

Immediately sequential bilateral cataract surgery (ISBCS) adapted protocol during COVID-19



Simrenjeet Sandhu, Daisy Liu, Pamela Mathura, Mathew Palakkamanil, Khaliq Kurji, Christopher J. Rudnisky, Kam Kassiri

Objective: To describe the steps, hurdles, and recommendations for implementation of the immediately sequential bilateral cataract surgery (ISBCS) evidence-based protocol at a high-volume Canadian tertiary care centre.

Design: Quality-improvement study.

Participants: A total of 406 patients who underwent ISBCS from July 2020 to December 2020. Patients were selected based on specific inclusion and exclusion criteria including psychosocial factors, refractive error and consent. This initiative impacted staff at all levels involved with cataract surgery.

Methods: The Model of Improvement framework was used and involved numerous discussions with multidisciplinary teams of ophthalmologists, nursing and support staff, management, pharmacists, and medical device reprocessing teams. This initiative was created and refined via a thorough review of the literature and current best practices. It was implemented in July 2020 after a nursing “huddle.” Any adverse outcomes and overall impact were collected from various levels of staff involved.

Results: Each eye was treated as a separate surgery with a double time-out per bilateral case. Additional measures were taken to ensure different lot numbers for medications, equipment, and materials. This practice increased surgical volume by approximately 25% and reduced the number of patient visits by 50%, reducing potential COVID-19 exposure.

Conclusions: The resulting protocol from our study may be useful to other centres wishing to integrate ISBCS as one example of successful implementation. Of the 406 cases of ISBCS performed, we report zero cases of toxic anterior segment syndrome or endophthalmitis. In times of decreased elective surgeries, ISBCS is a safe and effective option to supplement surgical volume and provide significant patient benefits.

Objectif: Décrire les étapes, les obstacles et les recommandations en vue de l'implantation d'un protocole factuel en matière de chirurgie de la cataracte bilatérale immédiatement séquentielle (CCBIS) dans un centre de soins tertiaires traitant un grand nombre de patients au Canada.

Nature: Étude d'amélioration de la qualité.

Participants: Un total de 406 patients qui ont subi une CCBIS entre juillet 2020 et décembre 2020 ont été choisis en fonction de critères d'inclusion et d'exclusion spécifiques, dont les facteurs psychosociaux, l'erreur de réfraction et le consentement. Ce projet faisait appel à l'ensemble du personnel concerné par la chirurgie de la cataracte.

Méthodes: Nous avons eu recours à un modèle d'amélioration de la qualité et tenu de nombreuses discussions avec des équipes multidisciplinaires formées d'ophtalmologistes, de membres du personnel infirmier, du personnel de soutien et de la direction, de pharmaciens et de personnes chargées du retraitement des dispositifs médicaux. Le projet a été créé et mis au point après un examen approfondi de la littérature et des meilleures pratiques actuelles. Il a été implanté en juillet 2020 à la suite d'une « réunion en petit comité » du personnel infirmier. Tous les intervenants ont fourni des données sur les résultats indésirables et les répercussions globales du projet.

Résultats: Chaque œil a été traité comme intervention chirurgicale distincte et s'accompagnait d'une pause chirurgicale distincte, donc deux pauses par cas bilatéral. Des mesures supplémentaires ont été prises pour s'assurer que les médicaments, l'équipement et le matériel provenaient tous de lots différents, ce qui a augmenté le volume chirurgical d'environ 25 % et réduit le nombre de visites des patients de 50 %, d'où une atténuation de l'exposition éventuelle à la COVID-19.

Conclusions: Le protocole issu de notre étude peut servir d'exemple d'implantation réussie pour d'autres centres qui souhaitent intégrer la CCBIS. Lors des 406 instances de CCBIS, nous n'avons recensé aucun cas de syndrome du segment antérieur toxique ni d'endophtalmie. Dans un contexte de réduction du nombre de chirurgies non urgentes, la CCBIS représente une option sûre et efficace pour augmenter le volume chirurgical et offrir aux patients des avantages significatifs.

Because of the COVID-19 pandemic response, elective surgery in Canada has decreased drastically, resulting in markedly increased waitlists. An average of 75.5 days across all provinces were lost to perform procedures in the spring of 2020 alone.¹ With patients previously waiting many months (up to 219 days in 2019)² for cataract surgery in an already backlogged healthcare system, it is critical to provide

timely care to patients, despite these new challenges, while also providing high quality outcomes.

