

part 1

Cataract

1 | Introduction

This part provides Guidelines specifically for the management of cataract in Aboriginal and Torres Strait Islander communities in rural and remote parts of Australia. The Royal Australian College of Ophthalmologists has developed clinical practice guidelines for cataract surgery in mainstream services.²

Cataract surgery is the main type of eye surgery Indigenous Australians need. Although the absolute number of cases is small, untreated cataract can result in considerable personal suffering and community loss.

Compared with non-Indigenous Australians, cataract surgery is usually performed on Indigenous Australians when the cataract is at a more advanced stage. Further, Indigenous Australians often face a variety of difficulties—distance, lack of transport, lack of medical services, language barriers and economic disadvantage, for example—when seeking out services.

2 | Background

2.1 Definition

A cataract is an opacity in the lens of the eye; it leads to a loss of visual function.

There are three cataract conditions: cortical cataract, nuclear cataract, and posterior subcapsular cataract. Each condition has its own pathology, occurs in anatomically different areas of the lens, has a different age of onset, and appears to have different risk factors. One condition can occur alone or in combination with one or both of the others. They all affect vision, however, and surgical treatment and management techniques are the same.

2.2 The patient population

The patient population is Aboriginal and Torres Strait Islander people who have cataract, particularly those who live in rural and remote parts of Australia. They may have a variety of characteristics:

- ▶ English as a second or third language, if it is spoken or understood at all;
- ▶ no previous experience or knowledge of hospitals or surgery;
- ▶ poor previous experience of hospitals (for example, racism on the part of staff) or surgery (for example, a poor outcome because of post-operative non-compliance or inadequate pain relief resulting from an inability to communicate adequately with staff) and anxiety or fear as a result;
- ▶ limited experience of cataract surgery, involving knowledge of a person who suffered the trauma of travel to a major metropolitan hospital or had a poor surgical outcome, and understanding this to be the norm;
- ▶ fears about the hospital (for example, if relatives have died there) or the town in which it is situated (for example, racism or clan or family matters);
- ▶ anxiety about being isolated from family and land, particularly if the patient is elderly and considers death a possibility while away from home;
- ▶ a different world view, with differing expectations about the need for surgery, attendance on the day arranged, punctuality, and compliance with medication requirements;
- ▶ poor general health;
- ▶ the need for someone to accompany them, with the added organisation and expense that entails;
- ▶ limited financial resources.

2.3 The aim of cataract surgery

The aim of cataract surgery is to achieve a rapid, stable recovery of vision to the preferred refractive status with minimal morbidity and risk.

2.4 The goal

The goal of these Guidelines is 'best practice' in the management of cataract and intraocular lens surgery in Aboriginal and Torres Strait Islander people, particularly those living in rural and remote regions where access to specialist eye health professionals and hospital care is limited.

To achieve this goal, the following are minimum requirements:

- ▶ identify the presence of cataract;
- ▶ assess the impact of the cataract on the patient's visual and functional status and their quality of life;
- ▶ advise the patient about cataract's impact on vision, functional activity and natural history, as well as the benefits and risks of, and alternatives to, surgery, so that they can make informed decisions about treatment options;
- ▶ establish criteria for a successful treatment outcome with the patient;
- ▶ perform surgery when it is expected that this will improve the patient's functional activity and when the patient chooses this option;
- ▶ provide the necessary post-operative care and rehabilitation and treat any complications; and
- ▶ achieve all of the above in a manner that respects the individual preferences of Aboriginal and Torres Strait Islander people and facilitates individual and community involvement.

3 | Epidemiology

3.1 Cataract

Worldwide, cataract is the leading cause of blindness; in Australia, it remains an important cause of blindness and visual impairment. Each year 120 000 cataract operations are performed in Australia, and cataract accounts for 8 per cent of legal blindness (4800 out of 62 500 people who are legally blind) and 9 per cent (36 000) of the 398 000 Australians who have less than driving vision.

Between 1985 and 1994 the number of cataract operations performed in Australia increased 2.6 times.^{2,3} Between 1995 and 2000 the rate increased a further 1.8 times, to give an overall increase of 4.6 times in the last 16 years. The rate of cataract surgery varies greatly from State to State, although the variation is not directly related to the number of ophthalmologists in each State.^{2,3,4} Significant geographic variation has also been observed in the United States.

There has been no systematic assessment of the prevalence of cataract among Indigenous Australians since the National Trachoma and Eye Health Program survey conducted between 1976 and 1978. That study reported an overall prevalence of lens abnormalities of 3.6 per cent among Aboriginal people, compared with 0.8 per cent among non-Aboriginal people. After adjustment for differences in the age structures of the Aboriginal and non-Aboriginal populations, lens abnormalities were reported to be twice as common among Aboriginal people.

Although the age-specific prevalence of cataract is relatively high, the absolute number of Indigenous Australians with cataract is relatively small and, if there is no surgical backlog, the number of people needing surgery each year is small. Nevertheless, if the rate of cataract surgery among Indigenous Australians was to be the same as for non-Indigenous Australians, about 2400 cataract operations would need to be performed each year in the Indigenous population.⁵

The only recent data on cataract among Aboriginal and Torres Strait Islander people come from health services. The data are particularly vulnerable to selection for surgery bias².

