Controversies, Consensuses, and Guidelines on Preventing, Diagnosing and Managing Acute-onset Bacterial Endophthalmitis after Cataract Surgery by the Academy of Asia-Pacific Professors of Ophthalmology (AAPPO), the Asia-Pacific Vitreo-retina Society (APVRS), and the Asia-Pacific Society of Ocular Inflammation and Infection (APSOII)

Namrata Sharma , Aafreen Bari , Srinivas K. Rao , Rupesh Agrawal , Penelope J. Allen , John C. Buchan , Andrew Chang , David F. Chang , Soon-Phaik Chee , Weirong Chen , Kuan-Jen Chen , Vanissa W.S. Chow , Taraprasad Das , Vivek P. Dave , Harry W. Flynn Jr , Tina Felfeli , Adrian T. Fung , Andrzej Grzybowski , Mary Ho , Wai Ching Lam , Liying Low , Mats Lundström , William F. Mieler , Nishant V. Radke , Paisan Ruamviboonsuk , Landon J. Rohowetz , Savitri Sharma , Tarun Sharma , Takashi Suzuki , Chi Wai Tsang , Ke Yao , Alvin L. Young , Mingzhi Zhang , Ke Zheng , Dennis S.C. Lam

PII: S0002-9394(25)00435-0
DOI: https://doi.org/10.1016/j.ajo.2025.08.031
Reference: AJOPHT 13536

To appear in: *American Journal of Ophthalmology*

Received date: June 8, 2025
Revised date: August 11, 2025
Accepted date: August 14, 2025

Please cite this article as: Namrata Sharma , Aafreen Bari , Srinivas K. Rao , Rupesh Agrawal , Penelope J. Allen , John C. Buchan , Andrew Chang , David F. Chang , Soon-Phaik Chee , Weirong Chen , Kuan-Jen Chen , Vanissa W.S. Chow , Taraprasad Das , Vivek P. Dave , Harry W. Flynn Jr , Tina Felfeli , Adrian T. Fung , Andrzej Grzybowski , Mary Ho , Wai Ching Lam , Liying Low , Mats Lundström , William F. Mieler , Nishant V. Radke , Paisan Ruamviboonsuk , Landon J. Rohowetz , Savitri Sharma , Tarun Sharma , Takashi Suzuki , Chi Wai Tsang , Ke Yao , Alvin L. Young , Mingzhi Zhang , Ke Zheng , Dennis S.C. Lam , Controversies, Consensuses, and Guidelines on Preventing, Diagnosing and Managing Acute-onset Bacterial Endophthalmitis after Cataract Surgery by the Academy of Asia-Pacific Professors of Ophthalmology (AAPPO), the Asia-Pacific Vitreo-retina Society (APVRS), and the Asia-Pacific Society of Ocular Inflammation and Infection (APSOII), *American Journal of Ophthalmology* (2025), doi: https://doi.org/10.1016/j.ajo.2025.08.031

Controversies, Consensuses, and Guidelines on Preventing, Diagnosing and Managing Acute-onset Bacterial Endophthalmitis after Cataract Surgery by the Academy of Asia-Pacific Professors of Ophthalmology (AAPPO), the Asia-Pacific Vitreo-retina Society (APVRS), and the Asia-Pacific Society of Ocular Inflammation and Infection (APSOII)

Authors:

Namrata Sharma[1#*]

Aafreen Bari[1#]

Srinivas K. Rao[2]

Rupesh Agrawal[3,4,5,6,7]

Penelope J. Allen[8,9,10]

John C. Buchan[11,12,13]

Andrew Chang[14]

David F. Chang[15]

Soon-Phaik Chee[16,17,18]

Weirong Chen[19]

Kuan-Jen Chen[20,21]

Vanissa W. S. Chow[22,23]

Taraprasad Das[24,25]

Vivek P. Dave[24]

Harry W. Flynn Jr[26]

Tina Felfeli[27,28]

Adrian T. Fung[29,30,31]

Andrzej Grzybowski[32,33]

Mary Ho[22,34]

Wai Ching Lam[35]

Liying Low[36,37]

Mats Lundström[38]

William F. Mieler[39]

Nishant V. Radke[40]

Paisan Ruamviboonsuk[41]

Landon J. Rohowetz[26]

Savitri Sharma[42]

Tarun Sharma[43]

Takashi Suzuki[44,45]

Chi Wai Tsang[22,23]

Ke Yao[46]

Alvin L. Young[22,34]

Mingzhi Zhang[47]

Ke Zheng[48]

Dennis S. C. Lam[40,49,50*]

*: Namrata Sharma and Dennis S. C. Lam contribute as co-corresponding authors.

[#] : Namrata Sharma and Aafreen Bari contributed equally to this work and should be considered co-first authors.