Immediately sequential bilateral cataract surgery (ISBCS) has been debated since the inception of cataract surgery. Though not accepted as the standard of care due to complications at the time,³ there are numerous well-documented benefits to ISBCS. In the last decade there has been a

growing body of literature, including several randomized controlled trials, demonstrating the safety and efficacy of ISBCS.^{4–6} ISBCS is also becoming a common practice globally, particularly in countries that do not financially penalize for simultaneous surgery; in Finland and Sweden, 40% of all cases are ISBCS.^{5,7,8} In 2006, 80% of all cases in the Canary Islands were ISBCS and found to be equally as safe and efficient as DSBCS (delayed sequential bilateral cataract surgery),⁹ which is the current standard of practice in North America.

Global ISBCS statistics are not yet available for the United States and Canada. However ISBCS is emerging as a primary consideration for eligible patients. For instance, Kaiser Permanente Health Maintenance Organization, the largest health maintenance organization in the United States, reported on 3,561 ISBCS procedures (7,122 eyes).^{10–12} Vision Group Canada reports over 30,000 ISBCS procedures, including bilateral refractive lens exchange, over the past decade performed by 50 surgeons. Dr. Steve Arshinoff based in Toronto, Canada has completed over 12,000 ISBCS procedures over the past 25 years, and currently performs ISBCS on 80%-90% of patients.^{5,8–13} Finally, Centre Universitaire d'Ophtalmologie du CHU de Québec-Université Laval reports over 6,500 ISBCS procedures (13,000 eyes) over 4 years, with resident participation, accounting for over 50% of all cataract procedures.¹⁴

Notably, these groups have unanimously reported no cases of bilateral postoperative endophthalmitis or bilateral toxic anterior segment syndrome (TASS) while following the General Principles for Excellence in ISBCS established by the International Society of Bilateral Cataract Surgeons (iBCS) in 2009.¹⁵ Historically, the main barrier to general acceptance of ISBCS has been the possibility of developing these complications, which have severe consequences. With the introduction of intracameral antibiotics including cephalosporins, vancomycin and fluoroquinolones, of which moxifloxacin is the most common, these risks have been reduced considerably.¹⁶ Growing literature supporting the safety and efficacy of ISBCS combined with the unique challenges of the COVID-19 pandemic have led the Department of Ophthalmology at the University of Alberta in Edmonton, Canada to adopt new standards of practice for cataract surgery.

In April 2020, the challenge faced was that cataract suites were operating at 0% capacity.¹ By May and June 2020, ophthalmologists gradually returned to operating rooms with an immense backlog of thousands of cataract surgeries, but were restricted to 50% capacity. Consequently, the Department of Ophthalmology reviewed the current CPSBC guidelines and consulted CMA regarding medico-legal considerations of ISBCS.

This quality improvement (QI) study will discuss the steps undertaken to adapt, create and implement our ISBCS guidelines/process initiative at our hospital-based surgical center. Candidacy including indications and

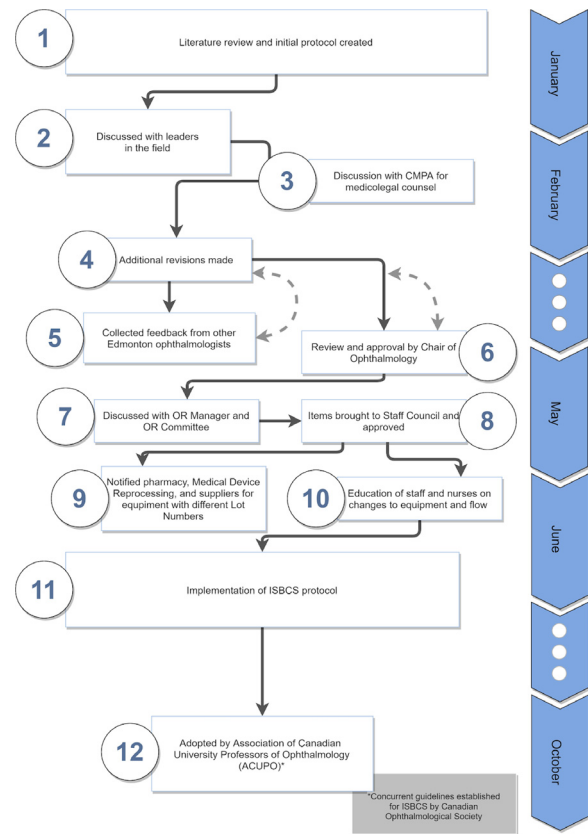


Fig. 1—Flowchart depicting the steps and timeline (January 2020–October 2020) of the implementation of immediately sequential bilateral cataract surgery in Edmonton.

contraindications for our ISBCS initiative will be reviewed, challenges and potential solutions will be outlined. We will also discuss major complications that have occurred since the implementation of ISBCS at our centre.