3.2 Risk factors

The single most important risk factor for cataract is increasing age. Data from the Visual Impairment Project⁶ are representative of data from other population-based studies. They show that the prevalence of cataract increases dramatically after the fifth decade (ages 41–50). By the eighth decade (ages 71–80), half of all people will have significant cataract, and by the tenth decade (91–100) everyone will be affected. Similarly, the proportion who have had cataract surgery doubles with each decade, until every second person in their 90s will have had cataract surgery.

Among other important risk factors for cataract are exposure to ultraviolet-B and ionising radiation, a lack of dietary anti-oxidant vitamins, the presence of diabetes, ocular trauma, the occurrence of severe diarrhoea and dehydration, and the use of therapeutic drugs such as steroids and recreational drugs such as cigarettes and alcohol.

4 | Prevention

At present there is no proven medical treatment available to prevent the formation or progression of age-related cataract. Although poor nutrition is thought to be a risk factor, research published to date does not support the use of nutritional or vitamin supplements for the prevention or treatment of cataract. Until the results of current studies of the effectiveness of anti-oxidant vitamin supplements become available, the only effective protective interventions to reduce the risk of developing cataract are to reduce ocular exposure to ultraviolet-B radiation and to stop smoking.

5 | Service delivery

5.1 Surgical eye care in rural and remote settings

Rural and remote settings are generally characterised by:

- ▶ the lack of a resident ophthalmologist;
- ▶ delivery of routine ophthalmic care by a visiting ophthalmologist during periodic visits to a patient's community or a nearby one;
- ▶ no easy access to specialist ophthalmic care at times other than during ophthalmologists' visits, because of distance, the patient's inability or unwillingness to travel, or the difficulty or cost of travel;
- ▶ ophthalmic equipment, especially the slit lamp, often not being of a quality similar to that usually applying in an urban setting;
- ▶ reliance on other health professionals—who may also be itinerant (for example, an optometrist or a flying doctor) or have limited ophthalmic training (for example, a clinic nurse or an Aboriginal Health Worker)—to provide intermediary or substitute ophthalmic care in the absence of the itinerant ophthalmologist.

Although consultations and treatments such as laser photocoagulation for diabetic retinopathy can be provided in a patient's community, cataract surgery should occur in nearby regional towns, so that acceptable surgical facilities are available and travel and social dislocation are minimised for the patient.

5.2 Hospital access in rural and remote areas

Cataract surgery currently occurs in country hospitals that may have the following characteristics:

- ▶ a high turnover of medical and nursing staff and a consequently poor procedural memory;
- ▶ only occasional cataract surgery sessions and thus limited procedural experience;
- ▶ inadequate or limited surgical equipment.

Ideally, cataract surgery should occur only in a hospital that:

- ▶ meets the relevant standards of accreditation, particularly in relation to instrument sterilisation and infection control;

- ▶ has at least one medical officer who is on site (but not necessarily in the operating theatre) during surgery and who is capable of patient resuscitation. A specialist anaesthetist is not necessary;
- ▶ has the capacity and willingness to transfer surgical patients to a metropolitan hospital should an intra-operative complication (for example, nucleus dropped into vitreous humour) or immediate post-operative complication (for example, endophthalmitis) occur.

5.3 Aboriginal community-controlled health services

In the search for better health outcomes, Aboriginal community-controlled health services represent an important source of assistance for patients, communities and health care specialists. The health service, and Aboriginal Health Workers, can:

- ▶ provide primary health care services;
- ▶ offer support and help to meet individual, family and community needs;
- ▶ accompany patients to regional health centres for specialist consultations;
- ▶ arrange transport;
- ▶ help to determine whether the potential visual improvement outweighs the potential risk, cost and inconvenience of surgery;
- ▶ liaise between the patient, medical officers (the flying doctor), the ophthalmologist and the regional hospital;
- ▶ maintain accurate patient records.

6 | Management

6.1 Diagnosis

The impact of cataract on a patient's functioning can be determined in a number of ways, among them Snellen visual acuity, contrast sensitivity, glare disability or self-assessment of functional status or difficulty with vision. There is, however, no single test that adequately describes the effect of cataract on a patient's visual status or functional ability or defines the threshold for performing cataract surgery.

Subjective measures of visual disability—as reported by the patient, the person accompanying the patient, or an informed health worker from the patient's community—may be more important in determining whether an offer of cataract surgery should be made to a particular patient.

The physical examination requires that a range of subjective factors be taken into account.

6.2 Outcomes

The successful outcome of surgery is restoration of the functional loss that the patient experienced before having surgery. Improved visual function after cataract surgery and improved health-related quality of life have been widely reported.^{7,8,9} The traditional outcome measure for cataract surgery has been Snellen visual acuity, and cataract extraction gives excellent outcomes.

Loss of visual function in the elderly is associated with a decline in physical and mental functioning and in independence in the activities of daily living. Improved visual function following cataract surgery can retard the progressive deterioration of quality of life normally seen in elderly patients. Cataract surgery can thus play an important part in preserving function and preventing disability in at-risk patients.¹⁰

Cataract surgery has been shown to have a significant impact on vision-dependent function. At least 90 per cent of patients undergoing first-eye cataract surgery noted an improvement in functional status¹¹ and satisfaction with vision, and 80 per cent of elderly patients with co-existing ocular and medical diseases reported improved visual function. The pooled percentage of eyes with post-operative best corrected visual acuity of 6/12 or better was 95 per cent among patients with no ocular co-morbidity and 90 per cent for all eyes undergoing cataract surgery.¹¹

6.3 Second-eye surgery

In patients with bilateral cataract-induced visual impairment, cataract surgery in both eyes is an appropriate treatment for restoring binocular vision. A number of studies in the United States and the United Kingdom,^{12,13,14,15} comparing the outcomes of first- and second-eye surgeries after extracapsular cataract extraction, concluded that patients who underwent surgery in both eyes had greater improvement in visual acuity and functional status than did those who underwent surgery in one eye.

