Cataract Surgical Outcomes: A Five-Year Audit

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ABSTRACT

Aim: Cataract extraction with intraocular lens implantation is the most common elective procedure in Australia. In order to ensure best clinical practice, outcome results must be compared with nationally or internationally accepted benchmarks. The aim of this paper was to present the clinical outcomes audit for a five-year period from 2008 to 2012 and compare to these benchmarks.

Method: A random sample of 1,734 patients was selected over a five-year period. Preoperative, surgical and postoperative data was recorded, including best-corrected visual acuity (BCVA), refraction and the VF-14 visual function questionnaire.

Results: In 2012, the mean final BCVA was 6/7 (0.87 decimal, 95%CI 0.84 0.90) significantly increased from 6/15 preoperatively (0.41 decimal, 95%CI 0.39 0.43, $p<0.001$), with 97% achieving 6/12 (0.50 decimal) or better and 52% achieving 6/6 (1.0 decimal) or better, with no significant differences over the five-year period. The mean refractive prediction error varied from -0.03 to -0.13 dioptres (DS), with 89 to 94% achieving a refractive prediction error within ±1.00 DS and 64 to 75% within ±0.50 DS. The VF-14 visual function postoperative mean for 2012 was 84.90 (95%CI 82.25 87.54) significantly increased from 70.34 preoperatively (95%CI 67.89 72.79, $p<0.001$), similar over the five-year period.

Conclusions: The Monash Health clinical outcomes of both visual acuity and refraction were within recommended benchmarks. With increasing pressure on the public health system an efficient and cost-effective service with the highest level of care is essential. A continual auditing process assesses this care and ensures the maintenance of quality outcomes.

Keywords: cataract outcomes, cataract audit, refractive outcomes

INTRODUCTION

Cataract surgery with intraocular lens (IOL) insertion is the most common elective surgical procedure in Australia, with 229,693 hospitalisations for cataract extraction in 2013-2014 (8.9 per 1,000 population).[1] In the public hospital system there were 51,465 cataract admissions in 2008-2009, rising to 64,770 in 2012-2013, an average increase of 5.9% per year.[2] In the context of an increasing demand for this service, it is essential that public health institutions provide an effective and cost-efficient service. Though cataract surgery is now essentially a day-case procedure with minimal complications, blindness may still occur as a result of this procedure, which means that the benefits of this common procedure must still always be balanced against the risks.[3]

In order to ensure that quality of care is achieved and maintained, regular audits of surgical and clinical outcomes are required. Audits serve to ensure the achievement of surgical and clinical goals and the maintenance of quality outcomes, and are particularly useful in a public health system with major registrar training and so frequently changing staff. Complication rates, including endophthalmitis, posterior capsule rupture, anterior and posterior vitrectomy are generally measured and reported as quality indicators;[4-9] however it is the clinical outcomes that are of more interest and importance to the patient. Clinical outcomes that may be measured following cataract surgery include visual acuity (VA) and refraction; or more subjectively, patient-reported visual function outcomes such as the VF-14 Index questionnaire. The VF-14 scale is an index of functional impairment in patients with cataract and has been shown to correlate better with patients' perceived trouble with vision and satisfaction following surgery than the measurement of VA.[10]

In order to ensure best clinical practice, to judge the quality of service provided and to promote learning and quality improvement, outcome results must be compared with nationally or internationally accepted gold-standard benchmarks. These benchmarks are established by the comparison of large sample audit reports. However, in

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order for meaningful comparison, they must be seen in the context of the population assessed. Many of the published reports are sourced from National Health Service (NHS) data or from the European Registry of Quality Outcomes for Cataract and Refractive Surgery (EUREQUO) and do not have restriction criteria on the reported samples.[5,7,9,11,12] These samples include patients with ocular comorbidities, complex cases, surgical complications, surgery performed by both experienced surgeons and those in training. A smaller number of reports present data from restricted samples, excluding those with comorbidity, complications; or include only those operated by consultants, or from independent hospitals.[8,13]

The aim of this paper was to present the audit results for a five-year period from 2008 to 2012 in comparison to established international benchmarks.

METHOD

Participants and Procedure

Patients treated at the Monash Health Cranbourne Day Surgery are referred either directly to the surgery list by Monash Health consultants, or to the preadmission clinic by community ophthalmologists and optometrists. The preadmission clinic provides a 'one-stop' visit, with visual acuity and biometry measurements performed by orthoptists, followed by ophthalmic assessment and consent, then nurse-led pre-anaesthetic triage. Surgery is performed as a day-case procedure by either a consultant or registrar. The postoperative clinical pathway consists of a one-week postoperative visit, where those requiring second eye surgery are consented and returned to the waiting list; and the majority are discharged to their referring clinician for their final four-week assessment. A small number who may have some complication are booked to return for further review.

