



**Alberta Heritage Foundation
for Medical Research**

Uncomplicated Senile Cataract Surgeries in Alberta

Christa Harstall

December 2001

IP-9 Information Paper

ACKNOWLEDGEMENTS

The Alberta Heritage Foundation for Medical Research is grateful to the following person(s) for information and comments on the draft paper. The views expressed in the final paper are those of the Foundation.

Dr. Ken Romanchuk, Saskatoon City Hospital, Saskatoon

Dr. Ian MacDonald, University of Alberta, Edmonton

Dr. Lorne Bellan, Misericordia Health Centre, Winnipeg

The interpretations and conclusions contained herein are those of the researcher and do not represent the views of the Government of Alberta. The views expressed in the final paper are those of the Foundation. Special thanks to Ms. Claire Belanger, Alberta Health and Wellness, Edmonton for carrying out the data extraction and analyses.

Additional information and comments relative to the information paper are welcome and should be sent to:

Director, Health Technology Assessment
Alberta Heritage Foundation for Medical Research
1500, 10104 – 103 Avenue
Edmonton
Alberta T5J 4A7
CANADA

Tel: 780-423-5727, Fax: 780-429-3509

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FOREWORD

One of the leading causes of visual impairment in North America is cataracts ¹. Cataracts have been identified in about 50% of persons between 65 and 74 years of age, and in about 70% of those over the age of 75 years ². Cataract surgery with implantation of an intraocular lens (IOL) is a successful intervention for the treatment of uncomplicated senile cataract.

In 1998/99, 16,013 cataract surgeries on 12,443 persons were paid to Alberta ophthalmologists, making it the most common surgical procedure performed in Alberta ³. Interest in uncomplicated, senile cataract surgery with IOL implantation came about as a result of an enquiry by the Consumers' Association of Canada (Alberta Chapter) and the Alberta Health Ministry about the safety and effectiveness of the newer foldable IOLs. A comprehensive, systematic assessment of the scientific research to address this inquiry was completed and published June 1999 ⁴.

There are three main types of IOLs in terms of the materials used for optics: poly methylmethacrylate (PMMA) (rigid), silicone (foldable), and acrylic (foldable). In Canada, PMMA IOLs have been used since the early 1970's, silicone IOLs for approximately ten years, and the first hydrogel (a form of acrylic) IOLs received pre-market clearance about three years ago. The decision on what type of lens to use is usually based on surgeon preference and training ⁵. Surveys indicate a trend to increasing use of foldable IOLs ⁶.

This report provides some statistics for a select Alberta population on cataract surgery rates and potential complications two years following the initial surgery. Descriptive rates are presented for cataract surgeries performed in Alberta between April 1994 to March 1998 on seniors without pre-existing ocular co-morbidities (using a crude definition). Four cohorts are described by the four fiscal years of the initial cataract surgery. The 1994/95 and 1995/96 cohorts were followed for selected complications over a 2 year period following the initial cataract surgery.

One of the main limitations of this study is that the selected population and their activity could only be crudely defined in the data source. Furthermore, the use of aggregated, anonymous data prevented the identification of individuals for appropriate follow up assessments.

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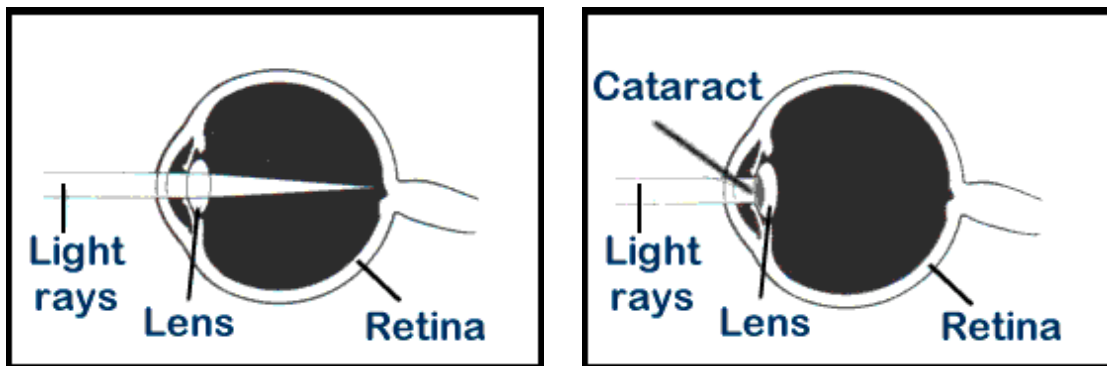
METHODOLOGY

