun or from lamps (e.g. during night driving).

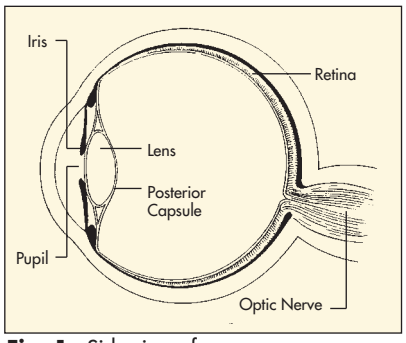

Fig. 1 Side view of eye

Most cataracts are age-related. The focus of this bulletin is age-related (or senile) cataract, defined as lens opacity in persons over 50 when causes other than age (genetic, congenital, metabolic, traumatic, or toxic) have been excluded.[1]

Once cataract has developed, the lens tends to become progressively more opaque. Studies have shown that at least 20% of cataracts get worse over the course of a year and 65% worsen over 5 years. Progression rates vary with the site of the opacity and the patient's age.[2-4] Most people with cataract, if left untreated, will eventually become severely visually disabled.

The aim of this bulletin is to summarise the evidence about the effectiveness of treatments and to highlight research results relevant to some of the key issues in the provision of health care for people with cataract.

B. Incidence and prevalence

Cataract rates increase with age and are higher in poorer areas. Estimates of need vary with the definitions used and should be based on measures of visual functioning and quality of life. Community studies suggest that there may be significant levels of unmet need for treatment in older people.

Incidence and prevalence rates of cataract are difficult to determine and the results of studies are hard to interpret because they are highly dependent on the quality of the data, definitions and types of measurement used, and the populations considered. For example, the degree of opacity used to define the existence of cataract, and loss of vision used to define impairment, will affect estimated rates.[5] Cataract can affect various aspects of vision; some people with visual impairment due to cataract have reasonable levels of acuity. Prevalence figures are also affected by current and past rates of cataract surgery. These factors should be taken into account when considering the figures in Table 1.

Between a fifth and a third of people aged 65 to 74 will develop some lens opacity over a five-year period.[2,6] The prevalence of decreased visual acuity (≤ 6/9) due to cataract in the US National Health and Nutrition Survey for people aged 45-74 was 14.7%.[7,8] The age and sex prevalence rates in predominately white middle class areas estimated from two large American population studies and a British GP based study[9-11] are shown in Table 1.

Higher rates have been recorded in poorer inner city areas.[12] A study of elderly people in inner London[13] indicated that a large proportion with marked visual impairment due to cataract had not been identified by the health service; they were subsequently referred. Similar findings were reported from other community based studies in London and the NW Region of England.[14,15] The primary health care team, therefore, has a key role in identifying unmet need.

There is a poor correlation between visual acuity and visual function.[16,17] To assess need it may be necessary to move away from an exclusive reliance on tests of eyesight (such as visual acuity) towards measures of visual functioning which take account of the effects on social functioning and quality of life as well as clinical examination. A population study of eye disease is underway in Bristol designed to produce estimates of disease rates and associated needs for health care services. This study is due to be completed in the next 2 years.

Table 1 Estimates of the prevalence of reduced visual acuity (≤6/9) due to cataract (%)

Age Band		Framingham[9]	Beaver Dam[10]	Melton Mowbray[11]
50 - 64	M	4.3	3.9	–
	F	4.7	10.0	–
65 - 74	M	16.0	14.3	–
	F	19.3	23.5	–
75 - 84	M	40.9	38.8	37.1
	F	48.9	45.9	43.8
85+	M	–	–	60.0
	F	–	–	66.2

C. Assessment

Cataract is easily identified in primary care. The decision to refer for specialist advice should not rely exclusively on measures of visual acuity, but should use an overall assessment of visual functioning. It is important to assess the degree of co-existing eye disease before the cataract is too advanced. There is

no evidence that tests of potential vision provide additional information about the likely outcome of surgery.

Cataract assessment includes verifying the presence of a cataract and assessment of the degree to which visual impairment and disability is caused by cataract. Simple physical examination of the eye is the most common method used to identify cataract. Different types of cataract are classified according to the area of the lens affected.[18] Visual acuity, glare disability and contrast sensitivity are three dimensions of visual function affected.[19,20]

The Snellen Visual Acuity test is most commonly used for the assessment of cataract and as an outcome measure for treatment. However, this test is not sensitive to problems of glare or reduced contrast sensitivity,[16,21] which may prove to be disabling even when visual acuity is near normal.[22,23] Various tests are available to assess glare disability[24,25] and contrast sensitivity.[26-32] These may be of some use when assessing patients reporting reduced visual functioning but no significant impairment of acuity; for example, a person who has acceptable visual acuity, but due to problems with glare, is unable to drive at night.

Ideally impairment in visual functioning should be measured.[16,33] Several questionnaires have recently been developed, such as the 20 point 'Activities of Daily Vision Scale',[34] the VF-14, a 14 item questionnaire addressing functional impairment potentially related to vision,[35] and the TyPE visual disability instrument which measures specific patient-assessed visual disability, generic patient-assessed health status, and clinical data.[17]

The VF-14 has been used extensively in observational studies in the USA to measure the effect of surgery and is being validated for use in the UK. The TyPE was developed and tested on a sample of 70 patients by Buckinghamshire Health Authority in England for use in routine practice.[17] Unfortunately, clinical decisions are often based upon tests of visual acuity and the degree to which everyday functioning is affected is rarely noted.[36]

Impairment of vision with symptoms similar to those associated with cataract can be due to eye problems which may co-exist with cataract and it is important to assess co-morbidity which might reduce the degree of improvement following cataract extraction.[37,38] This can be done using patient history and thorough ocular examination. As the cataract advances the fundus becomes more difficult to see. Therefore early detection and referral to an ophthalmologist may facilitate the assessment of retinal disease.