The indications for second-eye cataract surgery are the same as those for first-eye surgery. Where possible, a suitable time after the first-eye surgery should be allowed, so that any immediate post-operative complications that occur can be treated before second-eye surgery.

6.4 The physical examination

There are three main goals for the physical examination of a patient whose chief complaint might be related to a cataract:

- ▶ to diagnose or confirm the presence of the cataract;
- ▶ to confirm that the cataract is a significant factor related to the visual impairment and symptoms described by the patient;
- ▶ to exclude or identify other ocular or systemic conditions that might contribute to the patient's visual impairment or affect the surgical plan or ultimate outcome.

The ophthalmic examination should document the status of both eyes. It should include the following components:

- ▶ a patient history—including the patient's own assessment of functional status;
- ▶ Snellen acuity and refraction;
- ▶ measurement of intraocular pressure;
- ▶ assessment of pupillary function;
- ▶ examination of ocular motility;
- ▶ external examination;
- ▶ undilated and dilated slit-lamp examination;
- ▶ dilated examination of the fundus;
- ▶ keratometry and axial-length measurements.

Immediately before the surgery, the ophthalmologist should be satisfied that there has been no significant change in the patient's ocular status or general health since the previous examination. Primary health care providers should be encouraged to contact the ophthalmologist if they notice a change in visual symptoms in the interval between the examination and the surgery.

The past ocular history should be included in the work-up because previous records may not be available in the hospital.

6.5 Surgical management

Cataract surgery is recommended when a patient with cataract-induced visual loss is no longer able to function adequately with his or her present level of vision and surgery offers a reasonable likelihood of improved visual function. Generally, the threshold of visual impairment for which surgery is justified and appropriate for someone who drives a motor vehicle occurs when:

- ▶ a cataract significantly contributes to, or solely causes, a best corrected Snellen acuity of 6/12 or worse; or
- ▶ the patient fails to meet the visual criteria for retention of a motor vehicle driver's license.

The ophthalmologist and the Aboriginal Health Worker can help to explain the risks of cataract surgery to the patient. It may take some time to secure the patient's trust.

Cataract surgery in rural and remote settings is potentially accompanied by higher risks should complications occur. The decision to advise a particular patient to proceed with cataract surgery should be made after all factors have been considered and the individual benefits for the patient are felt to outweigh the risks. The decision whether or not to proceed will vary from patient to patient, depending on a variety of circumstances, including:

- ▶ added risks should complications occur;
- ▶ the patient's age and general health;
- ▶ the patient's home conditions, including family circumstances;
- ▶ the patient's daily activities, such as employment, hobbies and family care responsibilities;
- ▶ the health of the eye apart from cataract.

Cataract surgery should usually be performed as a day surgery procedure. There will, however, be some medical or social circumstances where hospitalisation is required.

6.5.1 Cataract surgery in a monocular patient

For a monocular patient—that is, a patient who is legally and permanently blind in one eye only—the indications for cataract surgery are the same as for a binocular patient. The threshold of visual disability for intervention may, however, be higher than that for the binocular patient. The ophthalmologist and the Aboriginal Health Worker should discuss with the patient the risk of total blindness if severe complications occur.

6.5.2 Other indications for cataract surgery

There are two other indications for cataract surgery:

- ▶ the need to see the fundus for treatment of retinal disorders and the management of intraocular pathology;
- ▶ the presence or risk of lens diseases—phacolytic glaucoma, uveitis or subluxated/dislocated lenses.

6.6 Contra-indications for cataract surgery

Surgery for visually impairing cataract should not be performed in the following circumstances:

- ▶ The patient does not want surgery.
- ▶ The patient is a child.
- ▶ The patient needs a special variant of surgery involving equipment or expertise not available locally.
- ▶ Glasses or visual aids provide satisfactory functional vision.
- ▶ Surgery will not improve visual function (unless there are other indications for surgery present—see section 6.5.2).
- ▶ The patient is medically unfit.
- ▶ Legal consent cannot be obtained.
- ▶ The patient is unable to obtain adequate post-operative care.

6.7 Pre-operative preparation

A recent study in the United States showed no benefit from routine medical tests before cataract surgery.¹⁶ A standard battery of tests—electrocardiography, complete blood count, serum electrolytes, urea nitrogen, creatine and glucose—did not alter morbidity. The authors concluded that, unless there is a known pre-existing condition that would require close

monitoring, routine medical testing before cataract surgery is neither needed nor justifiable. There are no data on the value of such testing in Australia.

The ophthalmologist who is to perform the surgery has the following responsibilities:

- ▶ to examine the patient pre-operatively—this could be done the day before surgery—to confirm that nothing has occurred since the patient was last seen that calls for a change to the management plan or makes surgery inappropriate;
- ▶ in the pre-operative consultation, to again explain the sequence and detail of pre-operative care, anaesthesia, surgery, and post-operative care;
- ▶ to inform the patient about the risks, benefits and expected outcomes of surgery. If the indication for surgery is not primarily visual rehabilitation, the immediately pre-operative consultation should be used to reinforce this for the patient and any immediate family, other relatives, Aboriginal Health Workers, or other people accompanying the patient;
- ▶ to obtain the patient's informed consent;
- ▶ to ensure that keratometry and A-scan measurements have been taken if an intraocular lens is to be implanted;
- ▶ to choose the appropriate lens power when intraocular lens implantation is planned;
- ▶ to formulate a surgical plan—anaesthesia, desired wound placement and construction, desired refractive results, and expected post-operative refraction;
- ▶ to review the results of pre-surgical and diagnostic evaluations with the patient or, as necessary, with a responsible adult acting for the patient.