*Correspondence:

Dennis S.C. Lam

2001 Longxiang Boulevard, Longgang District, Shenzhen, China

dennislam321@cuhk.edu.hk

Namrata Sharma

Cornea, Cataract & Refractive Surgery Services Dr. R P Centre for Ophthalmic Sciences All India Institute of Medical Sciences, New Delhi, India

namrata.sharma@gmail.com

[1] Dr. Rajendra Prasad Centre for Ophthalmic Sciences, All India Institute of Medical Sciences, New Delhi, India

[2] Darshan Eye Care & Surgical Centre, Chennai, India

[3] National Healthcare Group Eye Institute, Tan Tock Seng Hospital, Singapore

[4] Programme for Ocular Inflammation & Infection Translational Research, National Healthcare Group Eye Institute, Singapore

[5] Duke-NUS Medical School, Singapore

[6] Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore

[7] Singapore Eye Research Institute, Singapore

[8] Centre for Eye Research Australia, Royal Victorian Eye & Ear Hospital, East Melbourne, VIC, Australia

[9] Ophthalmology, Department of Surgery, University of Melbourne, Melbourne, VIC, Australia

[10] Vitreoretinal Unit, Royal Victorian Eye and Ear Hospital, East Melbourne, VIC, Australia.

[11] Department of Ophthalmology, Leeds Teaching Hospitals NHS Trust, Leeds, UK

[12] The Royal College of Ophthalmologists' National Ophthalmology Database Audit, London, UK

[13] International Centre for Eye Health, LSHTM, London, UK

[14] Sydney Retina Clinic, Sydney Eye Hospital, University of Sydney, Sydney, NSW, Australia

[15] Altos Eye Physicians (D.F.C.), Los Altos, California, USA

[16] Department of Ophthalmology, National University Hospital, Singapore

[17] Department of Ophthalmology, Yong Loo Lin School of Medicine, National University of Singapore, Singapore

[18] Singapore National Eye Centre, Singapore

[19] State Key Laboratory of Ophthalmology, Zhongshan Ophthalmic Center, Sun Yat-sen University, Guangdong Provincial Key Laboratory of Ophthalmology and Visual Science, Guangdong Provincial Clinical Research Center for Ocular Diseases, Guangzhou, China

[20] Department of Ophthalmology, Chang Gung Memorial Hospital, Taoyuan, Taiwan

[21] College of Medicine, Chang Gung University, Taoyuan, Taiwan

[22] Department of Ophthalmology and Visual Sciences, The Chinese University of Hong Kong, Hong Kong, China

[23] Hong Kong Eye Hospital, Kowloon, Hong Kong, China

[24] Department of Ophthalmology, LV Prasad Eye Institute, Kalam Anji Reddy Campus, Anant Bajaj Retina Institute, Srimati Kanuri Santhmma Centre for Vitreoretinal Diseases, Hyderabad, Telangana, India

[25] Shantilal Shanghvi Eye Institute, Mumbai, India

[26] Department of Ophthalmology, Bascom Palmer Eye Institute, University of Miami, Miami, FL, US

[27] Department of Ophthalmology and Vision Sciences, University of Toronto, Toronto, Ontario, Canada

[28] The Institute of Health Policy, Management and Evaluation, University of Toronto, Toronto, Ontario, Canada

[29] Save Sight Institute, Specialty of Clinical Ophthalmology and Eye Health, The University of Sydney, Sydney, New South Wales, Australia

[30] Department of Ophthalmology, Westmead Hospital, Sydney, New South Wales, Australia

[31] Department of Ophthalmology, Faculty of Medicine and Health Sciences, Macquarie University, Sydney, Australia

[32] Institute for Research in Ophthalmology, Foundation for Ophthalmology Development, Poznan, Poland

[33] Department of Ophthalmology, University of Warmia and Mazury, Olsztyn, Poland

[34] Department of Ophthalmology and Visual Sciences, Prince of Wales Hospital, Hong Kong, China

[35] Department of Ophthalmology, Vancouver Acute, University of British Columbia, Canada

[36] Academic Unit of Ophthalmology, Institute of Inflammation and Ageing, College of Medical and Dental Sciences, University of Birmingham, Birmingham, United Kingdom

[37] Birmingham and Midland Eye Centre, Sandwell and West Birmingham NHS Trust, Birmingham, United Kingdom

[38] Department of Clinical Sciences, Ophthalmology, Faculty of Medicine, Lund University, Lund, Sweden

[39] Department of Ophthalmology and Visual Sciences, Illinois Eye and Ear Infirmary, University of Illinois at Chicago, Chicago

[40] The Primasia International Eye Research Institute (PIERI) of The Chinese University of Hong Kong (Shenzhen), Shenzhen, China

[41] Retina Division, Department of Ophthalmology, Faculty of Medicine, Rajvithi hospital, Rangsit University, Bangkok, Thailand