Subjective visual function is measured using the VF-14 index of functional visual impairment, which consists of 12 questions designed to identify a broad spectrum of vision-dependent everyday activities, and two further questions on driving, graded by level of difficulty. An average score is calculated for the 12 questions, with the highest possible score of 100.[10] Preoperative best corrected visual acuity (BCVA) is measured in the clinic for all those patients referred from the community, or by the consultant for those referred direct to the list.

Random samples of all cataract surgery patients were selected from the date-ordered theatre list each year from 2008 to 2012, using the random ordering function in Microsoft Excel 2010. The total number of cataract operations in this time period was 8,989, with a total sample size of 1,734 (19%). The project was approved as a Quality Improvement activity by the Monash Health HREC (Project No. RES-16-00000443Q).

All preoperative, surgical and one-week postoperative clinical data was retrieved via the Scanned Medical Record (SMR) system. Final postoperative VF-14 visual function information was obtained from the sample patients. Visual acuity and refractive outcomes were obtained from their referring clinicians, ophthalmologists and optometrists, which meant that there was no standardised measure of VA, so all were converted to decimal notation for comparison.

Data analysis

The data was entered into a Microsoft Excel spreadsheet, and analysis performed using Microsoft Excel 2010 and the statistical program IBM SPSS Statistics Version 20.0. For analysis of differences in age, BCVA, VF-14, spherical equivalent refraction, refractive prediction error and absolute prediction error between the groups over the five-year period, one-way analysis of variance (ANOVA) was used, after homogeneity of variance was tested with Levene's test. Post hoc analysis was performed using Tukey HSD test. The Wilcoxon Signed Ranks test was used for paired comparisons between preoperative and postoperative scores. A p value of <0.05 was considered to be statistically significant. As can be seen in Table 1, postoperative data was not available for every patient, as either the clinician or the patient did not return the request for information.

RESULTS

Of the 1,734 patients in the sample, 1,040 (60%) were female and 58% presented for first eye surgery. Of the total sample, 1,236 (71%) attended the preadmission clinic, with the remaining 29% referred direct to the surgery list by hospital consultants.

The preoperative and postoperative measurements of BCVA and VF-14, and the age range of those in the sample are presented in Table 1. The proportion of patients in the different age groups combined across the five-year period is presented in Figure 1. No significant difference was found over the five-year period for mean age or VF-14. Analysis

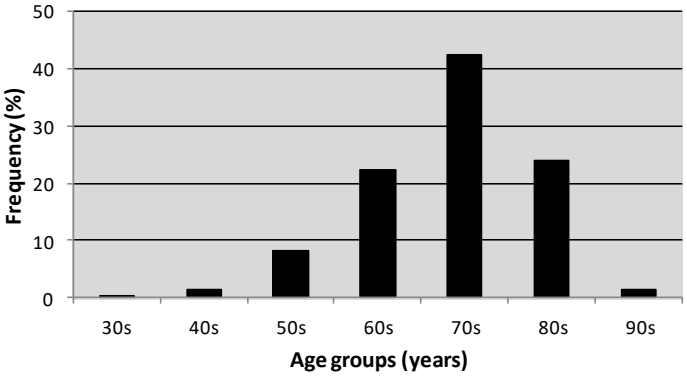

Figure 1. Age groups of the total sample.

Table 1. Preoperative and postoperative patient characteristics, five-year comparison							
		2008	**2009**	**2010**	**2011**	**2012**	**P**
Age (years)	N	343	334	353	349	355	
	Mean	73.5	73.0	72.6	72.5	72.4	0.510
	(95% CI)	(72.6, 74.5)	(72.0, 74.0)	(71.5, 73.6)	(71.5, 73.5)	(71.4, 73.5)	
	Range	41 - 94	35 - 90	36 - 96	33 - 98	42 - 97	
Preoperative BCVA operated eye (decimal)	N	333	328	342	343	353	
	Mean	0.36	0.38	0.39	0.40	0.41	0.016*
	(95% CI)	(0.34, 0.38)	(0.36, 0.40)	(0.37, 0.41)	(0.38, 0.42)	(0.39, 0.43)	
	Range	0.001 - 1.00	0.001 - 1.00	0.001 - 1.00	0.001 - 1.00	0.001 - 1.00	
Final BCVA operated eye (decimal)	N	265	274	250	239	248	
	Mean	0.88	0.86	0.83	0.90	0.87	0.019*
	(95% CI)	(0.85, 0.90)	(0.83, 0.89)	(0.80, 0.86)	(0.87, 0.93)	(0.84, 0.90)	
	Range	0.05 - 1.50	0.05 - 1.33	0.001 - 1.50	0.01 - 1.50	0.17 - 1.50	
Preoperative VF-14	N	294	280	269	285	312	
	Mean	74.19	72.57	70.25	69.56	70.34	0.061
	(95% CI)	(71.75, 76.62)	(70.03, 75.11)	(67.71, 72.79)	(66.81, 72.31)	(67.89, 72.79)	
	Range	16.67 - 100	5.00 - 100	9.09 - 100	0.00 - 100	4.17 - 100	
Preoperative VF-14	N	220	207	173	187	190	
	Mean	89.02	87.51	86.16	86.11	84.90	0.19
	(95% CI)	(86.81, 91.22)	(85.00, 90.02)	(83.47, 88.86)	(83.29, 88.93)	(82.25, 87.54)	
	Range	18.75 - 100	20.00 - 100	25.00 - 100	9.09 - 100	25.00 - 100	