Use of audiovisual aids should be encouraged as a means of informing the patient.

Clinical notes on the assessment of the prospective patient should be left in the patient's clinic notes, where they will be available to the patient's primary care physician (for example, the flying doctor) and other health professionals (for example, the Aboriginal Health Workers and staff of the health service) if the consultation occurred in the community. The notes should also be sent to the patient's primary care physician if the consultation occurs other than in a community health facility. In addition, they should be entered into the patient's medical records.

To facilitate post-operative follow up, the ophthalmologist should maintain a database of patients who have undergone cataract surgery. Although the ophthalmologist is responsible for the examination and the review of data, certain aspects of data collection may be carried out by another trained individual under the ophthalmologist's supervision.¹⁷

6.8 Management of the pre-operative patient

A number of things can be done to help the pre-operative patient.

6.8.1 Scheduling

The patient should be consulted about the proposed location for surgery to ensure that it is socially and culturally acceptable. The patient's name should be added to the waiting list of the surgical facility that is as close as practicable to their community.

When several patients from one community are to have surgery and must travel to the surgical facility, it may be useful to book these people onto a single operating list: the presence of familiar community members may allay fears about the experience, and the cost of transport will be less if there is a group of patients. It is important to bear in mind that an unforeseen community event—for example, a funeral—may lead to the whole group's absence, with many consequences for the operating list. Suitable escorts should be found to provide assistance with, say, elderly patients or minors.

When the date of surgery has been decided the patient should be informed directly, by mail if that is possible and the patient is literate or in person or by telephone if one is available.

The health professionals in the patient's community, and the regional eye health coordinator if there is one, should also be informed, since they will probably have to organise and facilitate the patient's attendance at surgery and to monitor post-operative progress. The hospital liaison officer, if there is one, should also be informed, since he or she will be responsible for organising and coordinating peri-operative attendance and explaining the processes and details of care.

The patient, often with an accompanying person, should be transported to the surgical facility on the day before surgery, to allow:

- ▶ confirmation of attendance;
- ▶ the patient to familiarise herself or himself with the facility, staff and processes of treatment;

- ▶ a further ocular assessment prior to surgery;
- ▶ the patient's informed medical and financial (if applicable) consent to be confirmed and documented;
- ▶ general medical aspects of the patient's care to be attended to—for example, use of diabetic medications on the morning of surgery;
- ▶ assessment of the patient's general health, outlook and wellbeing, with confirmation of their probable ability to cope with day surgery;
- ▶ accommodation with relatives or in a hostel, motel or similar establishment to be organised.

6.8.2 The day of surgery

On the day of surgery the patient should do the following:

- ▶ take a light breakfast, anti-hypertensive medications as usual, and diabetic and anti-coagulation medications as instructed;
- ▶ be transported to the surgical facility;
- ▶ be admitted as a 'day case', according to the facility's protocol;
- ▶ undergo baseline observations according to the facility's protocol—for example, blood pressure and blood sugar level;
- ▶ follow the facility's preparation protocol for entry to the operating theatre. This may mean simply donning clean disposable hat, shoes and gown over everyday wear or it may also require a face wash or, at maximum, showering with an antiseptic wash and a complete change into theatre attire;
- ▶ have the eye for surgery prepared;
- ▶ await surgery in comfortable seating close to the operating theatre;
- ▶ not have dentures, hearing aids or limb prostheses removed prior to entering the theatre suite.

Given the often high turnover of staff in rural and remote hospitals, with the resultant loss of institutional memory and the difficulties this creates for occasional surgical lists, protocols for management of the pre-operative cataract patient may be compiled and updated for the use of new staff and the convenience of patients and the surgeon.

6.8.3 Patients with diabetes

Many diabetic patients have relatively poor glycaemic control, and so it is generally easier and safer to have such patients take a light breakfast and omit diabetic medication on the morning of surgery, to confirm that the blood

sugar level is satisfactory at admission to the surgical facility, to complete the surgery, and then to have the patient eat and take his or her usual medication.

6.9 The surgical setting

Nearly all cataract surgery is performed in a day surgery setting. Inpatient surgery may be necessary if there is a need for complex ocular care, multiple procedures or general medical and nursing care, or because of the presence of multiple ocular conditions.

6.10 Anaesthesia

A variety of anaesthesia techniques are used for cataract surgery—general and local or regional (for example, retrobulbar, peribulbar, periocular subtenants injection, topical and intracameral). Sedation is sometimes used with regional or topical anaesthesia to minimise pain, anxiety and discomfort.

The type of anaesthesia chosen will depend on many factors, among them the surgical technique, the patient's health status, and the demands and constraints of the rural and remote setting. Because of the systemic risks associated with general anaesthesia, especially in elderly people with cardiac or pulmonary conditions, regional anaesthesia is generally recommended. General anaesthesia is now used in less than 4 per cent of cataract procedures.¹⁸ The type of anaesthesia does not affect the outcome of cataract surgery.