[42] Jhaveri Microbiology Center, L V Prasad Eye Institute, Hyderabad, India

[43] Department of Ophthalmology, Columbia University, New York, NY, USA

[44] Department of Ophthalmology, Toho University Faculty of Medicine, Tokyo, Japan

[45] Ishizuchi Eye Clinic, Niihama, Ehime, Japan

[46] Zhejiang University, Eye Center of Second Affiliated Hospital, School of Medicine, Zhejiang Provincial Key Laboratory of Ophthalmology, Zhejiang Provincial Clinical Research Center for Eye Diseases, Zhejiang Provincial Engineering Institute on Eye Diseases, Hangzhou, China

[47] Joint Shantou International Eye Center of Shantou University and the Chinese University of Hong Kong, Shantou, Guangdong, China

[48] The C-MER (Beijing) Dennis Lam Eye Hospital, Shenzhen, Guangdong, China

[49] The C-MER Dennis Lam and Partners Eye Center, C-MER International Eye Care Group, Hong Kong, China

[50] Department of Ophthalmology and Visual Sciences, The Chinese University of Hong Kong, Hong Kong, China

Authors' contributions

DSCL and NS conceptualized the study design and developed the methodology. SKR, AB and NS wrote the original draft. Data and materials were provided by all authors, in addition to existing literature. All authors contributed to the analysis and interpretation of the data, the review of the manuscript and consensus statements, voting on the consensus statements, manuscript revision and editing, and read and approved the final manuscript.

Consent: All Authors consent to be co-authors of this manuscript.

Abstract

Post-cataract surgery endophthalmitis is a serious but largely preventable clinical entity. The implementation of uniform pre-operative, intra-operative, and post-operative protocols is essential to reduce its incidence. In light of emerging evidence and considerable variability in clinical practices, a panel of international experts from the Academy of Asia-Pacific Professors of Ophthalmology (AAPPO), the Asia-Pacific Vitreo-retina Society (APVRS), and the Asia-Pacific Society of Ocular Inflammation and Infection (APSOII) convened to develop evidence-based guidelines addressing all phases of cataract surgery. This consensus manuscript is the product of a systematic review of the current literature, informed by the collective experience and expertise of the panel members. The panel engaged in structured discussions, critical evaluation of clinical data, and formal voting to establish agreement across three key domains: (1) pre-operative and intra-operative prophylactic strategies, (2) diagnostic approaches for early post-operative acute bacterial endophthalmitis, and (3) standardized management protocols. Voting on each proposed statement was conducted using a five-point Likert scale (strongly agree, agree, neutral, disagree, strongly disagree). Consensus was defined as ≥75% of experts voting either "strongly agree" or "agree." A total of 45 consensus statements were evaluated, of which 21 (46.6%) achieved the predefined level of consensus. This document aims to establish standardized guidelines to improve cataract surgery outcomes by minimizing the risk of post-operative endophthalmitis. For areas where consensus was not achieved, the panel recommends further investigation and continued research to guide future updates to clinical practice.

Keywords: post-cataract surgery endophthalmitis, prophylaxis, diagnosis, management, AAPPO, APVRS, APSOII

Introduction

Endophthalmitis remains an infrequent yet potentially sight-threatening postoperative complication across ocular surgeries. Reported incidence rates range from 0.03% to 0.2% following cataract extraction.[1,2] Notably, some epidemiological studies from Asia have documented higher rates, reaching up to 0.6%.[3] The risk of postoperative endophthalmitis is multifactorial, influenced by intraoperative asepsis protocols, hand hygiene compliance, the ocular adnexal microbiota, surgical technique, sterilization of instruments, the purity of intraocular solutions, wound integrity, and postoperative care.[4] Although topical antibiotic prophylaxis is frequently employed to mitigate this risk, its efficacy remains inconclusive, and adherence to treatment regimens poses additional challenges. Systemic prophylaxis with oral ciprofloxacin, in combination with preoperative povidone-iodine application and intracameral moxifloxacin, has been investigated but failed to demonstrate added protective benefit against endophthalmitis, leading to its disuse in the clinical setting.[5]

One of the primary reasons for developing the current consensus statements is to promote uniformity in cataract surgical practices. The statements aim to develop pre-operative practice guidelines and post-operative diagnostic and management strategies to minimize the incidence of post-operative endophthalmitis. The consensus document will serve as a valuable reference, consolidating best practices from seasoned surgeons worldwide to guide practitioners of all experience levels. Formulation of structured pre- and post-operative guidelines will help cataract surgeons modify their practise patterns to decrease the incidence of post-operative endophthalmitis and improve the overall surgical outcomes.