High level aggregate, administrative data were used in a population-based study of Albertans and the payments made on their behalf for cataracts and eye related services. For time and cost measures, no primary data collection such as chart reviews or surveys were conducted, although that would have been the ideal. This was an exploratory attempt to use 'readily accessible' administrative data to provide context for a previous assessment ⁴.

Data were extracted from payments to Alberta physicians by the Alberta Health Care Insurance Plan (AHCIP). Appendix A outlines the assumptions and limitations for extracting and aggregating data. The health service codes and ICD-9 diagnostic codes are listed in Appendix B. Data include services provided in both public hospitals and in non-hospital surgical facilities.

CATARACT SURGERY AND INTRAOCULAR LENSES

A cataract is an opacity or cloudy area in the lens that can block or scatter light. Once a cataract has developed it grows larger over time and clouds more of the lens, eventually causing severe visual impairment. The etiology of cataract formation is not fully understood but most cataracts are age related ². As yet there are no medical treatments available to prevent the formation and progression of a cataract in a healthy adult eye ^{2, 7, 8}. Cataract surgery is considered in an otherwise healthy eye when the medical, optical and environmental measures are no longer adequate for the individual's visual requirements ^{7, 8}.



(<http://www.eyesite.ca>, 2000 – used with permission)

Cataract surgery involves the opening of the front of the lens capsule, removing the natural lens from the eye, and either inserting an artificial lens (intraocular lens), or the patient has to resort to wearing contact lenses, or wearing cataract glasses. A 1994

meta-analysis concluded that cataract surgery yielded excellent visual acuity results (20/40 or better) in about 95% of eyes without pre-existing ocular co-morbidity ⁷⁻⁹.

GENERAL FINDINGS

Persons included in the study represent about 2% percent of the Alberta population aged 65 years and over (Table 1) and about 50% of all persons regardless of age receiving any cataract surgery (Table 2). The rates of cataract surgery per 1,000 population by age group (Chart 1) and by gender (Chart 2) have decreased between 1994/95 and 1997/98. Older age groups show higher rates of cataract surgeries than younger age groups, for both males and females. The rate per 1,000 persons for those 75 years of age and older is about 3.6 times higher than the rate for persons 65 to 69 years of age. The rates of cataract surgeries for females are higher than that for males over all time periods. The rate per 1,000 females is approximately 1.6 times greater than the rate for males.

Although these trends are similar to those noted in the literature, the Alberta rates are lower. According to the literature, cataracts are found to be visually significant in 14% of men and 24% of women aged 65 to 74 years and in 30% of men and 46% of women aged 75 years and older ^{7, 10}. Based on our study population, these reported rates seem to be significantly higher.

Table 1: Number of persons and rate per 1,000 receiving cataract surgery for uncomplicated senile cataract by fiscal year of initial surgery