ANOVA *Significance at <0.05
Post-hoc: Preop BCVA operated eye *Significance between 2008 and 2012 (Tukey HSD, Mean Difference = -0.466, p <0.05)
Post-hoc: Final BCVA *Significance between 2010 and 2011 (Tukey HSD, Mean Difference = -0.707, p <0.02)

Table 2a. Preoperative BCVA levels, five-year comparison					
Percentage achieved	**2008 N = 333**	**2009 N = 328**	**2010 N = 342**	**2011 N = 343**	**2012 N = 353**
VA 0.50 decimal (6/12) or better	28.8	33.2	26.3	41.5	42.5

Table 2b. Final postoperative BCVA outcomes levels, five-year comparison					
Percentage achieved	**2008 N = 265 (77% of sample)**	**2009 N = 274 (82% of sample)**	**2010 N = 250 (71% of sample)**	**2011 N = 239 (69% of sample)**	**2012 N = 248 (70% of sample)**
VA 0.50 decimal (6/12) or better	95.8	93.8	93.6	96.6	96.8
VA 0.67 decimal (6/9) or better	86.0	85.0	86.8	89.5	88.7
VA 1.0 decimal (6/6) or better	54.3	52.2	44.4	56.5	52.4

showed a statistically significant increase in preoperative BCVA between 2008 and 2012, representing an increase from Snellen equivalent 6/16.7 to 6/14.6; and a similar significant difference in postoperative BCVA from 6/7.2 in 2010 to 6/6.7 in 2011 (see Table 1 for statistical analysis).

In 2012, the mean preoperative BCVA of the designated surgical eye was Snellen equivalent 6/14.6 (0.41 decimal, 95%CI 0.39 0.43) which showed a significant improvement to a mean postoperative BCVA of 6/6.9 (0.87 decimal, 95%CI 0.84 0.90, p<0.001), with a similar result in previous years (Table 1). The proportion of patients achieving each line of the Snellen chart preoperatively and postoperatively over the five-year period is presented in Figures 2 and 3, illustrating the mean BCVA shift after surgery. Tables 2a and 2b present the proportion of eyes achieving a BCVA of 6/12, 6/9 and 6/6 over the five-year period, preoperatively and postoperatively respectively. The preoperative BCVA was 6/12 or better in only 29% in 2008, with an increase over the five-year period to 43% in 2012. The final BCVA was 6/12 or better in 94 to 97%, and 6/6 or better in 44 to 57% (Table 2b).

Figure 4 presents the final BCVA achieved in relation to the age of the patient, showing a decline in final BCVA with increasing age. Table 3 presents the proportion of those

Table 3. Final BCVA outcome compared to preoperative, five-year comparison					
Percentage achieved	**2008**	**2009**	**2010**	**2011**	**2012**
Both pre-and post-operative best VA known	75	81	69	67	70
VA improved	94.2	94.4	93.9	94.8	93.1
VA remained the same	3.9	4.1	2.0	3.0	4.4
VA decreased	1.9	1.5	4.1	2.2	2.4