Considering the variability in the current practices for preventing, diagnosing, and managing acute-onset bacterial endophthalmitis, the Academy of Asia-Pacific Professors of Ophthalmology (AAPPO), the Asia-Pacific Vitreo-retina Society (APVRS) and the Asia-Pacific Society of Ocular Inflammation and Infection (APSOII) felt the need for such consensus statements. Two senior authors (DSCL and NS) of this manuscript were appointed to coordinate this consensus project. This consensus statement brings together evidence-based, real-world practice recommendations from leading global experts to support safe and effective clinical practice in cataract surgery to prevent, diagnose and manage acute-onset bacterial endophthalmitis following cataract surgery.

Methods

Following the appointment of the two coordinators (DSCL and NS), the AAPPO formed an international panel of experts (IPE) consisting of 35 specialists from 13 countries/territories. From this panel, two more core group members (AB and SKR) were invited to join the two coordinators to form a core working to conduct a comprehensive literature review on bacterial endophthalmitis following cataract surgery. Literature search was done on PubMed using the terms bacterial endophthalmitis, cataract surgery, prevention, diagnosis, and management. Articles from the past 25 years were reviewed. The core group was tasked with drafting the initial version of the consensus statements, including detailed explanations and justifications. The statements were systematically categorized into 3 domains: preoperative strategies for the prevention of bacterial endophthalmitis associated with cataract surgery, diagnostic approaches for its early identification, and consensus-based recommendations for its clinical management.

Each panel member independently and anonymously reviewed each statement and provided comments to the core group. The core group then revised the feedback and comments and sent out the 2nd draft for further opinions. The process was repeated until the statements were finalized. Subsequently, each panel member voted on each statement anonymously in the final draft using a five-point Likert scale—ranging from strongly agree, agree, neutral, disagree, to strongly disagree.

A consensus was reached when at least 75% of the experts voted either 'agree' or 'strongly agree' for a statement.[6]

Controversies and Consensus Statements

Section 1: Preventing Endophthalmitis

Pre-operative prophylactic measures including application of betadine and pre-operative topical antibiotics help decrease the ocular commensal micro-organisms. Intra-operative and post-operative strategies including the use of intracameral and post-operative topical

antibiotics ensures optimal protective coverage against endophthalmitis. A 3-day pre-operative antibiotic regimen offers superior efficacy compared to shorter durations of 1 day or 1 hour, especially when enhanced by the synergistic action of povidone-iodine.[7] Povidone iodine is universally accepted and the only topical agent known to possess a bactericidal role by disrupting cellular membrane of the micro-organisms. Application of 5% betadine for at least 3 minutes effectively reduces the human conjunctival flora (including multidrug resistant microorganisms like *Enterococcus* sp.) and the risk of endophthalmitis by 3 to 5 fold within 1 minute of application.[8–10] Some studies report that addition of topical antibiotics to pre-operative application of periocular povidone-iodine (PVI) may not offer substantial additional benefits in terms of reducing conjunctival bacterial flora or preventing endophthalmitis in routine cataract surgeries. However, in patients at high risk of infection, combining 4th generation fluoroquinolones like levofloxacin with PVI may be considered. Thus, the most effective prophylactic regimen is yet to be established.[11–19]

Consensus Statement 1.1: Prophylactic measures are considered to reduce the rates of post-cataract surgery acute-onset bacterial endophthalmitis. (Consensus score: 100% [strongly agree: 84.62%; agree: 15.38%; neutral: 0%; disagree: 0%; strongly disagree 0%])

Consensus Statement 1.2: A short course of topical antibiotics is considered as a part of the pre-operative regimen in all cases undergoing cataract surgery. (Consensus score: 23.07% [strongly agree: 7.69%; agree: 15.38%; neutral: 15.38%; disagree: 46.15%; strongly disagree 15.38%])

Consensus Statement 1.3: Pre-operative application of betadine on the periocular skin and ocular surface offers enhanced protection against acute-onset post-cataract surgery endophthalmitis. (Consensus score: 100% [strongly agree: 84.62%; agree: 15.38%; neutral: 0%; disagree: 0%; strongly disagree 0%])

Consensus Statement 1.4: As part of pre-operative preparation, a single application of 5% betadine on the ocular surface for a minimum of 3 minutes is commonly utilized. (Consensus score: 100% [strongly agree: 46.15%; agree: 53.85%; neutral: 0%; disagree: 0%; strongly disagree 0%])

Consensus Statement 1.5: Combining pre-operative application of topical antibiotics and betadine decreases the risk of acute-onset post-surgical endophthalmitis. (Consensus score:

23.07% [strongly agree: 15.38%; agree: 7.69%; neutral: 46.15%; disagree: 23.08%; strongly disagree 7.69%])

Intracameral antibiotics are used by some for reducing the rates of post-cataract surgery endophthalmitis. There are various studies that have described use of intracameral drugs like vancomycin, cefuroxime and moxifloxacin.[20–22] A metanalysis by Kato et al, found all 3 to be comparable to each other.[23]

The administration of intracameral antibiotics can be considered in cases with an elevated risk of endophthalmitis including those with posterior capsular rupture (PCR), retained lens fragments, and systemic co-morbidities. However, it may lower the culture positivity of vitreous biopsy in cases developing post-surgical endophthalmitis.[24]

The use of intracameral and subconjunctival antibiotics has been described in paediatric cataract surgeries for prophylaxis of post-surgical endophthalmitis.