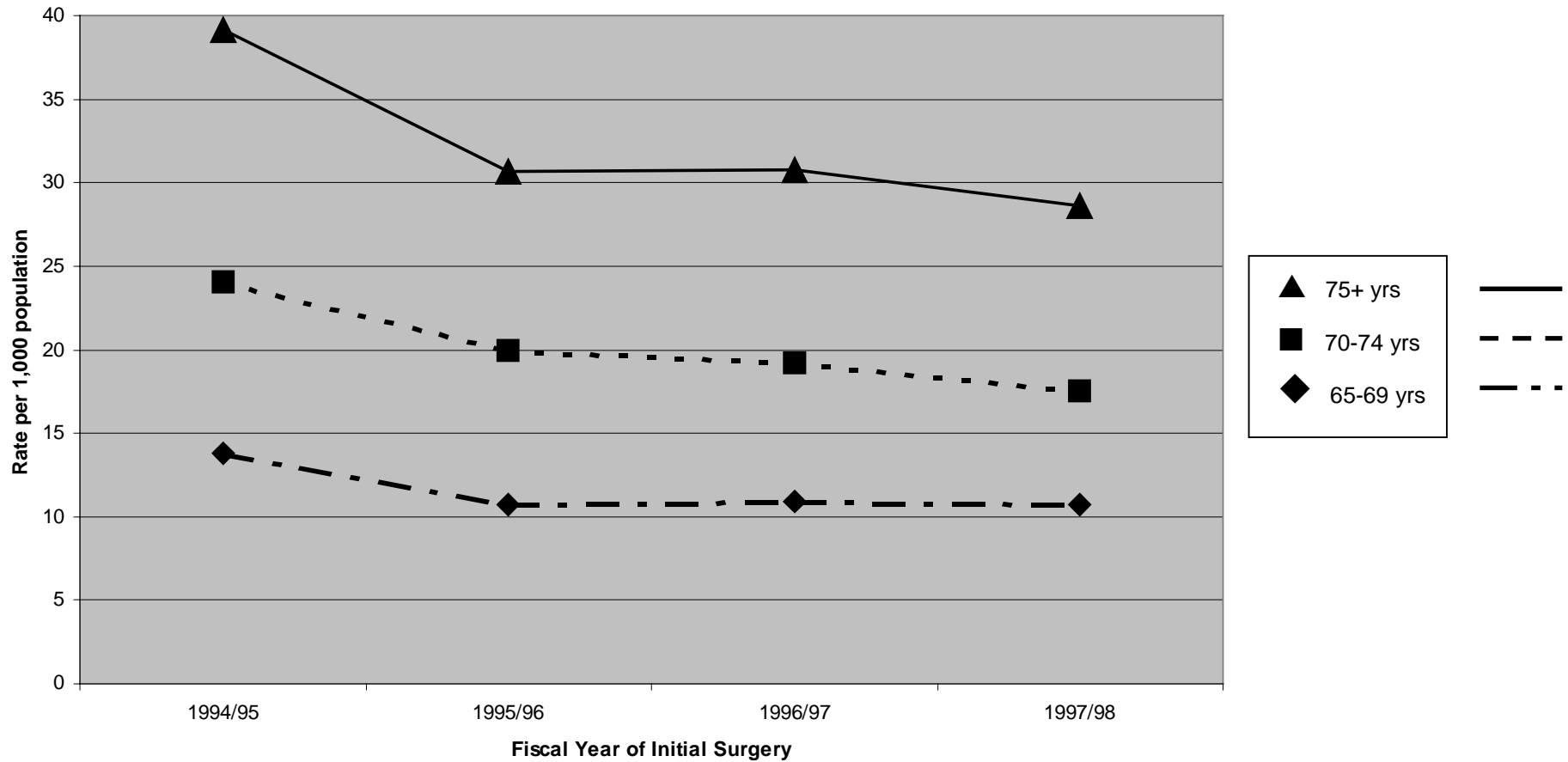
Fiscal Year	AB 65+ Population	Study Population	Rate per 1,000 Population
1994/95	263,678	7,118	27.0
1995/96	271,467	5,823	21.5
1996/97	278,538	5,978	21.5
1997/98	285,851	5,738	20.1

Table 2: Number of persons receiving cataract surgery for uncomplicated senile cataract as a percent of all persons receiving cataract surgeries

Fiscal Year	Study Population	All ages, with cataract surgery	% of all cataract surgery persons
1994/95	7,118	11,684	60.9%
1995/96	5,823	11,346	51.3%
1996/97	5,978	12,243	48.8%
1997/98	5,738	11,943	48.0%