A number of tests of potential vision (such as electrophysiologic tests) are available to try to predict visual function after surgery, particularly when the severity of opacity makes it difficult to inspect the back of the eye to assess any co-existing eye disease. A systematic review published in 1993 concluded that there was no evidence that these tests contribute more information than that which could be derived from comprehensive history and ocular examination.[39]

D. Treatment

The quality of research on cataract surgery is generally poor. Cataract is treated by the extraction of the lens and insertion of an artificial lens, which is highly effective and cost-effective. Around 80% to 95% of patients have improved levels of visual acuity and functioning after surgery. The procedure is safe but about 20% of patients will need laser treatment within 2 years for opacification of the posterior capsule. Surgery on a second affected eye results in nearly as much benefit as surgery on the first eye.

D1. *Quality of the research* Very few randomised controlled trials (RCTs) have been carried out to evaluate the effectiveness of treatments for cataract. Most of the research in this area is based on case series which, because they do not use comparable control groups, may provide biased estimates of the impact of different treatment methods.[40] Whilst the value of cataract surgery is not in doubt (see D4), shifts in care such as changes from intracapsular to extracapsular surgery have been made on the basis of professional judgement and personal choice, not reliable evidence of effectiveness and cost-effectiveness. The authors of a recent review concluded that, 'The rigor of research methods in studies of cataract surgery can be improved if more attention is paid to fundamental principles of study design, data analysis and reporting.'[40]

D2. *Prevention and medical treatments* The causes of cataract are not clear. No medical treatments have been shown to be effective in prevention or treatment of cataract.[41,42] There have been a number of epidemiological studies exploring the potential protective effects of nutrients, but the results are inconclusive.[43-47]

D3. *Surgical treatment* Extraction of cataract is one of the most common elective surgical procedures. Surgical treatment involves removing the lens and replacing it with an artificial lens. Over the last

fifteen years there have been major changes in surgical technique. These have permitted improvements in visual function after surgery, which have increased the benefit of surgery at an earlier stage in the course of development of the cataract.[39,48]

Ninety five percent of operations in the UK use extracapsular cataract extraction (ECCE), which involves removal of the lens (nucleus and cortical material), leaving behind the posterior capsule (Fig 1).[37,49] Intracapsular surgery, where the entire lens is removed including the capsule, is generally thought no longer to have a role in routine surgery.[50]

In standard extracapsular surgery, the lens nucleus is removed intact and the remaining cortical material aspirated. Increasingly, however, phacoemulsification is used to break up the nucleus with ultrasound so that it can be removed through a thin cannula. This requires a smaller incision and fewer, if any, sutures. Phacoemulsification predominates in North America and a shift to its use is taking place in the UK.[37] It is generally believed to be more effective, but no completed RCTs directly comparing visual and health outcomes, complications or costs of these techniques were identified.[51,52] A RTC currently in progress at Moorfields and Oxford Eye Hospitals, and financed by the Medical Research Council, will provide comparative information on outcomes and costs of standard ECCE and phacoemulsification. This is due to be completed in 1997.

D4. *Surgical outcomes* The benefits of a health care intervention are most reliably evaluated by RCTs, which permit changes in outcomes to be more confidently attributed to the intervention. No RCTs comparing cataract surgery with no treatment or placebo have been identified. However, progression studies demonstrate that cataracts do not show spontaneous improvement.[2-4] Case series show dramatic improvements in visual outcomes of people who undergo cataract surgery and therefore offer reliable evidence of its effectiveness. However, RCTs are needed to make reliable comparisons of the effectiveness of alternative treatments or techniques and the rates of their more frequent complications.

A systematic review of cohort studies and case series published in English between 1975 and 1991 which looked at outcomes of cataract surgery was the basis for the US Agency for Health Care Policy and Research clinical practice guidelines (see Appendix).[40,51] This review considered 57 studies which reported changes in visual outcome in 17,390 eyes after cataract surgery.

These studies were pooled (weighting for sample size) to give overall estimates for the proportion of patients who had visual acuity of 20/40 (6/12) or better after surgery. 95.5% (95% CI:95.1% to 95.9%) of eyes with no co-existing eye disease (e.g. age-related macular degeneration or glaucoma) and 89.7% (95% CI:89.3% to 90.2%) of all eyes were found to achieve this level of visual acuity after surgery. No differences were found in the rate of improved vision between standard extracapsular cataract extraction and phacoemulsification. However, the results of the Medical Research Council RCT are needed before we can be certain about the equivalence of these techniques.

Similar visual acuity results were found in the report of the National Cataract Surgery survey in the UK[38] which reported that 80% of patients (90% of those with no co-existing eye disease) achieved a 6/12 (20/40) acuity. Studies measuring visual functioning have also shown that high proportions of patients report benefits.[17,53-55]

These studies demonstrate that co-existing eye disease is not necessarily a contra-indication for cataract surgery. However, because it influences the outcome, it is important to assess eye disease and discuss it with patients so that they have realistic expectations of the likely improvement after surgery.

Whilst the probability of benefit from surgery is high, the degree of improvement varies between people and a small percentage show no benefit or even some decline in visual outcomes. Studies have shown that patients with the greatest levels of visual impairment prior to surgery on average experience the largest benefit.[17,55]

Table 2 Proportion of eyes experiencing complications following cataract surgery and intraocular lens implantation (adapted from Powe, 1994)[51]

Complication	No. of studies	Total no. of eyes	Pooled complication rate. % of eyes (95% CI)
Major, early			
Endophthalmitis	16	30,656	0.13 (0.09-0.17)
Major, late			
Bullous keratopathy	27	15,951	0.3 (0.2-0.4)
Malposition/dislocation of intraocular lens	40	17,944	1.1 (0.9-1.2)
Clinical cystoid macular oedema	43	20,671	1.4 (1.2-1.6)
Angiographic cystoid macular oedema	9	4,236	3.5 (2.9-4.0)
Retinal detachment	42	33,603	0.7 (0.6-0.8)
Other, late			
Posterior capsule opacification	41	14,677	19.7 (19.1-20.3)

D5. *Complications* Although highly effective, cataract surgery is associated with some complications.[51,56,57] The only systematic review of this area is the one by Powe *et al.*[51] (see Appendix). 83 cohort or case studies reporting complications were considered, including 68,316 eyes receiving cataract surgery. Pooled complication rates (weighting for sample size and where appropriate by quality score) are shown in Table 2. An examination of the literature on Medline from 1991 to 1995 by *Effective Health Care* showed that more recent studies gave results consistent with the findings of this review.