Intracameral moxifloxacin can be considered following cataract surgery. In an initial retrospective study in southern India, the use of intracameral moxifloxacin reduced the incidence of endophthalmitis from 0.07% to 0.02%.[20]

The Veterans Health Administration (VHA) meta-analysis of 14 comparative studies revealed that intracameral moxifloxacin was associated with a 73% reduction in the odds of developing endophthalmitis compared to standard care ($p < 0.001$). Intracameral cefuroxime demonstrated comparable effectiveness to moxifloxacin.[25] However, most of these studies were not randomized or prospective. Furthermore, the preparation and use of intracameral antibiotics has been associated with contamination and toxic anterior segment syndrome

The dose of Intracameral moxifloxacin ranges from 100 to 500 μg, while the dose of cefuroxime is typically 1 mg.[26] In the only published prospective study by Melega et al, the prophylactic efficacy of 150 μg of intracameral moxifloxacin was evaluated. It was effective in reducing endophthalmitis form 0.38% to 0.05% ($p=0.03$).[27]

Consensus Statement 1.6: Intracameral antibiotics (moxifloxacin or cefuroxime or vancomycin) can be considered at the end of cataract surgery. (Consensus score: 84.62% [strongly agree: 61.54%; agree: 23.08%; neutral: 15.38%; disagree: 0%; strongly disagree 0%])
Consensus Statement 1.7: Intracameral antibiotics can be considered in cases with a higher risk of post-surgical endophthalmitis. (Consensus score: 100% [strongly agree: 76.92%; agree: 23.08%; neutral: 0%; disagree: 0%; strongly disagree 0%])
Consensus Statement 1.8: Instillation of intracameral antibiotics can be considered in paediatric cataract surgery. (Consensus score: 84.62%[strongly agree: 23.08%; agree: 61.54%; neutral: 15.38%; disagree: 0%; strongly disagree 0%])
Consensus Statement 1.9: Intracameral moxifloxacin can be considered for possibly reducing the rates of post-cataract surgery endophthalmitis. (Consensus score: 84.61% [strongly agree: 38.46%; agree: 46.15%; neutral: 15.38%; disagree: 0%; strongly disagree 0%])

One study investigated the rate of post-operative endophthalmitis following immediate sequential bilateral cataract surgery and demonstrated a marked reduction in infection rates with the use of intracameral antibiotics. The incidence decreased to 1 in 14,352 cases (0.006%) when intracameral antibiotics were administered, compared to 1 in 5,759 cases (0.01%) without their use. Additionally, the risk of severe visual loss—defined as a final visual acuity equivalent to 20/200 or worse—due to post-operative endophthalmitis was exceedingly low with only 1 case per 18,000 operated eyes. However, the study was not randomized or prospective.[28] Though, immediate sequential bilateral cataract surgery is a cost effective alternative to delayed sequential bilateral cataract surgery, it may pose additional risk of post-surgical endophthalmitis.[29] Thus, senior surgeons may not recommend immediate sequential bilateral cataract surgery. (unpublished data as per Prof. Ke Yao's experience).

Intracameral cefuroxime, moxifloxacin, and vancomycin each possess a wide safety margin when used as prophylaxis for postoperative endophthalmitis, but they differ in their adverse effect profiles.[30,31] Cefuroxime is generally well-tolerated, with most studies reporting few side effects. Hypersensitivity reactions are rare but can occur, particularly in patients with penicillin allergies, occasionally leading to anaphylaxis. Overdose incidents have been

associated with ocular toxicity such as macular edema, retinal detachment, and corneal edema. [32,33]

Moxifloxacin which is available as a preservative-free formulation, is also considered for intraocular use. It shows no toxic effects on ocular structures even under stress conditions, though rare cases of hypersensitivity and anaphylaxis have been documented with topical use. [22,34] Vancomycin, while effective against gram-positive organisms like *S. epidermidis* and *S. aureus*, lacks a commercially available single use intracameral preparation, necessitating manual dilution. Although generally safe, it has been implicated in rare but severe cases of haemorrhagic occlusive retinal vasculitis (HORV), a presumed immune-mediated reaction causing irreversible vision loss. Given these risks, vancomycin is typically reserved for patients with beta-lactam allergies. Overall, while all 3 antibiotics have favourable safety profiles, cefuroxime and moxifloxacin have been preferred for routine use due to their lower incidence of serious adverse effects.[35–39] Intracameral moxifloxacin has been described in variable dosages (150 µg to 500 µg) and the higher doses have been reported to provide higher protection with no additional adverse effects. In a review by Arshinoff et al., a single case of endophthalmitis caused by moxifloxacin-resistant *Staphylococcus epidermidis* was reported among 3,430 surgeries where 100 µg/0.1 mL intracameral moxifloxacin was used. However, increasing the dosage to 450–600 µg and administering it as the final step of cataract surgery through the side port significantly reduced the risk of infection although there are concerns for reporting bias in this and other studies investigating intracameral antibiotics.[40]