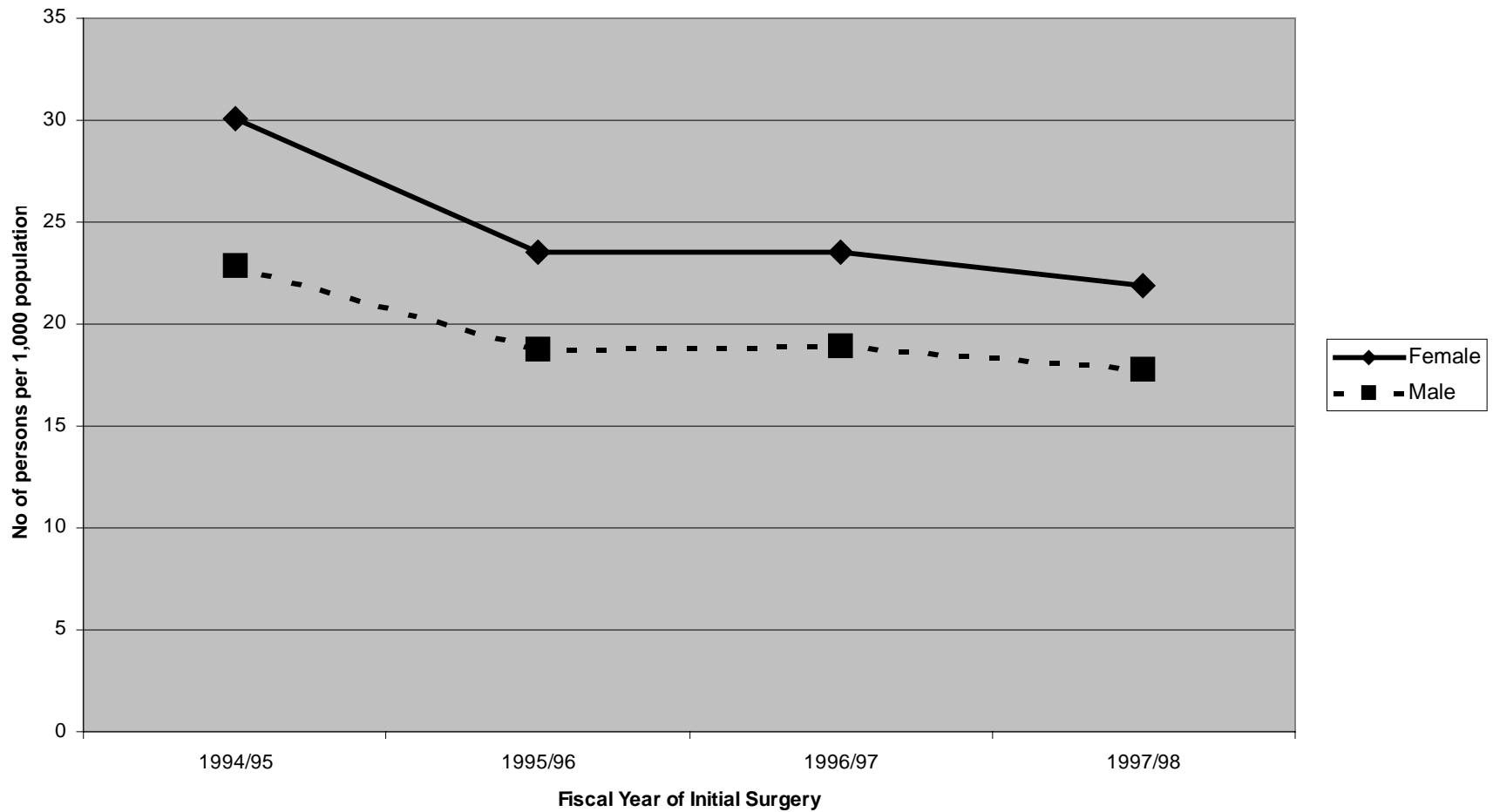
Uncomplicated Senile Cataract Surgeries in Alberta

Chart 1: Rate of Cataract Surgery for Uncomplicated Senile Cataract by Age Group and Fiscal Year of Initial Surgery.



Uncomplicated Senile Cataract Surgeries in Alberta

Chart 2: Rate of Cataract Surgery for Uncomplicated Senile Cataract by Sex and Fiscal Year of Initial Surgery



The sharp decrease in cataract rates shown on Charts 1 and 2 between fiscal years 1994/95 and 1995/96 may be explained by a general decrease in physician payments. A decrease of 14.6% between these fiscal years was reported, mostly explained as a result of decreased utilization ¹¹ due to limited access to cataract surgery through significant health care restructuring and budgetary restraints (personal communication, MacDonald).