The most common complication of cataract surgery is opacification of the posterior capsule, the part of the lens left behind after extracapsular extraction. The proportion of patients who experience this complication increases with length of follow-up, with 15-20% of eyes affected after two years.[39] A review of US Medicare beneficiaries revealed that 24% of 57,100 patients were treated for opacification within 3 years of cataract surgery.[58] This has implications for the cost of services and the way treatments are purchased.

Opacification of the posterior capsule can be quickly treated in an outpatient setting using Nd Yag (neodymium: yttrium-aluminium-garnet) laser. The Medicare study reported that laser treatment is associated with a nearly four-fold increase in the risk of a break or detachment of the retina.[58] Although the overall risk of a retinal detachment with laser treatment is low (0 to 4%)[39] and can be effectively treated, it should be discussed with patients considering cataract surgery.

There are a number of theories as to the causes of opacification of the posterior capsule and how surgical technique may affect incidence.[59] It may be that the laser technique and lower laser energy intensity used in Britain produce a lower rate of retinal detachment. This remains an issue for research.

D6. *Second eye surgery* The majority of people with cataract in one eye have or will develop cataract in their second eye.[60] This raises two questions: whether patients benefit from removal of the second cataract, and if so whether both should be removed in a single operative session.

The few relevant studies in this area strongly suggest that patients with cataract in both eyes (bilateral cataract) derive significant extra benefit by having both cataracts removed. A recent study by Javitt *et al.*[55] compared the outcomes in 426 patients having surgery in one eye with 164 having cataract surgery in two eyes. Whereas both groups showed improvement, those undergoing surgery in both eyes demonstrated significantly greater improvements in all three outcomes measured: a 61% greater improvement in VF-14 score, 27% more decline in trouble with vision, and 24% greater improvement in satisfaction with vision during the 12 month period of follow up. This study was not a randomised controlled trial but adjustment for patient characteristics and baseline differences in severity did not alter the results.

A recent unpublished English study of 194 patients undergoing first and then second eye surgery showed that all four dimensions of visual functioning (as measured by the Buckinghamshire TyPE instrument) showed significant improvement after operation on the second eye. This was close to the improvement found after the first cataract extraction.[61] A RCT comparing the benefits of second eye with single eye surgery is in progress in Bristol, UK.

It has been suggested that money could be saved by covering the costs of first eye surgery and not paying for second cataract extraction. However, the research shows that patients with both eyes affected experience greater improvement if both cataracts are extracted and significant functional problems can remain if only one is treated.[62-64]

Because cataract surgery carries a small risk of blindness and serious eye infection (endophthalmitis) it is generally recommended that both eyes are not treated simultaneously.[50]

D7. *Surgical rates* The rate of cataract surgery in England increases with age in line with prevalence (see Table 3). Data used to compare rates across areas have therefore been adjusted for age and sex.

The rate of cataract surgery financed by the National Health Service in England has been increasing over the last few years (Fig. 2). The national average rate for people over 45 in 1993/4 was 0.69% (SD 0.14) increasing to 1.4% for the over 65s (SD 0.3). Cataract surgery is also carried

Table 3 Rate of cataract surgery by age band in England 1993/4

Age Band	Rate (% of population)	
	Male	Female
45 - 54	0.08	0.07
55 - 64	0.27	0.28
65 - 74	0.78	0.89
75 - 84	1.77	2.18
85+	2.37	2.42

Source: HES data[65]

Fig. 2 Cataract extraction rates for adults 45 years and over in England 1989-1994 (age-sex adjusted)
Line represents national percentage, diamonds represent regions.

out in the private sector but no reliable national data are available.

There is considerable variation in the rate of cataract surgery between districts (Fig. 3). It is hard to interpret such aggregate variation without more information at an individual level. It is likely to be the result of a complex interplay of supply factors (e.g. numbers of ophthalmologists, thresholds for treatment, hospital beds and other facilities) and demand factors (e.g. prevalence, care seeking and GP referral behaviour).[55,66,67] A study in the Northern Region of England showed that there was considerable variation in the level of visual acuity impairment at which ophthalmologists decided to operate.[36]

E. Cost effectiveness of surgery

Because the benefits in terms of long term visual functioning are large and the cost of surgery relatively low, cataract surgery appears to be highly cost effective.

In 1987 Drummond estimated the cost utility of cataract surgery.[68] A total discounted cost of treatment and after care of £1,180 was used, and an assumption that the quality of life of people with advanced cataract was 0.6 (based on an estimate of 0.4 for people totally blind on a scale from 0 to 1) and 0.9 after surgery (i.e. an improvement of 0.3) for each of the following 10 years. The resulting cost per QALY was calculated to be around £500. The cost of the operation is now in the range of £500-£1,000 depending on whether it is done on an inpatient or day case basis.[69] Advances in microsurgical technique and the use of intraocular lenses have resulted in improved post-surgical levels of vision. Taking into account the cost of follow-up and treating complications, the current cost/QALY of cataract surgery in people with significant disability is likely to be in the order of £1,000-£1,500. This compares very favourably with other health care interventions.

Considerable caution should be exercised when interpreting and comparing estimates of cost utility.[70] However, the conclusion that cataract surgery is cost-effective appears robust.

F. Delivery of care: day case or inpatient?

Trials show that day case surgery is as effective as inpatient care. It is estimated that 30% of hospital costs can be saved by moving to day case surgery. Around 80% of patients are eligible for and do not object to day case surgery - almost four times the current national average rate.