Intracameral moxifloxacin is safe in post-operative settings. Studies have demonstrated favourable outcomes, including preserved specular endothelial cell count, stable central corneal thickness, and central macular thickness.[41,42] Thus, wound hydration with moxifloxacin may or may not pose any additional risk.

Furthermore, moxifloxacin has a short half-life in the aqueous humor, which is just over 1 hour. Yet it maintains a concentration above the minimum inhibitory concentration (MIC), even at a dosage of 150 µg/0.1 mL beyond 1 hour.[43]

Consensus Statement 1.10: Intracameral antibiotics can be considered in cases undergoing immediate sequential bilateral cataract surgery. *(Consensus score: 100% [strongly agree: 53.85%; agree: 46.15%; neutral: 0%; disagree: 0%; strongly disagree 0%])*

Consensus Statement 1.11: Adverse reactions of intracameral moxifloxacin, cefuroxime and vancomycin are comparable. *(Consensus score: 30.77% [strongly agree: 7.69%; agree: 23.08%; neutral: 15.38%; disagree: 46.15%; strongly disagree 7.69%])*

Consensus Statement 1.12: The reported safe dose of intracameral moxifloxacin for instillation after cataract surgery is 150 μg/0.1 mL. *(Consensus score: 61.53% [strongly agree: 15.38%; agree: 46.15%; neutral: 7.69%; disagree: 23.08%; strongly disagree 7.69%])*

Consensus Statement 1.13: Hydration of the corneal incisions may not post any additional risk. *(Consensus score: 69.23% [strongly agree: 7.69%; agree: 61.54%; neutral: 23.08%; disagree: 7.69%; strongly disagree 0%])*

In addition to intracameral and subconjunctival injection of antibiotics, addition of antibiotics like vancomycin and gentamycin in the irrigating solution have been reported to reduce the rate of post-cataract surgery endophthalmitis more than 10 times.[44] However, literature on this topic is limited and the practice has not been widely adopted due to risk of associated adverse effects with the drugs.[39,45,46]

Instruments should be autoclaved or sterilized using ethylene oxide (EtO) and not chemically sterilized. Operation theatre should be fumigated, and disinfection should be done using bacillocid, bacillol, virkon and UV irradiation. The airflow in OT and temperature (21^0 C) and humidity (20-60%) with positive pressure should be maintained.

There are various checklists for elective intraocular surgery which includes comprehensive ophthalmic evaluation prior to surgery, random blood sugar < 200, fasting blood sugar <140 and blood pressure < 160/95 mm Hg. The role of pre-operative topical antibiotics is controversial. Any contact procedure should be avoided. Use of povidone iodine 5% on periocular skin and conjunctival sac for 3 minutes is advisable. However, due to its epitheliotoxic nature, some surgeons believe concentration 1% or lower may be equally effective as 5% povidone iodine *(unpublished data as per Prof. Ke Yao's experience)*. Further studies are warranted. Trimming of lashes prior to cataract surgery has not been

demonstrated to confer any benefit in decreasing the ocular microflora. However, adequately draping the eyelashes away from surgical field is essential.[47–50]

Consensus Statement 1.14: Optimum OT sterilization techniques play an important role in reducing rates of post-surgical endophthalmitis. (Consensus score: 100% [strongly agree: 76.92%; agree: 23.08%; neutral: 0%; disagree: 0%; strongly disagree 0%])

Consensus Statement 1.15: Pre-operative check list for reducing rates of bacterial endophthalmitis is necessary. (Consensus score: 76.92% [strongly agree: 38.46%; agree: 38.46%; neutral: 7.69%; disagree: 7.69%; strongly disagree 7.69%])

Consensus Statement 1.16: Trimming eyelashes is not recommended practice prior to cataract surgery. (Consensus score: 76.92% [strongly agree: 46.15%; agree: 30.77%; neutral: 7.69%; disagree: 0%; strongly disagree 15.38%])

Consensus Statement 1.17: Instead of trimming eyelashes, adequate draping eyelashes from surgical field is an acceptable practical practice. (Consensus score: 100% [strongly agree: 61.54%; agree: 38.46%; neutral: 0%; disagree: 0%; strongly disagree 0%])