Approximately 30% to 35% of all study persons received a second cataract surgery service within 6 months of the initial surgery (Table 3). During the first six months 2,242 persons in the 1995 cohort received 4,441 services “insertion of intraocular lens prosthesis with cataract extraction, one-stage” and 2,021 persons in the 1996 cohort received 4,118 services. It is assumed that the second surgery was on the second eye; however, there may be some surgical procedures that were a re-operation on the first cataract for complications. A second cataract surgery on the same eye is highly unusual (personal communication, MacDonald).

Table 3: Percent of persons receiving a second cataract surgery by age group and gender in each time period after initial surgery

1995 Cohort					
Age	Sex	0-6 months	7-12 months	13-18 months	19-24 months
65-69 yrs	F	33%	6%	4%	3%
65-69 yrs	M	29%	4%	2%	2%
70-74 yrs	F	32%	6%	3%	2%
70-74 yrs	M	33%	5%	3%	2%
75+ yrs	F	32%	5%	3%	2%
75+ yrs	M	30%	3%	3%	2%
Total for 1995		31%	5%	3%	2%
1996 Cohort					
65-69 yrs	F	34%	8%	3%	3%
65-69 yrs	M	32%	4%	5%	2%
70-74 yrs	F	37%	7%	3%	2%
70-74 yrs	M	37%	4%	3%	3%
75+ yrs	F	34%	6%	5%	2%
75+ yrs	M	35%	5%	3%	2%
Total for 1996		35%	6%	4%	2%

A person counted in the 0-6 month column could be the same person counted in the other columns, so percentages may not be summed to estimate the percent of persons receiving a second cataract surgery in the next 24 months.

COMPLICATIONS

Some degree of reaction occurs after all cataract surgery with IOL implantation, regardless of the IOL material ¹². Posterior capsular opacification (PCO) is the main cause of vision problems following cataract surgery. PCO is most conveniently treated by laser capsulotomy ¹³.

In Alberta, the treatment for PCO is claimed through the fee schedule as “Discission of lens and capsulotomy: needling, capsulotomy, discission and synochiotomy”. The data show that the number of persons who received the treatment slowly increased as expected in the succeeding 6 month time periods after the initial surgery (Table 4). Over the 2 year period, the 1994/95 cohort received 678 services and the 1995/96 cohort received 659 services. The rates varied slightly between age groups but due to the very small number of events trends for the different age groups are not evident. An important limitation of these data to consider is that the treatment for PCO cannot necessarily be related to the initial cataract surgery and/or to the second cataract surgery of the other eye or to a previous cataract surgery (personal communication, Romanchuk).

Table 4: Percent of persons receiving a service for discission of lens and capsulotomy by age group and numbers of months after initial surgery

1995 Cohort				
Age group	0-6 months	7-12 months	13-18 months	19-24 months
65-69 yrs	1.2%	2.0%	2.6%	4.0%
70-74 yrs	1.2%	1.9%	2.9%	2.6%
75+ yrs	2.0%	2.0%	2.4%	2.7%
All ages	1.6%	2.0%	2.6%	2.9%
1996 Cohort				
65-69 yrs	3.5%	2.0%	3.0%	3.2%
70-74 yrs	1.9%	1.9%	2.9%	3.3%
75+ yrs	2.8%	2.2%	2.7%	2.7%
All ages	2.7%	2.1%	2.8%	3.0%

The follow-up diagnoses and procedures listed in Appendix B were selected from the literature as indicators of complications following cataract surgery. Due to low occurrences, only services for the discission of lens and capsulotomy are reported (Table 4). The average number of services per person by 3 digit eye **diagnosis** over the 2 years after surgery was less than one (Table 5), except for cataract at 3.6 services per person for the 1994/95 cohort and 3.7 services per person for the 1995/96 cohort.