Methods

A multidisciplinary study team was assembled that included ophthalmologists, nursing staff, management, pharmacists, and suppliers and staff on the medical device reprocessing team to develop the proposed ISBCS initiative (Fig. 1). Using stakeholder concerns and frontline perspectives, a literature review of best practices and other institutions' experiences and a new ISBCS guidelines were established.

Fig. 2 and Table 1 and 2

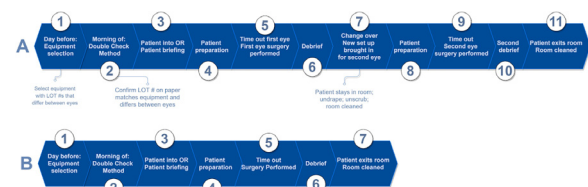


Fig. 2—Comparison of (A) the steps of immediately sequential bilateral cataract surgery with (B) the steps of unilateral cataract surgery.

Table 1—Candidacy favouring immediately sequential bilateral cataract surgery

Candidacy	Considerations
Patient consent	Every patient must be free to choose DSBCS over ISBCS.
Cataract surgery qualification	Qualification follows current COS guidelines for each eye.
Psychosocial concerns	Concerns include lack of support to attend surgery and visits.
Potential loss of independence	Patients living alone, patients with care providers unable to attend appointments.
High refractive errors	Decreased fall risk.
Loss of fusion	Loss of fusion that can affect recovery.
Travel time	Patients travelling long distances.
General anesthetic	Medical comorbidities requiring a general anesthetic (e.g., dementia, psychiatric illness, developmental delay, etc.).

COS = Canadian Ophthalmological Society; DSBCS = delayed sequential bilateral cataract surgery; ISBCS = immediately sequential bilateral cataract surgery.

The Model for Improvement framework guided this QI project, which involved plan-do-study-act cycles, allowing for continuous innovation, evaluation, and improvement.¹⁷ The aim of this QI study was to review and adapt the ISBCS best practices, address stakeholder concerns, and obtain frontline perspectives to better use operating room time during the COVID-19 pandemic. The QI project goal was to complete 5 ISBCS cases per day per surgeon per surgical day, increasing the daily cataract volume per surgeon in 6

months. The rationale for selecting 5 cases per day was based on the number of surgeons, past procedure time history, the allocated operating room time, and the number of patients on the waitlist.

The Donabedian conceptual evaluation framework was employed to evaluate the intervention through a set of measures, including process, outcome, and balancing measures.¹⁸ The process measures were number of ISBCS procedures completed per day per surgeon using the adapted guideline intervention. The outcome measures were reduction of cataract surgical waitlist, optimization of operating room time, and decreased visits to the clinic and hospitals. Balancing measures indicate unintended adverse events, which included the number of cases of TASS or endophthalmitis.

The new ISBCS guidelines were trialed initially starting in July 2020. The first cycle of improvement was for 1 month, followed by a formal QI team debrief, where slight modifications were made regarding nursing role and responsibility. During daily nursing huddles, all staff members were informed of the change and encouraged to prospectively report adverse events and process impacts and to offer comments and suggestions regarding the initiative. This daily feedback was given verbally to the managers of the operating room. Subsequently, every month our QI team met to formally debrief to ensure where appropriate continuous guideline adjustments were made by the study team and

Table 2—Potential contraindications ISBCS

1. Unilateral cataract	- Every patient must feel comfortable with intraoperative risks and postoperative requirements. - Severe or dense cataracts - Sequelae of recent or present ocular trauma (traumatic cataract) with phacodonesis - Phacodonesis - Clinically significant pseudoexfoliation (e.g., lens subluxation, phacodonesis) - Active ocular surface infection (untreated severe blepharitis, mucocoele, dacryocystitis) - Uncontrolled diabetes mellitus (surgeon discretion) - Immunosuppression and immunodeficiency (including systemic steroids) - Active leukemia or lymphoma - Povidone-iodine allergy preventing adequate cleaning - Any environmental consideration that could increase the risk of endophthalmitis (e.g., construction in an adjacent operating theatre, a change in cleaning or sterilization practices) - Moderate to advanced endothelial dystrophy - Guttata (surgeon discretion based on degree of guttae) - Shallow anterior chamber (surgeon discretion based on anterior chamber depth and comfort level)
2. Patient uncertainty about ISBCS	
3. Lenticular abnormalities	
4. Increased risk for infection	- Increased intraoperative risk of retinal detachment, vitreous loss, posterior capsular rupture; based on surgeon comfort level - Previous refractive surgery - Axial length difference between eyes > 1 mm (unexplainable with history and/or examination) - Can result in poor patient outcomes - Depending on risk of severe postoperative inflammation (last episode, severity, recovery time, etc.) - Some retinal pathologies may worsen after cataract surgery. - Surgeon discretion + comfort with anti-VEGF use - Examples include intraoperative floppy iris syndrome; based on surgeon discretion
5. Increased risk for corneal decompensation	
6. Axial length <21 or >26 mm	- anti-VEGF = anti-vascular endothelial growth factor; IOP = intraocular pressure; ISBCS = immediately sequential bilateral cataract surgery.
7. Increased risks of inaccurate biometry (Note: With newer technologies and formulas, this error rate has been drastically reduced.)	
8. Severe glaucoma or increased risk for high IOP	
9. Uveitis	
10. Retinal pathologies	
11. Other complex cases	