In day case surgery, the patient is admitted, receives treatment and is discharged in a single day. A search for comparative studies

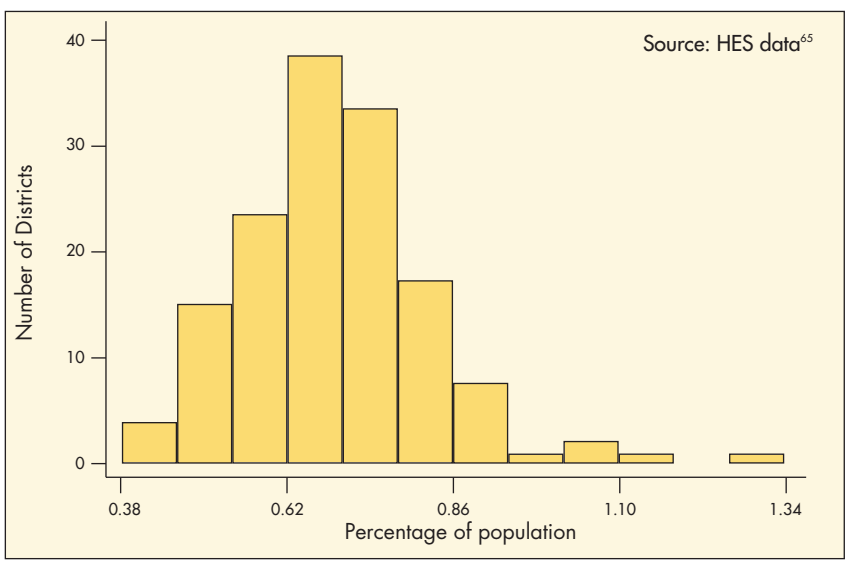

Fig. 3 Distribution of cataract extraction rates for adults 45 years and over by district in England 1993/94 (age-sex adjusted)

(see Appendix) identified four RCTs which directly compared day case with inpatient cataract surgery; none found any difference in outcome (see Table 4).[71-74] These results are supported by case series reports.[75-80]

In 1985 a regulation went into effect in the USA requiring that cataract removal funded by Medicare (over 65s) should, in general, be done in outpatient settings; fees were correspondingly reduced. Now around 80% of cataract extractions in the USA are carried out as day cases. The day case rate in England has increased over the last few years from under 5% in 1989/90 to over 20% in 1993/4 but it is below that in other European countries.[74] There is considerable variation in the day case rate across districts in England (Fig. 4).

Certain categories of patients, such as those who live a long way from the hospital, the chronically ill and those with psychiatric or social problems may not be suitable for day case surgery.[72,74] A recent study in England found that only 6.5% of 480 patients were not suitable and that another 11% preferred not to have day case surgery.[74] Surgical technique does not significantly influence the length of stay[76] and both day case and inpatient cataract procedures may be performed under local or general anaesthesia.[79]

Most people are very satisfied with day surgery in general and cataract surgery in particular[81] especially when recommended by their doctor.[73] However, some patients feel that they are rushed out too quickly or have problems caring for themselves after day surgery. Often people are unsure about aftercare and could benefit from more information.[82] More attention should be paid to giving patients good information before and after the operation.

The main potential advantages of day case surgery to purchasers and providers are economic - lower hospital unit costs due to shorter hours, fewer beds, reduced post-operative care and lower hotel costs, and the ability to treat more patients. The move towards day case surgery in the USA was associated with a 30% reduction in costs.[83,84] This corresponds to results from studies in the UK. One RCT reported that the mean hospital cost per patient of day case surgery was £222 compared to £366 for inpatient treatment[74] and a study of 4,000 routine operations in London found that the cost was 30% lower in day case surgery under local anaesthetic than inpatient care.[85]

The actual savings available will depend on the degree to which fixed or semi-fixed costs can be reduced, the use of spare capacity to treat patients on the waiting list at marginal cost, and the arrangements for day case surgery.[85] It should also be noted that these studies only consider direct hospital costs. Savings to

Table 4 Randomised controlled trials comparing inpatient with day case cataract surgery

Reference & location	Subjects	Procedure	Follow-up	Outcomes assessed	Results
Percival, 1992[74] Yorkshire England	n=200 DC n=100, IP n=100 Consecutive patients awaiting cataract surgery; relative or friend available to supervise convalescence and escort patient to and from hospital. Exclusions: ocular co-morbidity, local anaesthesia contra-indicated, general anaesthesia requested, ill-health which would interfere with procedure.	Local anaesthetic, ECCE with IOL. DC discharged 6 hours post-op. IP discharged first post-op morning.	1 month; 10-26 weeks after operation.	Visual acuity, complications	No significant differences in complication rates or visual outcomes. VA ≥ 6/9 at 1 month: 78% IP, 75% DC patients. VA ≥ 6/12 at final follow-up: 92% IP, 90% DC patients.
Lowe, 1992[73] Bristol England	n=442 DC n=200, IP n=242 Living within 8 miles of hospital, ≥ 55 years. Exclusions: previous intra-ocular procedure on same eye, ocular co-morbidity, listed for general anaesthesia, significant medical or psychiatric history.	Local anaesthetic, ECCE with IOL. 1st 2 post-operative mornings: DC visited at home by ophthalmic nurse, IP examined by surgeon. IP discharged 2nd post-operative day.	2 weeks, 8 weeks, 16 weeks.	Complications, patient satisfaction.	Serious complications: 1 endopthalmitis & 1 iris prolapse in each group. Post-operative patient satisfaction: 94% happy with day case allocation, 88% happy with inpatient. No significant differences between groups on any measure.
Galin, 1981[71] USA	n=250. Hospital n=82, hotel n=75, home n=93. Consecutive patients requiring cataract surgery. Exclusions (refusals) n=23	Local anaesthetic. Some had IOL. Non-hospitalised patients examined in clinic 7am 1st post-operative day.	2 years minimum Losses not described	Ocular results (not specified), complications, surgical re-intervention.	No significant differences in ocular results, no major complications in any group.
Ingram, 1980[72] Kettering England	n=138 1st eye randomly allocated to DC or IP, 2nd eye to alternative. Exclusions (n=71): 2nd eye surgery not indicated, chronic disease, private patient.	Local anaesthetic. DC discharged 3-6 hours post-op; IP discharged 2 days post-op.	3 months and 1 year, 4 patients lost to follow-up	Visual acuity. Complication rate. Patient satisfaction.	Visual acuity after 1 year: 79% of both DC and IP ≥ 6/12. Major complications in first year: DC 6 (4 IOP > 25mm Hg, 1 retinal detachment, 1 intraocular infection); IP 7 (3 IOP > 25 mm Hg, 2 retinal detachment, 1 intraocular infection, 1 expulsive haemorrhage). No significant differences between in-patient and day case. 30% of patients preferred inpatient care, 25% preferred day case, 45% no preference.