Oral antibiotics have not been observed to add additional benefit in terms of decreasing the rate of post-surgical endophthalmitis. Topical antibiotics should be initiated within 4–6 hours after surgery, coinciding with the decline in effectiveness of intracameral or subconjunctival antibiotics. Fluoroquinolones are the preferred agents for postoperative use and are commonly administered for a duration of 1–4 weeks. However, there is no conclusive evidence supporting their role in reducing rates of postsurgical endophthalmitis. To minimize the risk of developing antibiotic resistance, topical antibiotics should be discontinued rather than tapered.[51]

Consensus Statement 1.18: A short course of pre- and post-operative (peri-operative) oral antibiotics is not proven benefical for high-risk cases such as one-eye patients (the other eye blind already) to prevent post-surgical endophthalmitis. (Consensus score: 92.31% [strongly agree: 23.08%; agree: 69.23%; neutral: 7.69%; disagree: 0%; strongly disagree 0%])

Consensus Statement 1.19: The use of topical antibiotics for 1 to 2 weeks after surgery is commonly utilized. (Consensus score: 76.92% [strongly agree: 15.38%; agree: 61.54%; neutral: 15.38%; disagree: 7.69%; strongly disagree 0%])

The risk factors for post-cataract surgery endophthalmitis includes age >80- years, poor general health, immunocompromised states, periocular septic foci, blepharitis, and a history of penetrating trauma. The intra-operative and post-operative factors include posterior capsular rupture, large incision extracapsular extraction, absence of prophylactic measures, forceps-inserted foldable intraocular lens (IOL), silicone and polymethacrylate (PMMA) IOL material, additional intravitreal injection, late application of topical antibiotics and use of older-generation fluoroquinolones.[52–62]

A cluster Infection Is defined as the occurrence of 2 or more postoperative infections on the same day from a single operating theatre or the repeated occurrence of infections over time. In 2018 Kumar A et al analysed the causes of cluster endophthalmitis. The usual causes were attributed to contaminated irrigating fluids, unclean Phacoemulsification tubing, improper ventilation systems, poor operation room hygiene, and improper storage of bevacizumab.[63–65]

In case of an outbreak, effective management includes prompt confirmation of the diagnosis and thorough investigation to identify the source of the outbreak. This includes obtaining cultures, tracing the batch numbers of all solutions used, and reviewing the surgical logbook, operative notes, and the entire setup of the operating environment.[26]

The commercially available antibiotics preparation is more cost effective than those prepared through compounding pharmacies. [24] Thus, countries with limited resources may prefer them over fortified drops. The other possible causes of non-usage of reconstituted antibiotics include errors in dilution, break in the sterility chain, or other logistic reasons.[66]

Consensus Statement 1.20: The rates of endophthalmitis are higher in extracapsular cataract extraction than phacoemulsification. *(Consensus score: 53.84% [strongly agree: 7.69%; agree: 46.15%; neutral: 30.77%; disagree: 15.38%; strongly disagree 0%])*

Consensus Statement 1.21: Diabetic patients with well controlled blood sugars are not at higher risk of post-surgical endophthalmitis. *(Consensus score: 53.84% [strongly agree: 23.08%; agree: 30.77%; neutral: 0%; disagree: 46.15%; strongly disagree 0%])*

Consensus Statement 1.22: Cluster endophthalmitis is a preventable entity. *(Consensus score: 92.31% [strongly agree: 23.08%; agree: 69.23%; neutral: 0%; disagree: 7.69%; strongly disagree 0%])*

Consensus Statement 1.23: The major limiting factor for usage of intracameral antibiotics is the cost factor in developing countries. *(Consensus score: 38.46% [strongly agree: 0%; agree: 38.46%; neutral: 46.15%; disagree: 15.38%; strongly disagree 0%])*

Section 2: Diagnosing Endophthalmitis

The most common presenting symptom of endophthalmitis is progressive vision loss, followed by pain—which may be absent in up to 25% of cases—and conjunctival injection. In the landmark multi-centric Endophthalmitis Vitrectomy Study (EVS) study, one-fourth of eyes had vision limited to light perception (PL); however, the actual incidence of such poor vision may be higher, as eyes with no PL and significant anterior chamber opacification were excluded from the study. In addition to decreased visual acuity, common clinical signs include lid edema, conjunctival chemosis, corneal edema, anterior chamber cells and fibrin, hypopyon (present in 85% of cases), vitritis, retinitis, retinal periphlebitis (an early indicator), and blunting of the red reflex.[67]

The ESCRS study group define the terms ‘presumed’ and ‘proven’ endophthalmitis. Presumed endophthalmitis was diagnosed in any patient who presented with ocular pain or decreased vision following surgery, where the clinical findings were suggestive of intraocular infection. Proven endophthalmitis was considered if there was microbiological evidence (vitreous staining or culture or polymerase chain reaction positive for micro-organism) in addition to clinical symptoms and signs of endophthalmitis.[21,67,68]