anti-VEGF = anti-vascular endothelial growth factor; IOP = intraocular pressure; ISBCS = immediately sequential bilateral cataract surgery.

Table 3—Patient consent for ISBCS

Patient must be informed of the comparative risks of ISBCS versus DSBCS. Possibility that the surgeon may delay the second surgery resulting from concerns with the first eye. Examples include central endothelial damage, posterior capsular rupture, zonular instability, vitreous prolapsed, etc.
Discuss the risk of 1:1 million of bilateral permanent decreased vision down to total blindness from complications such as bilateral postoperative endophthalmitis.
Preference of lens options (e.g., Monofocal, TORIC, trifocal lenses, extended depth of focus lenses) as well as power and far-point measurements (if applicable).
Chart documentation: the consent discussion is documented in the patient's health care record and includes the nature of the health care proposed; the risks, benefits, and alternative(s) discussed with the patient (i.e., delayed sequential bilateral cataract surgery); and any specific additional issues or concerns that arose through the discussion and how they were addressed.
DSBCS = delayed sequential bilateral cataract surgery; ISBCS = immediately sequential bilateral cataract surgery.

communicated to all staff. All adverse events were reported, tracked, and followed up by the retina team. During these meetings, patient inclusion criteria, consent guidelines, intraoperative guidelines, and postoperative considerations were developed. We also collected real-time nursing feedback to make swift adjustments to support protocol implementation. Additionally, nursing feedback suggested that all ISBCS procedures be booked after 9 a.m., when full nursing capacity would be available. Also, it was recommended that we standardize the order to which eyes would undergo ISBCS, always starting with the left eye and then finishing with the right eye, to further streamline the process. Historically, the majority of surgeons were right-handed; therefore, completing the left eye first can be helpful in avoiding it while working on the right eye. Standardizing in this way also can reduce human error as well as improve efficiency.

Separating, tracking, and recording of the lot numbers of pharmaceutical products was a new and important requirement that was previously not followed as stringently and was performed on a per-case basis. This is important if there is a manufacturing abnormality or irregularity, preventing bilateral complications of TASS. Additionally, in the unfortunate circumstance that a patient develops TASS at one particular location, the offending agents may be quickly identified. It should be noted that the process of separating, preparing, and recording products via lot number by nursing staff prior to the day of surgery adds approximately 15 minutes per eye. We have suggested creating right and left shelves for supplies for easy access and rapid availability. The use of intracameral antibiotics (specifically moxifloxacin) was discussed and strongly recommended in all cases of ISBCS.

Results

Limitations of the protocol included only allowing a maximum of 5 bilateral cases per day as a trial period, increased turnover time between patients because of mandated COVID-19 cleaning, increased time resulting from hospital-

related screening protocols, and availability of staff due to COVID-19 isolation.

Preintervention, before the COVID-19 pandemic, the average number of cataract extraction cases completed per surgeon per day was approximately 21. Each surgical day length was roughly 9 hours. After this intervention, in October 2020, the number of cases completed was limited to 15 per surgeon per day. Each day was of the same duration (9 hours). However, of those 15 cases, each surgeon completed 5–6 bilateral cases per day, which yielded a total of 20–21 eyes per surgeon per surgical day. Operating at this volume of bilateral cataracts brought the daily cataract volume per surgeon to greater than 90%. There were a total of 406 cases that employed the adapted guidelines, and no cases of TASS or endophthalmitis were reported by the retina team.

A thorough discussion should be undertaken with the patient prior to ISBCS. The working group discussed consent for ISBCS with members of the Canadian Medical Protective Association, and the results are summarized in [Table 3](#).