Key to abbreviations

DC	day case
ECCE	extracapsular cataract extraction
IOL	intra-ocular lens
IOP	intra-ocular pressure
IP	inpatient
VA	visual acuity

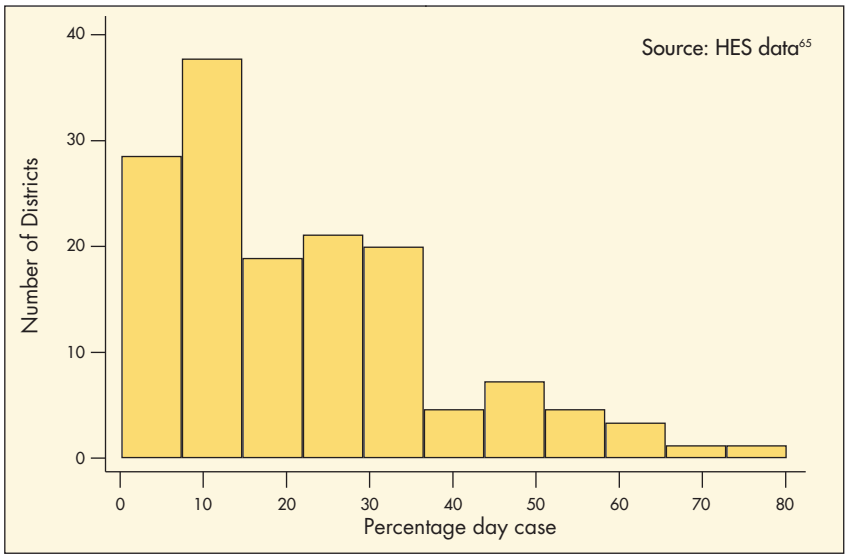

Fig. 4 Day case cataract extraction as a percentage of total by district in England 1993/94

the NHS from shifting to day case surgery are not cost free and involve some shift of burden in providing services to the community and in particular to informal carers.[86]

A number of reports have advocated an increase in day case surgery,[49,87] but these recommend rates of only 20%. There seems to be no objective reason why a much higher percentage (nearer 80%) of cataract surgery should not take place on a day case basis and the length of stay for inpatient procedures be reduced. However, professional resistance, structural obstacles and rigid management structures can hinder the implementation of cost-effective care. A recent report by Brogan and Pickard[88] describes some problems of trying to 'manage in' a shift to day case cataract surgery.

G. Anaesthesia

The preferred choice of anaesthetic technique has oscillated between general, local and topical over the years.[89] There is little high quality research comparing the effectiveness of alternatives. Because of the risks associated with general anaesthesia it is thought that properly managed local anaesthesia may be the preferred option, especially in people with significant cardiac or pulmonary problems.[39] However, a survey of consultant ophthalmologists in 1991 showed that only one fifth of ophthalmic surgeons used local anaesthetic 75% or more of the time.[90] The trend towards shorter operating time associated with phacoemulsification is leading to an increased use of topical anaesthesia.[91,92]

H. Post-operative care

There are a number of important but unresolved issues about the optimal care of patients after surgery. It is not clear how frequent or intensive the follow up should be, nor the degree to which it could be co-managed with optometrists and nurses in the community.[93-95] A study of co-managed care is being conducted by the University of Manchester.

There are also questions about the need for or frequency of post-operative eye drops and whether training people before their operation can reduce the need for district nurses to make home visits to instil eye drops for some patients.

I. Waiting lists

Waiting times for cataract surgery historically have been longer than for many less cost-effective treatments.[96] Several reasons have been suggested for large ophthalmic waiting lists, including a shortage of ophthalmology consultants, inadequate support services, inefficient use of existing resources[97] and the involvement of consultants in private practice.[98] There are considerable variations in waiting times across the country. However, because waiting times can be affected by several supply and demand factors, they have little meaning when considered in isolation and are not very useful as management tools.[99]

A number of waiting list initiatives have been developed in an attempt to reduce waiting times overall and in cataract surgery in particular, but they have not been properly evaluated in terms of their long term effect on waiting times and levels of unmet need in the community.

J. Policy recommendations

J1. Cataract surgery is highly cost-effective and purchasers should ensure that those with significantly reduced visual functioning due to cataract are offered surgery. The primary health care team and opticians have an important role in identifying people with unmet need and GPs should not wait until the cataract is 'ripe' before referral to a specialist.

J2. The proportion of cataract surgery carried out as day cases should be dramatically increased

possibly to around 80%. Purchasers may consider encouraging this change by funding most cataract surgery at the day case rate.

J3. Providers should ensure that good information is available to patients in order to promote informed choice.

J4. Purchasers should take into account the need for further treatment for common complications (in particular Nd Yag treatment for opacification of the posterior capsule) when contracting for cataract surgery in order to avoid counting these operations as separate episodes.

K. Research recommendations

K1. New surgical techniques and other interventions should only be introduced within the context of well designed RCTs in order to ensure they are well evaluated before general adoption. Research should use validated measures of visual functioning and not simply visual acuity as outcome measures.

K2. The cost-effectiveness of screening for cataract related visual disability in primary care to identify unmet need should be evaluated.