Table 5: Number of services per person by diagnosis (dx) over 2 years for 1995 and 1996 cohort

3 dig dx	Diagnosis Descriptor	1995 Cohort		1996 Cohort	
		Number of services	Services per person	Number of services	Services per person
360	Disorders of the globe, including endophthalmitis	121	0.02	77	0.01
361	Retinal detachment and defects	318	0.04	370	0.06
362	Other retinal disorders	3,249	0.46	2,673	0.46
363	Chorioretinal inflammations, scars, and other disorders of choroid	71	0.01	38	0.01
364	Disorders of Iris and Ciliary Body	2,128	0.30	1,787	0.31
365	Glaucoma	4,093	0.58	3,249	0.56
366	Cataract	25,500	3.58	21,315	3.66
367	Disorders of refraction and accommodation	367	0.05	259	0.04
368	Visual disturbances	912	0.13	457	0.08
369	Blindness and low vision	99	0.01	115	0.02
370	Keratitis	647	0.09	524	0.09
371	Corneal opacity and other disorders of cornea	869	0.12	881	0.15
372	Disorders of conjunctiva	1,756	0.25	1,407	0.24
373	Inflammation of eyelids	747	0.10	650	0.11
374	Other disorders of eyelids	560	0.08	393	0.07
375	Disorders of lacrimal system	660	0.09	546	0.09
376	Disorders of the orbit	53	0.01	27	0.00
377	Disorders of optic nerve and visual pathways	116	0.02	64	0.01
378	Strabismus and other disorders of binocular eye movements	182	0.03	148	0.03
379	Other disorders of eye	1,561	0.22	1,397	0.24
Other	Non – Eye Diagnoses	1,978	0.28	2,255	0.39
	Total services	45,987	6.46	38,632	6.63

This table includes all post surgery services for the expected diagnoses and procedures and includes for normal routine post cataract surgery follow up.

Many of the eye-related services provided after initial surgery were considered routine follow up after cataract surgery. These included: a) biomicroscopy, b) tonometry, c) ocular ultrasonography, d) full threshold on automated equipment, with interpretation, e) visual fields, f) potential acuity measurement or laser interferometry, and g) complete oculo-visual examination. The average number of health services per person for eye-related **procedures** over the 2 years after initial surgery was also less than one (Table 6). On average, the 1994/95 cohort received 6.5 eye-related services per person during the 2 years after initial surgery; similar to the 1995/96 cohort who received 6.6 eye-related services per person. These services do not include the initial surgery but include all services received during the 2 years of follow up.

The literature identified PCO or secondary cataract as a complication of cataract surgeries. PCO is the most common cause of visual morbidity following cataract surgery with the insertion of a posterior chamber IOL ^{14, 15}. A meta-analysis found that rates of visually significant PCO incidence in persons undergoing standard cataract surgery were 11.8% (95% confidence interval (CI) 9.3% to 14.3%) for one year, 20.7% (95% CI 16.6% to 24.9%) for three years, and 28.4% (95% CI 18.4% to 38.4%) at five years after surgery ^{7, 8, 15}.

The treatment rate of PCO in the study population is considerably lower (1.2% to 3.5% 6 months following initial surgery) than that reported in the literature. However, the literature reported visually significant PCO whereas these data report the number of surgical interventions to treat PCO. Visually significant PCO and capsulotomy rates are not necessarily the same ¹⁵. There are no standardized techniques to measure visually significant PCO and identify different degrees of opacification ^{15, 16}. Direct comparisons with the literature are also not possible because cumulative rates over the two years could not be calculated due to data limitations. As well, our study population is very selective in relation to age and co-morbidities while the meta-analysis ¹⁵ included patients of all ages with mixed co-morbidities (personal communication, Bellan).

Currently, there is no way to predict the extent to which persons who have primary cataract surgery will develop PCO ¹⁷. In general, the older the patient, the lower the frequency of capsular opacification ¹³.