All patients undergoing cataract surgery should have their history taken and a physical examination to identify any risk factors before undergoing either anaesthesia or sedation.

6.11 Use of antibiotics

A 5 per cent solution of povidone iodine placed in the inferior conjunctival sac before surgery has been associated with a reduction in bacterial colony counts taken from the ocular surface at the time of surgery and a reduced rate of post-operative endophthalmitis.¹⁹

The benefits of using prophylactic antibiotics before surgery are not entirely clear. No studies have convincingly demonstrated the effectiveness of antibiotics in reducing the risk of endophthalmitis, but there is evidence to support an association between the use of pre-operative antibiotics on the day of surgery and a reduction in ocular surface bacterial colony counts.²⁰ No studies have demonstrated the efficacy of antibiotics placed in the infusion solution for preventing endophthalmitis. There are, however, risks of toxicity as a result of dilutional errors if this is done.

There is no evidence that, in humans, subconjunctival antibiotics are superior to topical antibiotics at the close of surgery. Further, administration of subconjunctival antibiotics at the close of surgery has been associated with risks, among them macular infarction with the use of aminoglycosides.²¹

6.12 Dealing with pre-existing ocular conditions

6.12.1 Trauma

In eyes that have experienced trauma of some kind, post-traumatic zonular rupture should be specifically looked for and excluded.

6.12.2 Pseudoexfoliation

In patients with pseudoexfoliation, or PXF, the pre-operative assessment should specifically look for glaucoma, iridodonesis, phacodonesis and the extent of pupil dilation. Increased risk of lens dislocation, capsular rupture and vitreous loss have been noted in such patients. Surgical approaches should provide for adequate pupillary dilation and minimise stress on the zonules.²² PXF is common in some Indigenous communities, especially in Central Australia and Western Australia. Its presence is not associated with glaucoma.

6.13 Dealing with general medical conditions

6.13.1 Diabetes

For patients with diabetes, it is important to coordinate care with the primary care physician or endocrinologist. On the day of surgery, insulin-dependent patients' blood glucose should be checked. If necessary, measures should be taken to stabilise the condition; only then should it be decided whether or not to perform the surgery.

The severity of retinopathy is a major determinant of post-operative visual acuity among patients with diabetes.²³ Cataract surgery may be indicated to improve visual function or to assess and treat the retinopathy. For these patients, there is an increased risk of endophthalmitis, macular oedema, iritis, keratitis, rubeosis iridis, neovascular glaucoma and vitreous haemorrhage.²⁴ In addition, cataract surgery may worsen or accelerate retinopathy, and it often worsens co-existing macular oedema. It is thus important to pay attention to early post-operative assessment and treatment of maculopathy and neovascularisation.

Wherever possible, diabetic retinopathy requiring retinal laser photocoagulation should be treated as thoroughly as possible before cataract surgery.²⁵

6.13.2 Anti-coagulants

At present there is no clear evidence for the best way to manage patients taking anti-coagulants. Intraocular surgery on such patients has been conducted safely, and cessation of taking anti-coagulants may be associated with systemic morbidity. Individual circumstances, including the reason for taking anti-coagulants, should be reviewed to determine the best type of anaesthesia, the surgical technique and the timing of surgery.

7 | The surgery

7.1 The operating theatre

The operating theatre should meet the relevant accreditation standards, particularly in relation to infection control, instrument sterilisation, and the availability of oxygen and suction equipment. It should be air-conditioned and should have adequate secure, dust-free, air-conditioned storage space for equipment. The floor should be stable and firm, to minimise vibration and interference with a floor-mounted operating microscope.

Surgical equipment should be taken to metropolitan distributors or hospitals for maintenance as required. Alternatively, arrangements should be made for servicing and calibration at the regional or district hospital.

Delivery services may be infrequent or take days to complete, so surgical consumables should be held in sufficient quantity to meet any contingencies arising during surgery. Where surgical lists are infrequent, to avoid consumables passing their 'use-by date', stock can be held on consignment and/or several surgical facilities can share and rotate the same stock (for example, anterior and posterior chamber intraocular lenses).

The operating microscope should be coaxial, with suitable illumination, magnification and working distance. It may be mounted on the floor or an operating table, although the former is preferred. Foot-controlled focus or XYZ alignment is preferable.

The phacoemulsification machine should be easy to assemble and easily tested by nursing staff infrequently involved in cataract surgery. Further, it should require few consumables and only minimal routine maintenance. It should also have the capability for anterior vitrectomy.

Given the high staff turnover in many rural and remote hospitals—with the resultant loss of institutional memory and the difficulties this creates for occasional surgical lists—it is wise to compile and keep up to date documents outlining the set-up, use, cleaning and storage of ophthalmic equipment and the ordering of ophthalmic supplies. This information is useful for both new staff and the surgeon.