K3. The impact of sharing research-based information with patients on the decision to have an operation and the effects of surgery should be assessed.

K4. There is little research evidence to inform post surgical management including the optimal pattern and intensity of postoperative follow up, the role of nurses and optometrists in follow up and the need for eye drops.

K5. Methods for reducing the rate of complications following surgery need to be assessed.

Appendix

Methods of reviewing the literature

(I) Effectiveness of surgery and complication rates

The review of case studies and cohort studies by Powe *et al* [40,51] was based upon a broad computerised search of Medline database from 1975 to 1991 on the key words cataract; cataract extraction; lenses, intraocular; aphakia; cataract complications; cataract, intra-operative complications; and cataract, postoperative complications. This search was supplemented by examination of bibliographies of published and unpublished reviews of cataract surgery, and identified articles and in consultation with experts. Data from each study were extracted blind to the journal or author and were checked by another reviewer. Each included study was assigned a quality score based on methods used in the study. An assessment was made whether the results varied by the quality of the studies. This review was updated to 1995 for the bulletin.

(II) Day case versus inpatient surgery

A Medline search from 1974-1995 on the terms aphakia, post cataract; cataract, cataract extraction, lenses, intraocular, and comparative study limited to humans. All references with 'day case cataract surgery' or 'outpatient cataract surgery' in the title or text of the abstract were examined. Data were extracted from all studies comparing day case and inpatient care and data from RCTs included in a table for the bulletin.

References

1. Leske M, Sperduto R. The epidemiology of senile cataracts: a review. *Am J Epidemiol* 1983;118:152-165.
2. Italian-American Cataract Study Group. Incidence and progression of cortical, nuclear and posterior subcapsular cataracts. *Am J Ophthalmol* 1994; 118: 623-631.
3. Taylor H, Munoz B. The incidence and progression of lens opacities. *Aust N Z J Ophthalmol* 1991;19:353-356.
4. Magno BV, Datiles MB, Lasa S. Senile cataract progression studies using the Lens Opacities Classification system II. *Invest Ophthalmol Vis Sci* 1993;34:2138-2141.
5. West S, Taylor H. The detection and grading of cataract: an epidemiologic perspective. *Surv Ophthalmol* 1986;31: 175-184.
6. Podgor N, Leske M, Ederer F. Incidence estimates for lens changes, macular changes, open angle glaucoma, and diabetic retinopathy. *Am J Epidemiol* 1983;118:206-212.
7. Hiller R, Sperduto R, Ederer F. Epidemiologic associations with nuclear, cortical, and posterior subcapsular cataracts. *Am J Epidemiol* 1986;124:916-925.
8. Hiller R, Sperduto R, Ederer F. Epidemiologic associations with cataract in the 1971-1972 National Health and Nutrition Examination Survey. *Am J Epidemiol* 1983;118:239-249.
9. Kahn H, Leibowitz H, Ganley J, *et al*. The Framingham eye study: I Outline and major prevalence findings. *Am J Epidemiol* 1977;106:17-41.
10. Klein B, Klein R, Linton K. Prevalence of age-related lens opacities in a population. The Beaver Dam Eye Study. *Ophthalmology* 1992;99:546-552.
11. Gibson J, Rosenthal A, Lavery J. A study of the prevalence of eye disease in the elderly in an English community. *Trans Ophthalmol Soc UK* 1985;104:196-203.
12. Das B, Thompson J, Patel R, *et al*. The prevalence of eye disease in Leicester: A comparison of adults of Asian and European descent. *J R Soc Med* 1994;87: 219-222.
13. Wormald R, Wright L, Courtney P, *et al*. Visual problems in the elderly population and implications for services. *BMJ* 1992;304:1226-1229.
14. Little B, Aylward G, Gregson R, *et al*. Community ophthalmology pilot study. *Eye* 1993;7:180-183.
15. Harries U, Leventhal R, Poppy J. *Assessing the Health and Social Care Needs of Visually Disabled Older People*. Salford:

Public Health Research and Resource Centre, 1992.

16. Bernth-Petersen P. Visual functioning in cataract patients. Methods of measuring and results. *Acta Ophthalmol* 1981;59: 198-205.

17. Brogan C. Patient Assessed Cataract Outcome Pilot. (Part II MFPHM): Buckinghamshire Health Authority, 1994.

18. Sperduto R, Hiller R. The prevalence of nuclear, cortical, and posterior subcapsular lens opacities in a general population sample. *Ophthalmology* 1984;91:815-818.

19. Moseley M, Hill A. Contrast sensitivity testing in clinical practice. *Br J Ophthalmol* 1994;78:795-797.

20. Masket S. Reversal of glare disability after cataract surgery. *J Cataract Refract Surg* 1989;15:165-168.

21. McGraw P, Winn B, Whitaker D. Reliability of the Snellen chart. *BMJ* 1995;310:1481-1482.

22. Koch D. Glare and contrast sensitivity testing in cataract patients. *J Cataract Refract Surg* 1989;15:158-164.

23. Rubin G, Adamsons I, Stark W. Comparison of acuity, contrast sensitivity, and disability glare before and after cataract surgery. *Arch Ophthalmol* 1993;111:56-61.

24. Neumann A, McCarty G, Locke J, *et al.* Glare disability devices for cataractous eyes: a consumer's guide. *J Cataract Refract Surg* 1988;14:212-216.

25. Beckman C, Scott R, Garner L. Comparison of three methods of evaluating glare. *Acta Ophthalmol* 1992;70:53-59.

26. Williamson T, Strong N, Sparrow J, *et al.* Contrast sensitivity and glare in cataract using the Pelli-Robson chart. *Br J Ophthalmol* 1992;76:719-722.

27. Morris M, Klett Z, Gieser S, *et al.* Assessment of potential contrast sensitivity. Part I: Preoperative prediction of contrast sensitivity following intraocular lens implantation. *J Cataract Refract Surg* 1991;17:37-44.