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Table 6: Number of services per person by Health Service Code (HSC) over 2 years for 1995 and 1996 cohort

3 dig HSC	Services Descriptor	1995 Cohort		1996 Cohort	
		Number of services	Services per person	Number of services	Services per person
03.03A	Diagnostic interview and evaluation or consultation - visit not requiring complete history and evaluation	11,849	1.66	9,216	1.58
09.01A	Biomicroscopy	11,462	1.61	9,897	1.70
27.72	Insertion of intraocular lens prosthesis with cataract extraction, one-stage	5,940	0.83	5,741	0.99
03.04A	Diagnostic interview and evaluation or consultation - comprehensive visit.	5,345	0.75	4,452	0.76
03.12	Tonometry	4,346	0.61	3,270	0.56
26.98A	Operation on iris, ciliary body, sclera & Interior chamber - Light coagulation and cryopexy	1,015	0.14	761	0.13
X295	Ocular ultrasonography	797	0.11	764	0.13
03.08A	Comprehensive consultation	709	0.10	615	0.11
27.3 A	Discission of lens and capsulotomy - Needling, capsulotomy, discission synechiotomy	678	0.10	659	0.11
09.05B	Full threshold on automated equipment, with interpretation	397	0.06	324	0.06
09.05A	Visual fields	381	0.05	301	0.05
09.01F	Potential acuity measurement or laser inferometry	366	0.05	280	0.05
09.11C	Complete oculo-visual examination	281	0.04	211	0.04
09.02B	Anterior Chamber Depth Measurement	219	0.03	144	0.02
21.31A	Irrigation probing of nasolacrimal duct	203	0.03	184	0.03
09.11B	Specular microscopy, interpretation	142	0.02	207	0.04
28.5A	Light coagulation or cryopexy – treatment of lesions of retina or choroid	134	0.02	118	0.02
	Eye related examinations/measurements	259	0.04	263	0.05
	Operations on the eyes	838	0.12	731	0.13
	Other Health Service Codes	626	0.09	494	0.08
	Total	45,987	6.46	38,632	6.63

This table includes all post surgery services for the selected diagnoses and procedures and those for routine post cataract surgery follow up and those for expected complications. Operations on the eyes include services paid to the surgeon and to an anesthetist.

CONCLUSION

The study population who received surgery for uncomplicated senile cataract represent only 2% of the Alberta population aged 65 years and up. However, the study persons represent about 50% of all persons of all ages who received cataract surgery in Alberta. Approximately 30% to 35% of the study population received a second cataract surgery service within a 6 month period following the initial surgery. Rates of cataract surgeries for seniors with no co-morbidities varied from 27 per 1,000 persons over the age of 65 years for 1994/95 to 20 per 1,000 persons for 1997/98. Females across all age groups had higher cataract surgery rates than males. The data show that the number of persons who received treatment for PCO slowly increased in the succeeding 6-month time periods after the initial surgery.

Limited inferences can be deduced from these data due to the aggregate extraction methodology used. The manner in which data are currently reported does not allow the linking of PCO to specific lens type. As well, there is no requirement to identify in the physician claims data if the service provided was for the right or left eye. Based on this limited data set and short term follow up, the complication rate of PCO in this study population was substantially lower than that reported in the literature.

Pooled data available from AHCIP was not designed to determine the actual rate of treatment for PCO nor linking PCO rates to lens type.

APPENDIX A: METHODOLOGY, ASSUMPTIONS AND LIMITATIONS

Readily available, aggregate, administrative, secondary data was used to describe selected physician payments for the study population in a population based descriptive study. The advantages of this approach were very large sample size, ready access to data, and low cost. Estimates for power calculations and other requirements of subsequent primary research can be based on actual data. The disadvantages are that the study population and their activity could only be crudely defined in the data source and that aggregate, anonymous data prohibited the identification of individuals for further study.

Alberta Health and Wellness disclosed discrete person counts and number of services across each 6 month follow up period, by age groups and sex, as requested. Therefore, individuals and all their activity could not be tracked over time, services and diagnoses.

Physicians do not indicate on the claims submitted on which, the right or left eye, the procedures were performed nor the type of lens (rigid or foldable) that was inserted.

Physicians may submit a 3-digit or a 4-digit diagnostic code on the claim for payment and the vast majority of claims are paid with a 3-digit diagnosis. Any estimate of the occurrences of conditions described by a 4-digit diagnosis would be understated. Therefore, senile cataract (366.0) and after-cataract (366.5) could not be reliably isolated from cataracts (366).