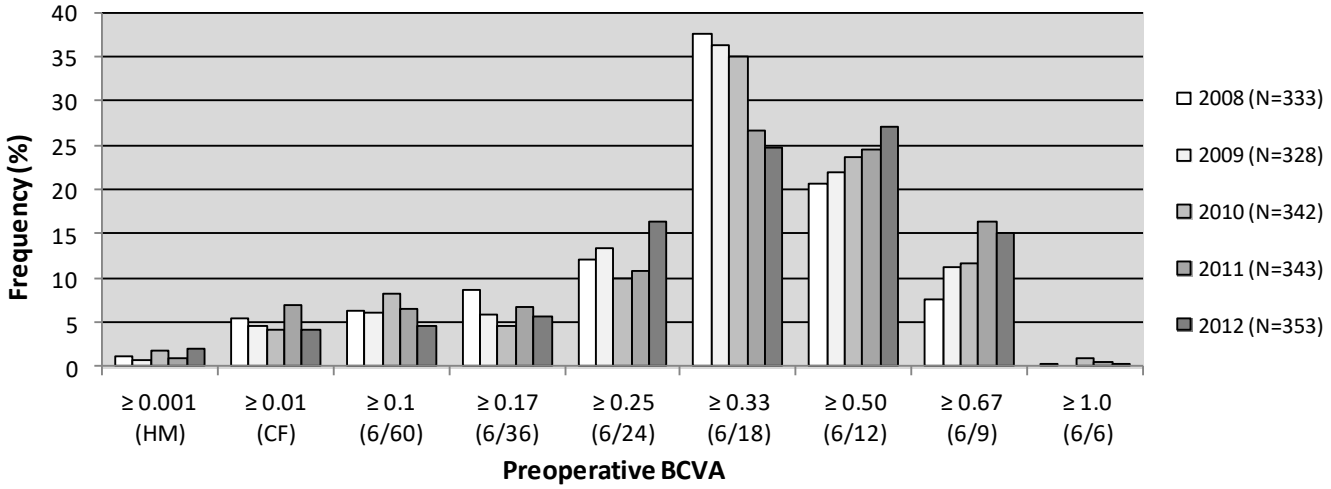

Figure 2. Preoperative BCVA in designated surgical eye, five-year comparison.

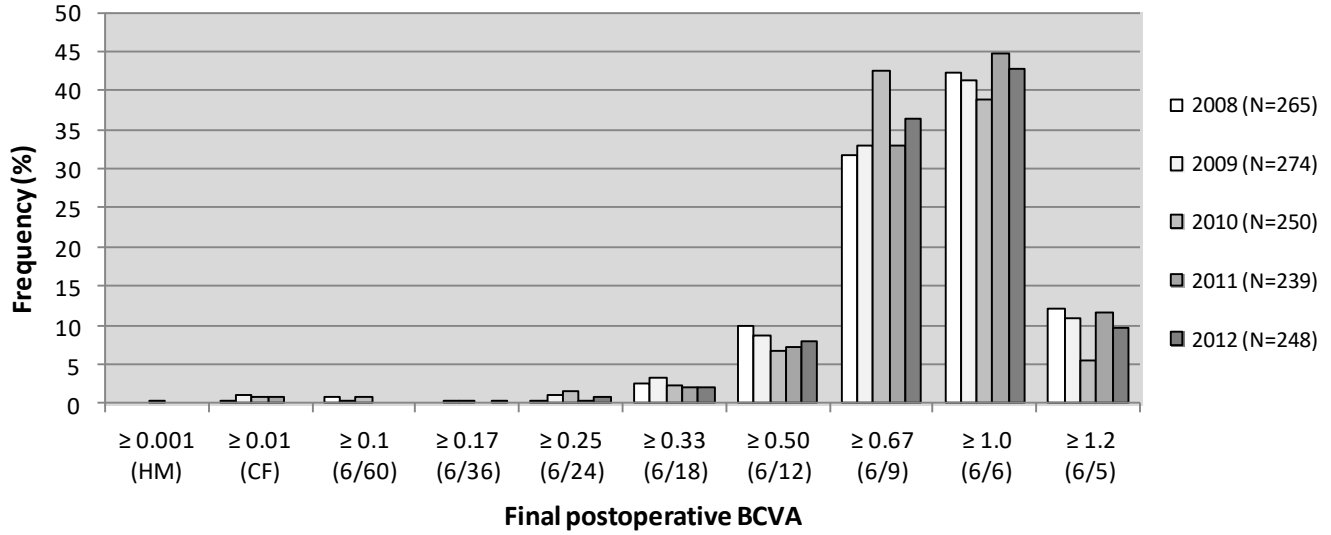

Figure 3. Final postoperative BCVA, five-year comparison.

Table 4. Refractive outcomes, five-year comparison							
		2008	**2009**	**2010**	**2011**	**2012**	**P**
Spherical equivalent refractive outcome (DS)	N Mean (95% CI) Range within ±0.50DS within ±1.0DS	263 -0.27 (-0.34, -0.20) -2.00 - +1.75 71.5% 88.2%	252 -0.24 (-0.31, -0.16) +3.50 - +1.13 76.6% 93.3%	244 -0.26 (-0.34, -0.18) -2.50 - +2.00 65.6% 90.6%	240 -0.28 (-0.36, -0.21) -3.50 - +1.00 68.8% 91.7%	244 -0.27 (-0.33, -0.20) -2.50 - +1.50 73.4% 91.9%	0.936
Refractive prediction error (DS)	N Mean (95% CI) Range	255 -0.08 (-0.16, -0.01) -2.07 - +1.82	251 -0.03 (-0.10, +0.04) -3.08 - +1.53	242 -0.08 (-0.15, -0.00) -2.47 - +2.20	240 -0.12 (-0.18, -0.05) -1.79 - +1.18	244 -0.13 (-0.19, -0.06) -2.09 - +1.70	0.357
Absolute prediction error (DS)	N Mean (95% CI) Range	255 0.46 (0.41, 0.51) 0.01 - 2.07	251 0.40 (0.35, 0.45) 0.00 - 3.08	242 0.46 (0.40, 0.51) 0.00 - 2.47	240 0.41 (0.37, 0.45) 0.00 - 1.79	244 0.38 (0.34, 0.43) 0.00 - 2.09	0.079