28. Klett Z, Morris M, Gieser S, *et al.* Assessment of contrast sensitivity. Part II: The relationship between objective lens opacity and laser interferometric contrast sensitivity in the cataract patient. *J Cataract Refract Surg* 1991;17:45-57.

29. Elliott D, Hurst M, Weatherill J. Comparing clinical tests of visual function in cataract with the patient's perceived visual disability. *Eye* 1990;4:712-717.

30. Regan D, Giaschi D, Fresco B. Measurement of glare sensitivity in cataract patients using low-contrast letter charts. *Ophthalmic & Physiological Optics* 1993;13:115-123.

31. Regan D, Giaschi D, Fresco B. Measurement of glare susceptibility using low-contrast letter charts. *Optom Vis Sci* 1993;70:969-975.

32. Elliott D, Bullimore M. Assessing the reliability, discriminative ability, and validity of disability glare tests. *Invest Ophthalmol Vis Sci* 1993;34:108-119.

33. Neumann A, McCarty G, Steedle T, *et al.* The relationship between cataract type and glare disability as measured by the Miller-Nadler glare tester. *J Cataract Refract Surg* 1988;14:40-45.

34. Mangione C, Phillips R, Seddon J, *et al.* Development of the 'Activities of Daily Vision Scale'. A measure of visual functional status. *Med Care* 1992;30: 1111-1126.

35. Steinberg E, Tielsch J, Schein O, *et al.* The VF-14. An index of functional impairment in patients with cataract. *Arch Ophthalmol* 1994;112:630-638.

36. Mordue A, Parkin W, Baxter C, *et al.* Thresholds for treatment in cataract surgery. *J Public Health Med* 1994;16: 393-398.

37. Courtney P. The National Cataract Surgery Survey: I. Method and descriptive features. *Eye* 1992;6:487-492.

38. Desai P. The National Cataract Surgery Survey: II. Clinical outcomes. *Eye* 1993;7: 489-494.

39. Agency for Health Care Policy and Research. *Cataract in Adults: Management of Functional Impairment.* Rockville, MD: US Department of Health and Human Services, 1993.

40. Powe N, Tielsch J, Schein O, *et al.* Rigor of research methods in studies of the effectiveness and safety of cataract extraction with intraocular lens implantation. *Arch Ophthalmol* 1994;112: 228-238.

41. Harding J. Pharmacological treatment strategies in age-related cataracts. *Drugs & Aging* 1992;2:287-300.

42. Young S. The medical treatment of cataract. In: Douthwaite W, Hurst M, editors. *Cataract: Detection, Measurement and Management in Optometric Practice.* Oxford: Butterworth Heinemann, 1993:128-136.

43. Seddon J, Christen W, Manson J, *et al.* The use of vitamin supplements and the risk of cataract among US male physicians. *Am J Public Health* 1994;84:788-792.

44. Hankinson S, Stampfer M, Seddon J, *et al.* Nutrient intake and cataract extraction in women: a prospective study. *BMJ* 1992;305:335-339.

45. Mares-Perlman J, Klein B, Klein R, *et al.* Relation between lens opacities and vitamin and mineral supplement use. *Ophthalmology* 1994;101:315-325.

46. Sperduto R, Hu T, Milton R, *et al.* The Linxian cataract studies. Two nutrition intervention trials. *Arch Ophthalmol* 1993;111:1246-1253.

47. Sarma U, Brunner E, Evans J, *et al.* Nutrition and the epidemiology of cataract and age-related maculopathy. *Eur J Clin Nutr* 1994;48:1-8.

48. Batterbury M, Khaw P, Hands R, *et al.* The cataract explosion: the changing pattern of diagnoses of patients attending an ophthalmic outpatient department. *Eye* 1991;5:369-372.

49. Williams M, Frankel S, Nanchahal K, *et al. Cataract Surgery: Health Care Needs Assessment.* Bristol: Health Care Evaluation Unit, 1992.

50. The Royal College of Ophthalmologists. *Guidelines for Cataract Surgery.* London: The Royal College of Ophthalmologists, 1995.

51. Powe N, Schein O, Gieser S, *et al.* Synthesis of the literature on visual acuity and complications following cataract extraction with intraocular lens implantation. Cataract Patient Outcome Research Team. *Arch Ophthalmol* 1994;112:239-252.

52. Schein O, Steinberg E, Javitt J, *et al.* Variation in cataract surgery practice and clinical outcomes. *Ophthalmology* 1994;101:1142-1152.

53. Mangione C, Phillips R, Lawrence M, *et al.* Improved visual function and attenuation of declines in health-related quality of life after cataract extraction. *Arch Ophthalmol* 1994;112:1419-1425.

54. Brenner M, Curbow B, Javitt J, *et al.* Vision change and quality of life in the elderly. Response to cataract surgery and treatment of other chronic ocular conditions. *Arch Ophthalmol* 1993;111: 680-685.

55. Javitt J, Steinberg E, Sharkey P, *et al.* Cataract surgery in one eye or both: a billion dollar per year issue. *Ophthalmology* 1995;102:1583-1593.

56. Lee P, Kamberg C, Hilborne L, *et al. Cataract Surgery: A Literature Review and Rating of Appropriateness and Cruciality.* Santa Monica: RAND, 1993.

57. Masket S. Complications of cataract and intraocular lens surgery. *Curr Opin Ophthalmol* 1992;3:52-59.

58. Javitt J, Tielsch J, Canner J, *et al.* National outcomes of cataract extraction. Increased risk of retinal complications associated with Nd:YAG laser capsulotomy. *Ophthalmology* 1992;99:1487-1497.

59. Apple D, Solomon K, Tetz M, *et al.* Posterior capsule opacification. *Surv Ophthalmol* 1992;37:73-116.

60. Leibowtiz HM, Krueger D, Maunder L, *et al.* The Framingham eye study monograph. *Surv Ophthalmol* 1980;Supplement,:333-363.