Edmonton Zone Key Intraoperative Guidelines

Intraoperative considerations

- Each eye is treated as a surgeon would treat a different patient, following all requirements accepted by the centre through college approval.
 - A double time-out is performed:
 - The first time-out is performed with the team, including nurse, anaesthesiologist, and patient prior to sedation.
- The second time-out occurs with the nurse holding up the box containing the lens and intelligent Optical Link Mapper (iOLM) and chart with designated iOLM power displayed to the surgeon prior to the first incision. (Using this technique, Kaiser Center in California reported no cases of incorrect lens implantation. Similar results characterize the Canadian experience because Steve Arshinoff reports no cases of intraocular lens exchange for period 2000–2020 in his practice.)
- Sequence of eyes operated on: the same sequence can be performed for all ISBCS patients, where first the left eye is operated on, followed by the right. In this manner, the same flow is observed.
- The second lens does not enter the room until the turnover time.
- If there is any difficulty with the first eye, the team should be ready to pause and postpone the surgery for the second eye.
- Intracameral fluoroquinolones are recommended for all ISBCS procedures per iBCS. The surgeon can choose to hold this in case of contraindications.
- Fluids: All fluids used in each eye should have different lot numbers than the fluids used in the second eye, including tetracaine, balanced salt solution bottles, phacoemulsification bags, ophthalmic viscosurgical devices,

Table 4—Examples of nursing feedback and solutions

Nursing Challenges	How We Are Coping (Proposals)
Clearly visible IOL power on slate for scrub nurse to check	Currently must rely on the circulating nurse Proposal: Display VAX slate on one monitor in the room. Recommend following standard routine sequence if possible. Each eye is entered as a different patient on the slate.
Not knowing which eye we start with?	Create a standard for anaesthesia. Nurses need to familiarize themselves with the cart. Communication board would be helpful.
Not knowing if one or both eyes need freezing?	Book bilaterals after the fourth case, and book 2 in a row at a time.
Searching for medications with the appropriate lot number is challenging.	Management is buying a whiteboard to communicate updates, and it will be kept with the bilateral supplies.
Having enough time to organize the cases	
Constant change of medical availability in different lot numbers and communicating these to the nursing staff	
IOL = intraocular lens; VAX =	

and lidocaine. Iodine preparations with the same lot number may be used.

8. Two batches of extras need to be marked as “Right/Left” and present in the room for potential phenyl, vision blue, or any other liquid consumables. (After implementation, it was determined that very rarely are the same extras needed for both eyes.)

Edmonton Zone Postoperative Considerations

Postoperative patient care will be surgeon specific. Recommendations include eye protection (glasses or shield) to be used immediately after surgery during daytime hours and tape-on shields for the first 5–7 nights. The drop regimen should follow that of DSBCS: topical fourth-generation fluoroquinolone, steroid, and consideration of nonsteroidal anti-inflammatory drugs; iSBCS members recommend moxifloxacin 6 times a day for 3–4 days and then 4–5 times a day for 5 days.^{19,20} Patients are also recommended to get a different set of bottles for each eye. Eyes should not be patched to allow prompt start of postoperative drops early after surgery. Patients are closely followed for signs of endophthalmitis and TASS. We also recommend informing triage teams to allow ISBCS patients to be seen with a lower threshold of symptoms. In Alberta, this would include Health-Link, a 24/7 call line where Albertan’s can seek advice from a registered nurse pertaining to any immediate health concern. Finally, all complications should be tracked and incidents of TASS reported to the Canadian Ophthalmological Society TASS Task Force.

Table 4 is an example of organized communication occurring at our institution between multidisciplinary teams. All staff members were informed of the change and encouraged to prospectively report adverse events and process impacts and to offer comments and suggestions regarding the initiative. Any required adjustments were made by the study team and communicated to all staff.

Discussion

A total of 406 patients underwent ISBCS between July 2020 and December 2020. In spite of the addition of preparatory steps and time to accommodate ISBCS, we found

that incorporating ISBCS increased surgical volume by up to 25% compared with DSBCS alone. Since the beginning of the pandemic, surgical slates have slowly approached 75% of previous capacity, and with the addition of ISBCS, they have surpassed 90%. There are undeniable benefits to patients, especially from a medical education perspective. It also should be noted that our institution set a maximum number of ISBCS procedures that were allowed to be completed per surgeon on any given day, which was 4 during the initial rollout. We believe that there may be potential to increase surgical volume further if more bilateral cases are permitted.

Patient risks for ISBCS have been well described in the literature. To our knowledge, bilateral postoperative endophthalmitis (POE) has been reported in 6 patients in the literature (Table 5).^{3,21–23} It should be noted, however, that these cases did not follow the guidelines now established by the iSBCS. Steve Arshinoff, a world leader in ISBCS with more than 12 000 cases, has had no cases of bilateral POE while following the iSBCS guidelines. Arshinoff and Bastianelli also reviewed similar practices and found no instances of bilateral POE in 95 606 cases.⁸ Vision Group Canada (Cataract MD) reported 31 047 cases of ISBCS with no cases of bilateral POE or TASS. Kaiser Permanente reported 1 instance of unilateral POE in 5247 ISBCS procedures (10 494 eyes) and 2 instances of unilateral POE in 38 736 DSBCS eyes. The reported risk of unilateral POE following ISBCS using the iSBCS guidelines, including intracameral antibiotics at the end of surgery, is 1 in 14 352–16 800 (0.006%–0.007%) by the iSBCS and 1 in 10 494 by Kaiser Permanente.^{11,15} Our group in Edmonton strongly recommends and has adopted the use of intracameral antibiotics in ISBCS. We did not have any reported cases of endophthalmitis.