ANOVA

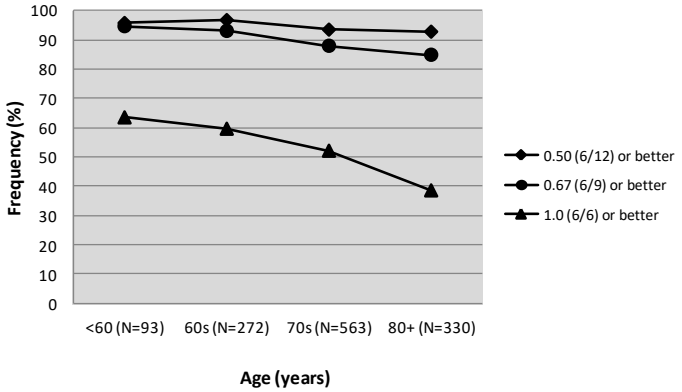

Figure 4. Final BCVA by age group, 2008 to 2012 (N = 1,258).

who did not show an improvement in BCVA postoperatively.

The final refraction information was known for 1,243 eyes, 72% of the original sample. The mean spherical equivalent outcome refraction in 2012 was -0.27 dioptres (DS), ranging from -2.50 to +1.50DS, similar each year over the five-year period (Table 4). Mean refractive prediction error varied from -0.03 to -0.13DS, and mean absolute prediction error from 0.38 to 0.46DS (Table 4). Figure 5 presents the range of refractive prediction error, known for 1,232 patients, over the five-year period, with no statistically significant change over this time (Table 4). The cumulative percentage of refraction prediction error within ±0.5 to ±3.5DS over the five-year period is presented in Table 5.

In 2012, the mean preoperative VF-14 of the designated surgical eye was 70.34 (95%CI 67.89 72.79), improving to a mean of 84.90 postoperatively (95%CI 82.25 87.54, $p<0.001$), with no significant difference across the five-year period (Table 1). The ranges of preoperative and postoperative VF-14 scores are presented in Figure 6. The preoperative and postoperative responses to the individual VF-14 questions are presented in Table 6. Table 7 presents the comparison of preoperative and postoperative scores, demonstrating the proportion of those who did not show an improvement in VF-14 postoperatively.

DISCUSSION

The female predominance of 60% was similar to other studies which ranged from 53 to 68%.[5,7-9,12-19] The mean age of 72.4 to 73.5 years was also similar to other studies,

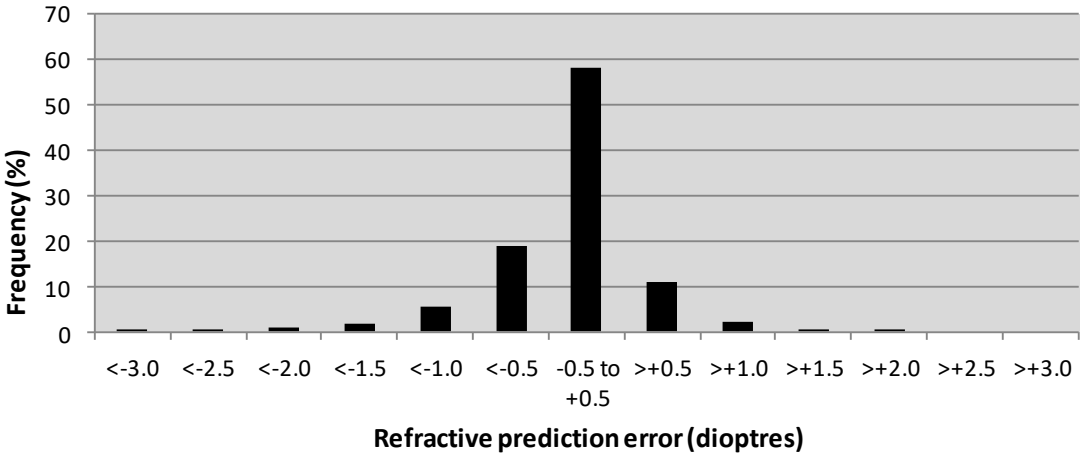

Figure 5. Five-year refractive prediction error (N = 1,232).