61. Lawrence D, Brogan C, Benjamin L, *et al. The Effectiveness of Surgery: A Study of a New Patient-Assessed Cataract Outcomes Instrument:* Buckinghamshire Health Board, 1995.

62. Hillbourne JFH. Social and other aspects of adjustment to single eye cataract extraction in elderly patients. *Trans Ophthalmol Soc UK* 1975;95:254-259.

63. Laidlaw A, Harrad R. Can second eye cataract extraction be justified? *Eye* 1993;7:680-686.

64. Javitt J, Brenner M, Curbow B, *et al.* Outcomes of cataract surgery. Improvement in visual acuity and subjective visual function after surgery in the first, second, and both eyes. *Arch Ophthalmol* 1993;111:686-691.

65. Department of Health. Hospital Episode Statistics Data 1993-94. Unpublished data provided by the Department of Health

66. Escarce J. Would eliminating differences in physician practice style reduce geographic variations in cataract surgery rates? *Med Care* 1993;31:1106-1118.

67. Sanderson H. Regional variation in cataract extraction rates and their relationship with resource supply and need. *J R Soc Med* 1980;73:492-496.

68. Drummond M. Economic aspects of cataract. *Ophthalmology* 1988;95:1147-1153.

69. Jefferys E. *Shifting to Day Case Surgery: An Investigation of Cataract Extractions in North Yorkshire*. York: North Yorkshire Health Authority, 1995.

70. Mason J, Drummond M, Torrance G. Some guidelines on the use of cost-effectiveness league tables. *BMJ* 1993;306:570-572.

71. Galin M, Boniuk V, Obstbaum S, *et al.* Hospitalization and cataract surgery. *Ann Opthalmol* 1981;13:365-367.

72. Ingram RM, Banerjee D, Traynar M, *et al.* Day-case cataract surgery. *Trans R Opthalmol* UK 1980;100:205-209.

73. Lowe K, Gregory D, Jeffery R, *et al.* Suitability for day case cataract surgery. *Eye* 1992;6:506-509.

74. Percival S, Setty S. Prospective audit comparing ambulatory day surgery with inpatient surgery for treating cataracts. *Qual Health Care* 1992;1:38-42.

75. Vernon S, Cheng H. Comparison between the complications of cataract surgery following local anaesthesia with short stay and general anaesthesia with a five-day hospitalisation. *Br J Ophthalmol* 1985;69:360-363.

76. Schanzer M, Wilhelmus K. Outpatient cataract surgery by ophthalmology residents in a county hospital. *Ann Opthalmol* 1985;17:480-482.

77. Elsas T, Guldahl J, Blika S, *et al.* Outpatient anterior chamber lens implantation. *Acta Ophthalmol* 1988;66:214-216.

78. Holland G, Earl D, Wheeler N, *et al.* Results of inpatient and outpatient cataract surgery. A historical cohort comparison. *Ophthalmology* 1992;99:845-852.

79. Strong N, Wigmore W, Smithson S, *et al.* Daycase cataract surgery. *Br J Ophthalmol* 1991;75:731-733.

80. Javitt J, Street D, Tielsch J, *et al.* National outcomes of cataract extraction. Retinal detachment and endophthalmitis after outpatient cataract surgery. *Ophthalmology* 1994;101:100-105.

81. Davies B, Tyers A. Do patients like day case cataract surgery? *Br J Ophthalmol* 1992;76:262-263.

82. North Tyneside Community Health Council. *In for a Day*. North Tyneside: North Tynside General Hospital, 1995.

83. Bloom B, Krueger N. Cost and quality effects of outpatient cataract removal. *Inquiry* 1988;25:383-387.

84. Steinberg E, Javitt J, Sharkey P, *et al.* The content and cost of cataract surgery. *Arch Ophthalmol* 1993;111:1041-1049.

85. Aylward G, Larkin D, Cooling R. Audit of cost and clinical outcomes of cataract surgery. *Health Trends* 1993;25:126-129.

86. Ancona-Berk V, Chalmers T. An analysis of the costs of ambulatory and inpatient care. *Am J Public Health* 1986;76:1102-1104.

87. Audit Commission. *A Short Cut to Better Services: Day Surgery in England and Wales*. London:HSMO: Audit Commission for Local Authorities and the National Health Service in England and Wales., 1990.

88. Brogan C, Pickard D. *Implementing Day Case Cataract Surgery:* Buckinghamshire Health Authority, 1994.

89. Davis D, Mandel M. Anesthesia for cataract extraction. *Int Ophthalmol Clin* 1994;34:13-30.

90. Hodgkins P, Luff A, Morrell A, *et al.* Current practice of cataract extraction and anaesthesia. *Br J Ophthalmol* 1992;76:323-326.

91. Novak K, Koch D. Topical anesthesia for phacoemulsification: initial 20-case series with one month follow-up. *J Cataract Refract Surg* 1995;21:672-675.

92. Kershner R. Topical anesthesia for small incision self-sealing cataract surgery. A prospective evaluation of the first 100 patients. *J Cataract Refract Surg* 1993;19:290-292.

93. Revicki D, Brown R, Adler M. Patient outcomes with co-managed post-operative care after cataract surgery. *J Clin Epidemiol* 1993;46:5-15.

94. Steinberg E. Do optometrists see what ophthalmologists see when they look you in the eye? *J Clin Epidemiol* 1993;46:3-4.

95. Lichter P. Different providers and differing error rates in health care outcomes: cataract co-management at what price? *Ophthalmology* 1993;100:445-446.

96. Frankel S, West R. *Rationing and Rationality in the National Health Service: The Persistence of Waiting Lists*. Baskingstoke: Macmillan, 1993.

97. Drummond M, Yates J. Clearing the cataract backlog in a (not so) developing country. *Eye* 1991;5:481-486.

98. Yates J. *Private Eye, Heart and Hip: Surgical Consultants, the National Health Service and Private Medicine*. Edinburgh: Churchill Livingstone, 1995.

99. Sanderson H. What's in a waiting list? *BMJ* 1982;285:1368-1369.

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