TASS is a rare and devastating complication of intraocular surgery that is defined as an acute sterile anterior chamber inflammatory reaction that usually develops within days of anterior segment surgery. To our knowledge, no cases of bilateral TASS following ISBCS have been reported in the literature. In the rare event of multiple TASS complications occurring at 1 institution, the strict 2009 guidelines of the iSBCS are meant to minimize the risk of TASS in both eyes.¹⁵ We did not have any cases of TASS with the implementation of ISBCS.

Table 5—Reported bilateral postoperative endophthalmitis cases

Date and journal	1978 British Journal of Ophthalmology	2005 Journal of Cataract and Refractive Surgery	2007 Indian Journal of Ophthalmology	2008 Journal of Cataract and Refractive Surgery	2018 American Journal of Ophthalmology	2019 Ophthalmology Retina Journal
Author	Benezra	Ozdek	Kashkoui	Puvanachandra	H-Da Mota	Callaway
Country, patient	Malawi, N/A	Turkey, 70-year-old male	Iran, 67-year-old male	United Kingdom, 81-year-old female	Mexico, 77-year-old male	Mexico, 80-year-old male
Risk factors	Bacteremia Dysentery	—	—	—	—	Dementia
Breach in ISBCS sterility protocol	Same instruments + fluids used for both eyes	Same fluids/OVD + same instrument with flash autoclave used in both eyes	Same instruments + fluids used in both eyes	Same flash autoclave + same flash cycle used in both eyes	Sterility protocol asked by the authors, not given from the surgical center	Found covered in his stools Sterility protocol asked by the authors, not given from the surgical center
Surgery done	ICCE OU	PCIOL OU	PC OD/ECCE OS unplanned	PCIOL OU ICam cefur	PCIOL OU	PCIOL OU
Endophthalmitis management	N/A	Vanco/Cefal/Dexa IVit + Top Oral Cipro	Vanco/Arni IVit + Top PPV/ATB	Vanco/Cefur IVit + Top After 48 h: top + PO Pred	Vanco/Cefal IVit + Top PPV/ATB IVit + Top + Syst	D1-SC steroids D2-Vanco/Cefal IV D4-PPV/Van/Ceft D6-PPV/Van/Ceft
Pathogen	Unknown	Negative tap	IVit SConj + System	Staph epi	Pseudomonas	Pseudomonas
Final BCVA	HM OU	20/50–20/40	NLP OU	20/30 OU	NLP OU	NLP OU

N/A = not available; OVD = ophthalmic viscosurgical devices; ICCE = intracapsular cataract extraction; PCIOL = posterior chamber intraocular lens; PC = posterior chamber; Vanco or Van = vancomycin; Cefa = cefazolin; Dexa = dexamethasone; IVit = intravitreal; Top = topical; ICam = intracameral; Cefur = cefuroxime; Cipro = ciprofloxacin; PPV = pars plana vitrectomy; ATB = antibiotics; SC or Sconj = subconjunctival; System or Syst = systemic route; PO = oral route; D1/2/4/6L = days 1, 2, 4, and 6; Cefal or ceft = ceftazidime; BCVA = best-corrected visual acuity; HM = hand motion; NLP = no light perception.

A refractive surprise has been a potential concern for some ophthalmologists considering ISBCS. Some cataract surgeons feel more comfortable with delayed sequential bilateral cataract surgery so that the refractive outcome of the first eye may be used to assist with the surgical planning of the contralateral eye. However, Guber et al.²⁴ retrospectively evaluated 110 sequential ISBCS procedures, for which refraction was within ± 1.0 D of the target in 83% of eyes. Only 5% of cases (n = 6) would have benefitted from DSBCS, potentially altering intraocular lens choice. The Kaiser Permanente group reported the postoperative spherical equivalent to be within 0.5 D in 61% of patients OU in 13 711 DSBCS procedures and 63% of patients OU in 3561 ISBCS procedures.¹¹ With newer imaging modalities and formulas, the refractive measurements of the second eye are very well tolerated by most patients.

Postoperative macular edema and corneal decompensation may occur more than 4 weeks after surgery and would not be identified prior to surgery of the second eye in DSBCS procedures. Cystoid macular edema and corneal edema are treatable either by drops, injections, or surgery. Careful selection of patients for ISBCS minimizes these risks.