Table 5. Cumulative percentage of prediction error outcomes, five-year comparison

Percentage achieved	2008 N = 255 (74% of sample)	2009 N = 251 (75% of sample)	2010 N = 242 (69% of sample)	2011 N = 240 (69% of sample)	2012 N = 244 (69% of sample)
Within ±0.50DS	68.2	71.7	64.1	71.3	74.6
Within ±1.0DS	89.4	92.8	92.2	91.7	93.5
Within ±1.5DS	96.4	97.2	96.8	99.6	98.0
Within ±2.0DS	99.6	99.6	98.4	100	99.6
Within ±2.5DS	100	99.6	100		100
Within ±3.0DS		99.6			
Within ±3.5DS		100			

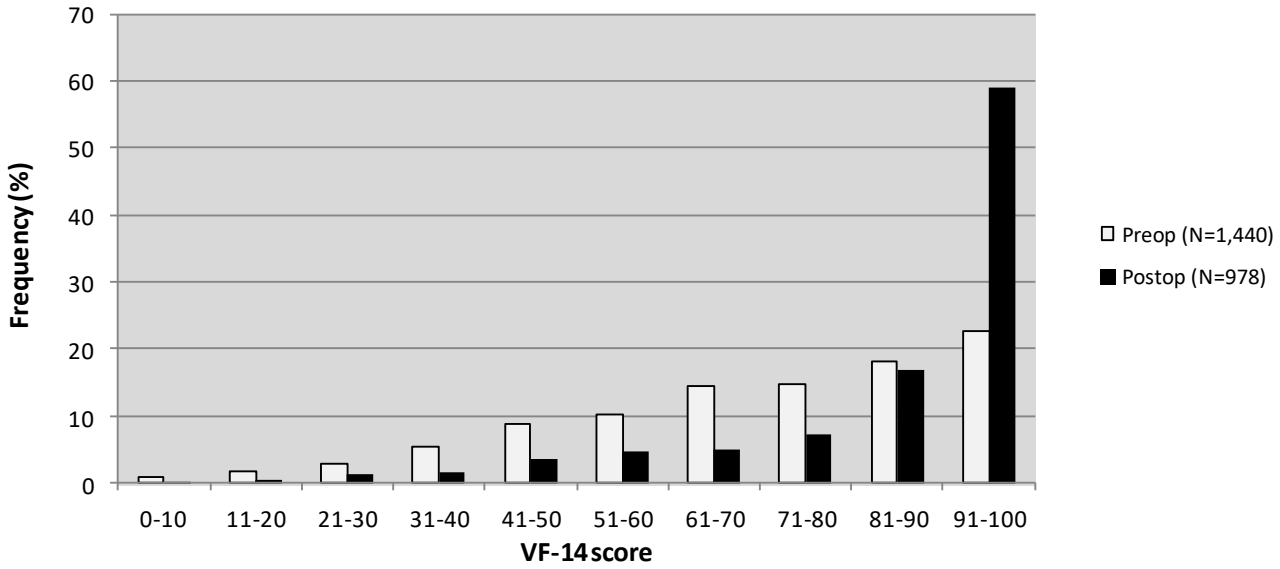

Figure 6. Five-year comparison of preoperative and postoperative VF-14 scores.

Table 6. VF-14 visual function, five-year comparison of preoperative and postoperative scores

VF-14 question	Preoperative 'At least mod difficulty' N = 1,447 (%)	Postoperative 'At least mod difficulty' N = 999 (%)
1. Reading small print such as labels …	59	28
2. Reading newspaper or book	53	24
3. Reading large print …	28	12
4. Recognising people …	16	8
5. Seeing steps, curbs …	23	11
6. Reading traffic, street and shop signs	31	12
7. Doing fine handiwork …	51	22
8. Writing cheques, filling forms …	37	15
9. Playing games …	29	14
10. Sports …	35	13
11. Cooking, self-care	18	11
12. Watching television	30	12

Table 7. Final VF-14 outcome compared to preoperative VF-14, five-year comparison

Percentage achieved	2008	2009	2010	2011	2012
Both pre- and post-operative VF-14 known	57	52	39	44	48
VF-14 improved	76	77	75	73	73
VF-14 remained the same	10	4	6	9	5
VF-14 decreased	14	19	19	18	22

which ranged from 72 to 76 years,[5,8,12,14,16-20] with 43% of patients in their 70s. The 58% of first-eye operations was similar to the 58 and 59% reported elsewhere.[5,7]

Visual acuity

The mean BCVA showed a small significant change over the five-year period and demonstrated a trend towards operations performed at milder levels of visual impairment, as the VA of the operated eye was 6/12 or better in 29% in 2008, with a steady increase over the five-year period to 43% in 2012 (Figure 2 and Table 2a). Such a trend to earlier surgery was also reported in the UK National Cataract Survey, with 45% of operated eyes having VA of 6/12 or better in 2003, compared with only 27 to 31% in 1997.[5,12] In other studies preoperative levels of vision have reported a very wide range, with the proportion having VA 6/12 or better varying from 17 to 47%.[5,7,9,12,15,17,18,21] Historically, less than 9% had VA of 6/12 or better in 1990,[5] prior to the now common procedures of phacoemulsification, foldable IOLs and small-incision surgery. It must be noted that there was no standardised method of measuring VA as these results were obtained from clinical records and converted to decimal notation from a Snellen fraction. This results in an imperfect statistical analysis in comparison to LogMAR VA which with logarithmic scaling allows equal steps between

lines and standardisation of results.[22]