7.2 Preparation for surgery

- ▶ In general, no sedation is given for routine regional anaesthesia. In this situation, the patient's hand should be held by a theatre nurse, a liaison officer, a community health worker or someone accompanying the patient; the patient should be reassured throughout the procedure.
- ▶ Topical anaesthetic is applied. Intravenous access is recommended because of the potential risk for cardiorespiratory depression¹⁹. Topical phenylephrine 10% and tropicamide 1% (or cyclopentolate 1%) are generally available in rural and remote hospitals, without the need to organise a special order. They give satisfactory mydriasis when instilled 60, 30 and 15 minutes before the patient is called to the operating theatre.
- ▶ If it is the surgeon's preference, a topical antibiotic can be instilled when the topical mydriatic is applied. Topical chloramphenicol is ubiquitous and cheap, but a topical antibiotic is less effective than topical aqueous betadine 5% for decontaminating the conjunctival sac.
- ▶ The conjunctiva, eyelid margins, eyelids and adjacent face should be decontaminated with aqueous betadine 5%. Trimming of eyelashes is not required.
- ▶ Regional anaesthetic, generally peribulbar, should be applied using the surgeon's preferred technique.
- ▶ Monitoring by qualified personnel during surgery can include electrocardiogram, pulse oximetry, blood pressure and respiration.

7.3 The surgery itself

The patient can walk into the operating room and be positioned comfortably on the operating table, with their arms and elbows supported by side boards, a pillow under their knees, a warm blanket over them, and a guard bar positioned so that the sterile drape later applied will not be resting on their face. An oxygen outlet with a pulse-oximeter attached should be secured to the guard bar and positioned near the patient's nose.

The patient should be told what is about to happen:

- ▶ Their face will be washed again.
- ▶ A plastic drape will be fitted over their face, but air will be coming through the tubing near their nose, so they will have no difficulty breathing.
- ▶ They will be awake, but the eye will be 'asleep'.
- ▶ They will hear noises and talking but should not worry about it.

- ▶ It is important that they do not make any abrupt head movements during the surgery.
- ▶ They may sneeze or cough, but only after telling the surgeon that this is about to happen, so that the instruments can be withdrawn from their eye.
- ▶ They may, without moving their head, tell the surgeon if there is any problem.

Operating theatre staff should be reminded that the patient is awake, and unnecessary conversation and noise should be avoided. It is recommended that an Aboriginal Health Worker be present in the theatre.

At the completion of surgery, a pad or a shield, or both, should be placed over the operated eye to protect it and keep it clean.

The patient should be informed of the likely outcome for their vision; the opportunity can also be used to reinforce the reason for surgery if the indication for intervention was not primarily visual rehabilitation. The Aboriginal Health Worker can provide valuable support and reassurance at this time.

7.3.1 The surgical technique

Although the cataract-extraction technique to be used will depend on the surgeon's preference, phacoemulsification with in-the-bag intraocular lens implantation is the operation of choice. This technique is well suited to rural and remote circumstances for several reasons:

- ▶ It tolerates poor post-operative medication compliance.
- ▶ It tolerates poor follow-up.
- ▶ It leads to a more robust eye, one that is better able to withstand untoward post-operative events (for example, trauma).
- ▶ It may obviate the need for suture removal and allows for faster recovery of visual acuity.

Manual extracapsular cataract extraction with intraocular lens implantation is an appropriate technique in the following circumstances:

- ▶ when there is a failure of the phacoemulsification machine;
- ▶ when the nucleus is too hard for safe phacoemulsification;
- ▶ when pseudoexfoliation of the lens is associated with sufficient phacodonesis to make phacoemulsification unsafe;
- ▶ when traumatic phacodonesis is sufficient to make phacoemulsification unsafe.

Intracapsular cataract extraction is an inappropriate technique for routine cataract surgery but is useful in two particular situations:

- ▶ when the lens is dislocated;
- ▶ when there is marked phacodonesis with vitreous in the anterior chamber.

Surgery should not be performed in both eyes at the same time because of the potential for bilateral loss of vision. There may, however, be rare occasions when bilateral surgery should be performed, but these should be considered very carefully.

Before the operation, plans need to be made for the patient's evacuation if severe intra-operative complications occur—for example, a 'dropped nucleus'.

Given the high staff turnover in many rural and remote hospitals, it is wise to compile and keep up to date documents outlining the layout of instruments on the scrub trolley (including photographs showing the instruments' names and positions), the order of using instruments during cataract surgery, and the 'dos and don'ts' of cataract surgery (for example, correct flushing, cleaning and care of cannulas and how to avoid confusion of gentamicin with intraocular medications). This information is useful for both new staff and the surgeon.

7.3.2 Intra-operative complications

Complications can arise in the intra-operative stage (including complications related to anaesthesia) and in the immediate and longer term post-operative stages. Sight-threatening complications from cataract surgery are uncommon, but blindness does occasionally occur. There are no data to suggest that Indigenous Australians have an altered risk, all other things being equal.

The following are among the potential intra-operative complications:

- ▶ complications during the administration of local anaesthesia—for example, scleral perforation and retrobulbar haemorrhage; optic, oculomotor, trochlear or abducent nerve injury; and extraocular muscle injury (0.7 per cent)²⁶;
- ▶ capsular rupture and/or zonular fibre rupture with or without vitreous loss (0.8 per cent)¹¹;
- ▶ incomplete removal of fragments of the cataract;
- ▶ intraocular haemorrhage including expulsive choroidal haemorrhage (1.1 per cent)¹¹;
- ▶ iris trauma (1.3 per cent).¹¹

The most common surgical complication encountered in rural and remote settings is capsule rupture with vitreous loss, such that it may be better to leave some residual cortex during cortical clean-up, rather than risk capsule rupture. Anterior vitrectomy instrumentation must be available.

Although the intraocular lens insertion technique to be used following vitreous loss and clean-up will depend on the surgeon's preference, implantation of an anterior chamber intraocular lens is more practical than a sutured posterior chamber lens. A peripheral iridectomy is recommended with anterior chamber intraocular lenses.