It should be noted that conversion to DSBCS can be attributed to a number of factors including central endothelial damage, posterior capsular rupture, zonular instability, vitreous prolapse and others. Kaiser Permanente reported a conversion rate to DSBCS of 0.7%.¹¹ It is imperative that all patients interested in ISBCS be counselled on the possibility of conversion to DSBCS preoperatively.

There are a number of benefits in performing ISBCS, particularly during this pandemic. There is a 50% decrease in the number of hospital, clinic, and pharmacy visits pertaining to the operating day and postoperative visits due to 1 fewer visit. ISBCS may also be ideal for anxious patients, as there is only one surgery rather than having to think about two separate surgeries. Additionally, respecting physical distancing policies, there is a 50% decrease in the number of close contact interactions with perioperative caregivers. There is also faster visual recovery and patients are able to obtain spectacle adjustment sooner. Quicker restoration of binocular vision and stereopsis would allow patients to return to driving sooner and also reduce the risk of falls. Patients would likely find there is reduced discomfort and morbidity between surgeries, particularly in patients with high levels of anisometropia. Since both eyes are completed on the same day, there is likely a decreased risk of confusion in drop regimen between the two eyes. Furthermore, patients and caregivers would have less time off work and decreased transportation costs while decreasing the length and burden of care on the caregiver.

There are numerous benefits of ISBCS to the healthcare system including decreased waitlists for surgeries and decreased hospital costs. Hospital and office administration only needs to schedule one day per patient rather than two days and there is a decreased risk of patient identification

errors. This is a 50% decrease in their scheduling per ISBCS patient. From a pandemic perspective, fewer patients require preoperative processing and preoperative and recovery areas are less crowded. Resources are better utilized as there is a decreased need for porters and stretchers and more efficient use of anaesthesiology time. In Canada, each ISBCS could significantly reduce the average hospital costs by 34%, with savings of approximately \$500 compared with DSBCS.⁷

After approval of ISBCS at our institution the nursing staff were advised of the changes in their morning “huddle”. ISBCS was not a completely new concept to the team as this was occasionally performed in extenuating circumstances (Ex. Patients with cognitive impairment requiring a general anesthetic). Typically, five nursing team members are assigned to two operating rooms. However, due to the increased time required for documentation and preparation, a sixth nursing staff member was added to these rooms. Secondly, we received feedback from our nursing team that flow could be improved and opportunities for error reduced if all ISBCS were performed in sequence.

Residents and fellows can still be involved in ISBCS based on patient consent, resident skill level, and complexity of the cases. In fact, resident involvement and teaching may also be improved with ISBCS. By observing the surgery on the first eye, the resident may be better equipped to immediately use that surgical experience to help guide surgical steps on the contralateral eye, as both eyes may behave similarly in the same patient.

A multidisciplinary team was paramount in moving this initiative forward, all with a clear goal of safely improving patient care during a widespread pandemic. This initiative continues to be a work in progress, with a goal in improving specific steps of this initiative as seen in Table 4. Broad principles that provide guidance for planning improvements include the use of a multidisciplinary team. Additionally, a critical component during this process was the importance of receiving constructive feedback through all stages of development and implementation. This was complemented by keen and receptive team members that were constantly making changes to streamline and improve patient care. Elective surgery in Canada has drastically decreased, resulting in markedly increased waitlists due to the COVID-19 pandemic response. When performed under the proper guidelines, ISBCS offers a low risk, cost effective solution to help decrease the backlogged surgical wait times. Using a multidisciplinary study team, the study group was able to institute the ISBCS initiative in the Edmonton area.