Over five years, the mean BCVA increased from between 6/14.6 and 6/16.7 initially, to between 6/6.7 and 6/7.2 after cataract surgery. The final BCVA was 6/12 or better in 94 to 97%, 6/9 or better in 85 to 90%, and 6/6 or better in 44 to 57% of patients. These outcomes are similar to previous reports where final BCVA of at least 6/12 was reported in 83% to 98%.[5,7,9,13,18-21,23,24] The proportion of patients with BCVA of at least 6/9 compared favourably with previous reports of 73 to 90%;[23-26] and those with BCVA of 6/6 or better also compared well to 46% reported by Jaycock et al.[5]

When comparing visual acuity outcomes, it is important to consider the reported inclusion or exclusion criteria. It is interesting to note that the proportion of eyes with ocular comorbidity achieving VA of 6/12 or better has been reported as 75 to 80%,[5,20,23] in comparison to those without pre-existing ocular comorbidity and/or surgical complications, where 92 to 97% achieved 6/12.[5,7,18,20,21,23] The sample from our study included all patients receiving surgery; those with pre-existing ocular pathology such as age-related macular degeneration, diabetic retinopathy, glaucoma and previous trauma; those with surgical complications including posterior capsule rupture, anterior vitrectomy, zonular dehiscence and extracapsular cataract extraction; and postoperative complications such as cystoid macular oedema.

Lundstrom et al recommended a benchmark of 97% gaining VA 6/12 or better, including all patients in their study, in comparison to Hahn et al who suggested 98.5% but had a very restricted sample of only uncomplicated surgery from experienced surgeons and those with no comorbidity.[7,13] In our study, of the patients who were known not to achieve 6/12, the vast majority had significant pre-existing retinal or corneal pathology.

In an analysis of final BCVA in relation to patient age, Jaycock et al reported a rapid decline in the proportion of eyes achieving 6/6 from the age of 65 years, whereas a similar decline was not evident with BCVA of 6/12 until 80 years.[5] Our patients show a similar pattern, with the drop in VA only minimal at the 6/12 level, reducing from 97% of those less than 60 years to 93% of those in their 80s; but markedly different for those achieving 6/6, reducing from 63% of those less than 60 years to only 38% of those 80 years and older. Clinically, these results are important as this makes the prognosis for VA outcome quite different for those over 80 years of age and may be reflected in the mean value if the sample reported is from an older demographic.

It is interesting to note that there are a small number of patients who do not improve after surgery, being either worse (1.5 to 4%) or unchanged (2 to 4%) This is within the levels reported by others of 1.7 to 4.8% worse postoperatively,[5,15,18,21] and 5 to 11% unchanged,[5,15] usually due to pre-existing disease.

Refraction

Over the five-year period the spherical equivalent refractive outcome was within ±1.00DS for 88 to 93%, and within ±0.50DS for 66 to 77% of patients. Final refractive outcome has been reported within ±1.00DS in 74[27] and 82%[16] and within ±0.50DS in 44%.[27]

Calculation of the prediction error, the difference between the predicted and the actual outcome refraction showed a mean error of -0.03 to -0.13DS, ranging from -3.08 to +2.20DS. This wide range is similar to other studies, with the 99% range previously reported as -3.98 to +2.92DS[21] or within ±4.00DS.[9] The prediction error of our sample was within ±1.00DS for 89 to 94%, and within ±0.50DS for 64 to 75%. Other studies have reported between 79 and 97% within ±1.00DS[7-9,11,13,20,24] and between 49 and 80% within ±0.50DS.[8,9,11,13,24]

Absolute Error is the amount of refractive prediction error irrespective of the direction. Mean absolute error (MAE) reduced from 0.48 to 0.36DS over the five years, however this was not a statistically significant change. Improvements in MAE over time have been reported from 0.77DS in 1995 to 0.67DS in 2000,[20] and from 0.63DS in 2003 to 0.55DS in 2006,[11] with the European Registry reporting MAE of 0.55DS for 2009 to 2011.[7]

The refractive outcomes at Monash Health from 2008 to 2012, measured by both absolute refractive prediction error and proportion of patients within ±0.50DS and ±1.00DS, demonstrate stable outcomes. This may reflect the procedural changes made in 2006 to improve reliability and consistency of measurements; including the introduction of partial coherence laser interferometry biometry and the performance of all biometry scans by the one orthoptist. Previously biometry had been performed by a varying number of consultants and registrars. The introduction of a more consistent methodology, including measurement of both eyes and the measurement of the glasses, also improves the reliability of the results, assisting with confirmation of results and the detection of outliers.