8 | Post-operative care

Provided this complies with the facility's protocol for patient transfer from the operating theatre, the patient should walk back to the waiting area near the operating suite and:

- ▶ when necessary, have their blood sugar assessed and attended to;
- ▶ have their vital signs monitored;
- ▶ be given food and drink;
- ▶ be encouraged to discuss with patients awaiting surgery the fact that the expectation was worse than the experience;
- ▶ be given pain relief if necessary.

8.1 Criteria for discharge

Among the criteria for discharge after ambulatory surgery are the following:

- ▶ stable vital signs;
- ▶ return to pre-operative mental state;
- ▶ absence of nausea;
- ▶ absence of significant pain;
- ▶ availability of an Aboriginal Health Worker or some other support person, if necessary;
- ▶ review of post-surgical care with the patient or support person, or both.

The attending nurse or health worker should explain the immediate post-operative requirements to the patient and the person accompanying them. These include the following:

- ▶ reporting bleeding, pain, nausea or vomiting;
- ▶ taking it easy for the remainder of the day and evening;
- ▶ taking any acetazolamide tablets or other oral medication given on discharge;
- ▶ leaving the eye pad and shield intact until next seen by the surgeon;
- ▶ appearing at the appointed time the following day for the first dressing.

An illustrated post-operative instruction leaflet may be of use in helping the patient to understand these requirements.

If the indication for surgery is not primarily visual rehabilitation, the immediate post-operative period should be used to reinforce this for the patient and any immediate family, other relatives, health workers, or other people accompanying the patient.

The patient should be transported to their accommodation, arrangements having been made for them to attend the first dressing the following day.

8.2 The first dressing

At the first dressing, there are a number of things the ophthalmologist should do:

- ▶ Before removing the pad and shield, discuss the probable level of immediate vision.
- ▶ Discuss the probable course of visual rehabilitation during the recuperative period.
- ▶ Discuss—with the patient, any immediate family, other relatives, health workers or other people accompanying the patient—the probable long-term visual outcome, particularly if the indication for surgery is not primarily visual rehabilitation.
- ▶ Make an assessment of the patient's unaided visual acuity.
- ▶ Check the condition of the cornea, the integrity of the wound, intraocular pressure, the level of anterior chamber activity and the position of the intraocular lens and look for evidence of infection.
- ▶ Discuss with the patient and their carer the symptoms and signs of possible complications, eye protection, suitable post-operation activities, the need for and use of medications, arrangements for follow-up visits, and how to get emergency care, especially if visual acuity deteriorates.
- ▶ Give the patient adhesive tape, a shield, and topical antibiotic and steroid medications.

Patients and their carers should also receive information about the following:

- ▶ use of the protective shield at night for the first week;
- ▶ storage, application and frequency of use of topical medications;
- ▶ appropriate activities such as hair and face washing, reading, watching television, lifting, and bending;
- ▶ inappropriate activities such as eye rubbing;
- ▶ what to do if there is increasing ocular pain or decreasing visual acuity, or both;

- ▶ how to contact the surgeon or his or her deputy should a complication arise;
- ▶ the next follow-up appointment.

Where possible, the post-operative medication regime should be the same for all patients, and it should be easy to remember and execute—for example, three times a day for three weeks, then twice a day for two weeks.

Following the first dressing, the hospital liaison officer or regional eye health coordinator should organise the patient's return to their community and let the community's health workers know that the patient is about to return.

8.3 Clinic records

An operation summary (giving details of the date, the technique used, the power of the intraocular lens, and any complications that arose), a report of the first-dressing findings (detailing visual acuity and any complications) and a copy of the instructions for post-operative care should be faxed or sent to the patient's community clinic.

This information is for the use of the attending health workers, nurses and the primary care physician, who will generally supervise the patient during the convalescence period and be responsible for early detection and referral of complications. The ophthalmologist will also need to see the records when he or she visits the community to provide follow-up care.

9 | Complications following routine cataract surgery

Among the possible complications in the immediate post-operative period are:

- ▶ corneal oedema (0.3 per cent)¹¹;
- ▶ raised intraocular pressure (1.4 per cent)¹¹;
- ▶ endophthalmitis (0.13 per cent).¹¹

Among the possible longer-term post-operative complications are:

- ▶ cystoid macular oedema (1.4 per cent)¹¹;
- ▶ persistently raised intraocular pressure or glaucoma (1.4 per cent)¹¹;
- ▶ retinal detachment, especially if vitreous loss has occurred (0.7 per cent)¹¹;
- ▶ decentred or dislocated intraocular lens (1.1 per cent)¹¹;
- ▶ posterior capsular thickening (19.7 per cent)¹¹;
- ▶ exacerbation of some types of pre-existing aged-related macular degeneration;
- ▶ exacerbation of diabetic retinopathy;
- ▶ unsatisfactory post-operative refractive status.

Despite these potential complications, cataract surgery is a highly effective procedure. The pooled results of pre-1992 literature show that post-operative visual acuity reached 6/12 or better in 90 per cent of all cases of cataract surgery and in 95 per cent of cases without pre-surgical ocular co-morbidity.¹¹ The Cataract PORT study showed an improvement in VF-14 in 89 per cent of patients, an improvement in satisfaction in 85 per cent of patients, and an improvement in self-reported difficulty with vision in 80 per cent of patients.¹⁸ Nevertheless, patients and ophthalmologists must recognise that complications do occur from time to time and that cataract surgery cannot be considered a risk-free or minor procedure.