Services provided by the ophthalmologist or by the anaesthetist are paid on the same diagnostic code. Therefore, number of services by health service code does not reflect number of procedures performed. This was requested so data could be compared to public documents that report services.

It is assumed that the inclusion and exclusion criteria accurately selected all persons aged 65 years and over who received cataract surgery for an otherwise healthy eye.

Selection criteria for persons in the cohorts

A person having cataract surgery for uncomplicated senile cataract is defined as an Alberta Resident:

- for whom a health service for cataract extraction with insertion of an intraocular lens, one stage, as defined by the Alberta Healthcare Insurance Plan (AHCIP) Schedule of Benefits, was provided between 1994 April 1 and 1998 March 31, and
- who was 65 years of age or over on March 31st of the fiscal year when the health service was provided, and

- for whom no paid health service was provided with an ICD-9 diagnosis (360 to 379) of “Disorders of the eye and adnexa” in the 6 months prior to the date the cataract surgery was performed.

Persons for whom more than one cataract insertion service was provided in this time period were assigned to the cohort with the date of service closest to 1994 April 1.

Follow up of 1994/95 and 1995/96 cohorts for selected complications

The follow up activity for persons in the 1994/95 and 1995/96 cohorts included:

- health services paid with a ICD-9 diagnosis of “Disorders of the eye and adnexa” (360 to 379) provided any time during the 2 years after the initial health service, OR
- selected eye related procedures provided anytime during the 2 years after the initial health service.

Data aggregation

Population-based data were derived from payments to Alberta physicians by the AHCIP, as submitted by the claimants. The data were aggregated on:

- year of initial surgery,
- patient age group at the year end of the fiscal year of the initial surgery,
- sex,
- the number of persons with services for selected diagnoses and procedures in each 6 month time periods after the initial cataract surgery, and
- the number of services for eye-related diagnoses or selected eye procedures in each 6 month time period after initial cataract surgery. Data were not presented across both diagnoses and health service codes.

APPENDIX B: DIAGNOSTIC AND HEALTH SERVICE CODES FOR EXTRACTION AND FOLLOW UP

Follow up diagnoses

Services provided to study persons for the diagnoses starting with the values below, during the 2 years following the initial service for insertion of intraocular lens prosthesis with cataract extraction, one stage, were included in the follow up activity. These diagnoses include all ICD9 Codes for Disorders of the eye and adnexa.

Diagnosis Code	Diagnosis Descriptor
360	Disorders of the globe, including endophthalmitis
361	Retinal detachment and defects
362	Other retinal disorders
363	Chorioretinal inflammations, scars, and other disorders of choroid
364	Disorders of Iris and Ciliary Body
365	Glaucoma
366	Cataract
367	Disorders of refraction and accommodation
368	Visual disturbances
369	Blindness and low vision
370	Keratitis
371	Corneal opacity and other disorders of cornea
372	Disorders of conjunctiva
373	Inflammation of eyelids
374	Other disorders of eyelids
375	Disorders of lacrimal system
376	Disorders of the orbit
377	Disorders of optic nerve and visual pathways
378	Strabismus and other disorders of binocular eye movements
379	Other disorder of eye

Follow up Health Service Codes

Services provided to study persons for the health service codes below, during the 2 years following the initial service for insertion of intraocular lens prosthesis with cataract extraction, one, stage, were included in the follow up activity.

Health Service

Code	Health Service Code Descriptor
27.3A	Dissection of lens and capsulotomy: needling, capsulotomy, dissection and synochiotomy
27.7A	Insertion of prosthetic lens: repositioning of pseudophakos with paracentesis
27.7B	Insertion of prosthetic lens: manipulation of pseudophakos and entry into the anterior chamber
27.7C	Insertion of prosthetic lens: removal, replace or repositioning of anteriorly dislocated pseudophakos
27.7D	Insertion of prosthetic lens: removal, replace or repositioning of posteriorly dislocated pseudophakos
27.7E	Insertion of prosthetic lens: simple repositioning of pseudophakos
27.72	Insertion of intraocular lens prosthesis with cataract extraction. One stage.
27.73	Secondary insertion of intraocular lens prosthesis
27.99A	Dislocated lens, removal

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