Benchmark standards are recommended by various studies, however the inclusion criteria and outcome measures vary between studies. On review of the literature, looking at refractive outcomes over the time period from 2001 to 2009, it can be seen that prediction error has improved, with one study reporting three cycles from 2003 to 2006, with those within ±1.00DS increasing from 80 to 87% and within ±0.50DS from 49 to 60%.[11] Gale et al (2009) recommend setting the benchmarks of refractive prediction error at 85% within ±1.00DS and 55% within ±0.50DS, though it must be noted that their sample included only uncomplicated surgery, with 'in the bag' lenses and final BCVA of 6/12 or better. Hahn et al in 2011 recommend a higher benchmark of 80% within ±0.50DS; though do suggest that this is derived from a sample excluding any

ocular comorbidity, using experienced consultant surgeons and only including those with uncomplicated surgery and a postoperative BCVA of 6/7.5 or better; and propose these figures as a contribution to the discussion of how valid benchmarks should be derived.[13] Lundstrom et al (2012) are more in line with Gale et al, recommending an outcome refraction of 87% within ±1.00DS, including all postoperative results.[7] One further measure, mean absolute error of 0.6DS, is recommended as a benchmark outcome.[7]

There are several sources of error which may affect the refractive outcome, including the preoperative measurements, surgical procedures and resultant lens position. The major sources have been reported as: prediction of the effective lens position (35% contribution to error), postoperative refraction measurement (27%), axial length measurement (17%), and pupil size and its effect on spherical aberration (8%).[28] Effective lens position can be affected by customisation of the A-constant, IOL haptic design, the surgical incision, capsulotomy size and many other unmeasurable variables. Other variables may include astigmatism, optical aberrations, alignment of the visual axis, and surgically-induced corneal changes. One study suggested that cataract density affected refractive outcome by errors in axial length measurement due to changes in the refractive index of the lens.[29] With our model of care, the patients are returned to their referring clinician for the four-week assessment, which means the results are obtained from a large number of clinicians, with no standardisation of outcome measures. Of interest in this context is the added factor described by Norrby that the refractive outcome measure itself has such variability that it contributes significantly to the total error,[28] which would further complicate the outcome result in our series.

Visual function, VF-14

Over the five-year period the mean preoperative VF-14 visual function score varied from 69.56 to 74.19, slightly less than the mean values reported by others of 75.1 to 79.4.[10,14,16,30,31] Of the entire sample, 41% had a preoperative VF-14 score greater than 80, including 23% with a score greater than 90. A trend towards a lower VF-14 threshold has been reported with visual function scores of greater than 90 in more than 30% of patients.[14,31]

The mean postoperative VF-14 visual function score over the five-year period varied from 84.90 to 89.02, slightly less than the mean values reported by others which ranged from 88 to 93.[14,16,31-33] There was a statistically significant improvement from the mean preoperative score, with 76% reporting a postoperative score greater than 80, an increase from 41% preoperatively. Similar to the BCVA outcomes, 73 to 77% reported an increase in their VF-14 score, with others either decreased or remaining the same. These results are similar to other studies which reported between 23 and 28% of patients with no change or a decreased score,[14,16,31] or 16% who reported no improvement with Catquest, another visual function questionnaire.[20]

It can be seen in Table 6 that the tasks presenting most difficulty for the patients were 'reading small print such as labels …', 'reading the newspaper or book' and 'doing fine handiwork …', with 59%, 53% and 51% reporting at least 'moderate difficulty', respectively. Postoperatively these were reduced to only 28%, 24% and 22% respectively. The tasks associated with fine near vision have been reported as the most troublesome preoperatively, with the highest correlation postoperatively between the change in these abilities and satisfaction after surgery.[14,16,30]

CONCLUSION

The outcomes achieved of BCVA of 94 to 97% 6/12 or better, 44 to 57% 6/6 or better and refractive prediction error of 89 to 94% within ±1.00DS and 64 to 75% within ±0.50DS are within the recommended benchmarks. The Monash Health cohort of patients included all those who received surgery; those with systemic and ocular comorbidities, complicated surgery and both trainee registrar and consultant surgeons.

Though the mean of each measurement improved and the majority gained a good level of function, it must be noted that there was still a small number of patients who decreased on either of these measurements, as has been reported by others, with the most frequent reason being the existence of ocular comorbidity in the operated eye.[5,7,14-16,18,20,31,33] This emphasises the importance of a patient's understanding of a guarded prognosis when making the decision to have cataract surgery.

Best clinical practice involves a comparison of outcomes to established benchmark standards. Continual monitoring of clinical, administrative and surgical processes is required to maintain the highest level of patient care and efficiency. The more recent introduction of electronic medical records will assist in the easier collection of data, making ongoing evaluation, learning and quality improvement a much easier and more time-responsive process. As the population ages, there will be an ever-increasing need for cataract surgery, and so an efficient provision of this service will become increasingly important. The Monash Health model of care, promoting cataract management as day-case surgery integrated with community-based referral and follow-up management, continues to provide a resource-efficient model.

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