References

1. Canadian Medical Association. Clearing the backlog: the cost to return wait times to pre-pandemic levels. Available at: www.cma.ca/sites/default/files/pdf/Media-Releases/Deloitte-Clearing-the-Backlog.pdf.
2. Canadian Institute for Health Information. Benchmarks for treatment and wait time in Canada: Cataracts. Available at: waittimes.cihi.ca/All/cataract. Accessed December 2020;14.
3. Benezra D, Chirambo MC. Bilateral versus unilateral cataract extraction: advantages and complications. *Br J Ophthalmol* 1978;62:770–3.
4. Serrano-Aguilar P, Ramallo-Farina Y, Cabrera-Hernandez JM, et al. Immediately sequential versus delayed sequential bilateral cataract surgery: safety and effectiveness. *J Cataract Refract Surg* 2012;38:1734–42.
5. Sariikola AU, Uusitalo RJ, Hellstedt T, Leivo T, Kivelä T. Simultaneous bilateral versus sequential bilateral cataract surgery: Helsinki Simultaneous Bilateral Cataract Surgery Study Report 1. *J Cataract Refract Surg* 2011;37:992–1002.
6. Lundstrom M, Albrecht S, Nilsson M, Astrom B. Benefit to patients of bilateral same-day cataract extraction: randomized clinical study. *J Cataract Refract Surg* 2006;32:826–30.
7. O'Brien JJ, Gonder J, Botz C, Chow KY, Arshinoff SA. Immediately sequential bilateral cataract surgery versus delayed sequential bilateral cataract surgery: potential hospital cost savings. *Can J Ophthalmol* 2010;45:596–601.
8. Arshinoff S, Bastianelli PA. Incidence of post-operative endophthalmitis after immediate sequential bilateral cataract surgery. *J Cataract Refract Surg* 2011;37:2105–14.
9. Servicio de Evaluación del Servicio Canario de la Salud (SESCS). Seguridad, efectividad y coste efectividad de la cirugía de la cataratas bilateral y simula (SESCS 2006-05). Tenerife: SESC; 2006.
10. Amsden LB, Shorstein NH, Fevrier H, Liu L, Carolan J, Herrington LJ. Immediate sequential bilateral cataract surgery: surgeon preferences and concerns. *Can J Ophthalmol* 2018;53:337–41.
11. Herrington LJ. Immediate sequential versus delayed sequential bilateral cataract surgery: retrospective comparison of postoperative visual outcomes. *Ophthalmology* 2017;124:1126–35.
12. Shortein NH, Lucido C, Carolan J, Liu L, Slean G, Herrington LJ. Failure Modes and Effects Analysis of bilateral same-day cataract surgery. *JCRS* 2017;43:318–23.
13. Walter B, Arshinoff S. Is bilateral, same-day cataract the future? *Rev Ophthalmol* 2015.
14. Qi SR, Arsenault R, Hébert M, You E, Légaré ME, Arshinoff SA, Mercier M. Immediately sequential bilateral cataract surgery (ISBCS): an academic teaching center's experience [e-pub ahead of print]. *J Cataract Refract Surg*. doi: , accessed .
15. International Society of Bilateral Cataract Surgeons. iBCS General principles for excellence in ISBCS 2009. Available from: <https://valeandarou.com/files.dl/2010-07-20-FINAL-ISBCS-SBCS-suggestions-from-ESCRS-Barcelona.pdf>. Accessed May 31, 2018.
16. Hellinger WC, Bacalis LP, Edelhauser HF, et al. Recommended practices for cleaning and sterilizing intraocular surgical instruments. *J Cataract Refract Surg* 2007;33:1095–100.
17. Langley G, Moen RD, Nolan KM, et al. The improvement guide: a practical approach to enhancing organizational performance. 2nd ed. San Francisco, Calif: Jossey-Bass; 2009.
18. Donabedian A. Evaluating the quality of medical care. *Milbank Quart* 2005;83:691–729.
19. Puvanachandra N, Humphry RC. Bilateral endophthalmitis after bilateral sequential phacoemulsification. *J Cataract Refract Surg* 2008;34:1036–7.

20. Hernandez-Da-Mota S. *Pseudomonas aeruginosa*-induced bilateral endophthalmitis after bilateral simultaneous cataract surgery: case report. *Arq Bras Oftalmol* 2018;81:339–40.
21. Callaway NF, Ji MH, Mahajan VB, et al. Bilateral endophthalmitis after immediately sequential bilateral cataract surgery. *Ophthalmol Retina* 2019;3:618–9.
22. Ozdek SC, Onaran Z, Gürelik G, et al. Bilateral endophthalmitis after simultaneous bilateral cataract surgery. *J Cataract Refract Surg* 2005;31:1261–2.
23. Kashkouli MB, Salimi S, Aghaee H, et al. Bilateral *Pseudomonas aeruginosa* endophthalmitis following bilateral simultaneous cataract surgery. *Indian J Ophthalmol* 2007;55:374–5.
24. Guber I, Remont L, Bergin C. Predictability of refraction following immediate sequential bilateral cataract surgery (ISBCS) performed under general anaesthesia. *Eye Vis* 2015;2:13.

Footnotes and Disclosures

The authors have no proprietary or commercial interest in any materials discussed in this article.

From the Department of Ophthalmology, University of Alberta, Edmonton, AB.

Originally received Jan. 23, 2021. Final revision Oct. 4, 2021. Accepted Oct. 14, 2021.

Correspondence to Kam Kassiri, MD, Department of Ophthalmology and Visual Sciences, Faculty of Medicine and Dentistry, University of Alberta, 2319 Active Treatment Centre, 10240 Kingsway Avenue NW, Edmonton, AB, Canada T5H 3V9. kkassiri@ualberta.ca