Operative complications of an ocular or medical nature are possible indications for unplanned post-operative hospitalisation. Possible ocular complications are hyphema, uncontrolled elevated intraocular pressure, threatened or actual expulsive suprachoroidal haemorrhage, retrobulbar haemorrhage, severe pain, and other problems requiring acute management or careful monitoring.

Possible medical complications are cardiac instability, respiratory instability, a cerebrovascular episode, diabetes mellitus requiring acute management, uncontrolled nausea or vomiting, acute urinary retention, acute psychiatric disorientation, and other medical conditions requiring acute management or careful monitoring.

Planned post-operative hospitalisation might be warranted in the following circumstances:

- ▶ if the patient has medical conditions that call for prolonged post-operative observation by nurses or other skilled personnel;
- ▶ if best correctable vision in the unoperated eye is 6/60 or worse;
- ▶ if the patient is mentally debilitated or diagnosed as mentally ill;
- ▶ if the patient cannot walk or cannot care for himself or herself, or if a responsible carer is unavailable, during the immediate post-operative period.

If a serious complication does occur during the convalescence period:

- ▶ The ophthalmologist must make themselves available to advise the attending Aboriginal Health Worker, nurse or primary care physician.
- ▶ The patient may be reviewed by the ophthalmologist, using telemedicine technology.
- ▶ The patient may need to be transferred to the ophthalmologist's metropolitan base practice or hospital.

10 | Post-operative review

After the first dressing, the timing of the ophthalmologist's review of the patient will probably be determined by the ophthalmologist's schedule for visiting the community, which may not be until two or three months after the surgery.

This review will include an assessment of:

- ▶ visual acuity
- ▶ intraocular pressure
- ▶ slit lamp examination of the anterior segment
- ▶ indirect ophthalmoscopy of the fundus

Further, and as appropriate, the assessment will include referral for refraction and dispensing of spectacles and determining the progress and completion of post-operative rehabilitation.

During the convalescence period, ideally the patient will follow the advice and instructions of the ophthalmologist. In turn, the ophthalmologist's obligation to the patient is to provide post-operative eye care or, when necessary, make arrangements for referral of the patient to another ophthalmologist. This continues until post-operative rehabilitation is complete.

At a minimum, following phacoemulsification and implant lens surgery, the patient should be reviewed within three days of surgery and undergo a final review about two to three weeks after surgery.

A dilated ophthalmic exam should be performed at least once during the post-operative period to visualise the intraocular lens for proper centration, to assess the status of the lens capsule, and to evaluate the peripheral retina for retinal traction, tears, detachment or posterior vitreous detachment.

The timing and frequency of refraction will depend on the patient's needs, the extent of astigmatism, and the stability of the measurement. The ophthalmologist can cut or remove sutures to reduce astigmatism. Usually, optical correction can be prescribed six to 12 weeks after standard extracapsular cataract extraction surgery and between one and four weeks after surgery by phacoemulsification or manual nucleus fragmentation.

11 | Posterior capsule opacification

The incidence of posterior capsule opacification depends on a number of factors, among them the type of surgery, the age of the patient, and the type of intraocular lens material. Reported incidence ranges from 3 to 58 per cent within three years of surgery.²⁷ A figure of 20 per cent is commonly quoted.²⁵ There are no data on the incidence of posterior capsule opacification among Indigenous Australians.

Diagnosis of the condition is based on reported reduced vision or problems with glare or reduced colour contrast. The presence of capsule opacification is confirmed by ophthalmoscopy or retinoscopy and slit-lamp biomicroscopy. Other causes of visual loss should also be considered.

Nd:YAG laser capsulotomy is the recognised technique for treating capsular opacification. Treatment should usually be delayed for at least three months following surgery, and the patient's informed consent should be obtained. Indications for the procedure are capsule opacification leading to either functional visual impairment or impaired visualisation of the retinal fundus for the evaluation or treatment of retinal disease.

Among the complications associated with Nd:YAG laser capsulotomy are:

- ▶ transient elevation of intraocular pressure;
- ▶ retinal detachment;
- ▶ cystoid macular oedema;
- ▶ hyphema;
- ▶ intraocular lens subluxation or dislocation;
- ▶ direct intraocular lens damage, with visible pitting;
- ▶ vitreous prolapse.

The frequency of follow-up visits after such a procedure varies, depending on the patient's condition and pre-existing co-morbidities. The intraocular pressure of patients with compromised optic nerve status should be monitored. A dilated ophthalmic exam should be performed within one year to visualise the capsule and to check for possible retinal detachment. Patients with risk factors for retinal detachment—for example, young high myopes and patients with longer axial length, pre-existing lattice degeneration or a history of retinal detachment in either eye—should be examined within one month of surgery. Most importantly, patients should be educated about the symptoms of posterior vitreous detachment and retinal tears and detachment and the need for immediate examination if these symptoms are noticed.

12 | Standards of care

The standards and obligations of care for surgical services provided in rural and remote settings should be no less than those pertaining to the ophthalmologist's metropolitan private or public practice.

The ophthalmologist should disclose to the prospective surgical cataract patient his or her personal involvement with organisations, medical suppliers or individuals that may create a conflict of interest in relation to the cataract surgery to be undertaken.

The Royal Australian and New Zealand College of Ophthalmologists is opposed to any payment by an ophthalmologist to any party for referring to him or her a patient who undergoes a surgical procedure.