Culture positivity in cases of endophthalmites is variable ranging from 34% to 58%. The most commonly isolated micro-organism are gram positive bacteria, particularly coagulase negative Staphylococcus (CoNS). Outcomes in cases caused gram positive bacteria are superior compared to those caused by other micro-organisms.[69,70]

Postoperative follow-up on day 1 and week 1 are essential for all post-cataract surgery patients. Early scheduled follow-up may help in timely diagnosis of early-onset endophthalmitis.[56]

Consensus Statement 2.1: The most common symptom of acute-onset endophthalmitis is loss of visual acuity. (Consensus score: 92.31% [strongly agree: 30.77%; agree: 61.54%; neutral: 7.69%; disagree: 0%; strongly disagree 0%])
Consensus Statement 2.2: Both presumed and proven endophthalmitis should be managed similarly. (Consensus score: 100% [strongly agree: 53.85%; agree: 46.15%; neutral: 0%; disagree: 0%; strongly disagree 0%])
Consensus Statement 2.3: Culture positivity of vitreous biopsy is an important prognostic factor in post-surgical endophthalmitis. (Consensus score: 100 [strongly agree: 41.67%; agree: 58.33%; neutral: 0%; disagree: 0%; strongly disagree 0%])
Consensus Statement 2.4: The 1-week post-operative visit is important for diagnosing acute-onset bacterial endophthalmitis. (Consensus score: 69.23% [strongly agree: 30.77%; agree: 38.46%; neutral: 15.38%; disagree: 15.38%; strongly disagree 0%])

Both clinical presentation and microbiological evidence are prognostic of outcomes in post-cataract surgery endophthalmitis. A meta-analysis by Cioana et al determined that the greatest improvement in visual acuity occurred in cases caused by coagulase-negative staphylococci, followed by gram-negative bacteria, and then other gram-positive organisms such as streptococci and enterococci. The outcomes aligned with the results of the Endophthalmitis Vitrectomy Study despite advancements in surgical techniques and microbial changes over time.[71,72] A study by Rahimi et al, suggested that the “gram-positive coagulase-negative” and no growth” groups had the best visual outcome. In addition, cases of endophthalmitis associated with keratitis and those avoiding intraocular steroids were associated with risk of evisceration.[10] Furthermore, antibiotic resistance is a predictor of poor visual outcomes.[73]

The described clinical presentation of acute-onset bacterial endophthalmitis has been comparable between landmark endophthalmitis studies. The most common presenting symptom in these was blurred visual acuity with pain, media haze, and hypopyon. [21,72]

When evaluating suspected endophthalmitis, it is essential to consider differential diagnoses such as toxic anterior segment syndrome (TASS), residual lens material, noninfectious uveitis, and vitreous haemorrhage. TASS can closely mimic infectious endophthalmitis, presenting with severe corneal edema and hypopyon, but lacks vitreous involvement. Differentiation is crucial, as TASS typically shows anterior chamber inflammation without posterior segment signs. Confirming the diagnosis involves isolating the causative organism through gram stain, culture, and PCR testing, particularly in resistant cases. Empiric broad-spectrum intravitreal antibiotics should be initiated promptly. In culture-negative cases (~30%), B-scan ultrasonography helps assess vitreous opacities and retinal or choroidal detachment.[74–76]

Consensus Statement 2.5: The clinical features and microbiology report of acute-onset endophthalmitis are important in management. (Consensus score: 100% [strongly agree: 53.85%; agree: 46.15%; neutral: 0%; disagree: 0%; strongly disagree 0%])
Consensus Statement 2.6: Post-operative endophthalmitis with keratitis is associated with worse clinical outcomes. (Consensus score: 100% [strongly agree: 38.46%; agree: 61.54%; neutral: 0%; disagree: 0%; strongly disagree 0%])
Consensus Statement 2.7: Toxic anterior shock syndrome (TASS) is clinically distinct from acute-onset endophthalmitis in most cases. (Consensus score: 76.92% [strongly agree: 30.77%; agree: 46.15%; neutral: 15.38%; disagree: 7.69%; strongly disagree 0%])

In acute-onset endophthalmitis after cataract surgery the microbiological analysis of aqueous and vitreous samples reveal a good positivity rate (up to 61%) with a higher prevalence of gram-positive isolates.[10]

In 2019 Duan F. et al aimed to identify the microbial etiology of acute-onset endophthalmitis in isolates at an eye hospital in South China. In postsurgical endophthalmitis, all infections were bacterial.[77]

Mollan et al. reported an acute-onset endophthalmitis incidence of 0.09% in the United Kingdom with gram-positive bacteria being the predominant causative organisms, identified in 93.4% of culture-positive cases. They recommended performing both anterior chamber tap

and vitreous biopsy or PPV in suspected cases to aid in microbiological diagnosis and guide appropriate treatment.[69]

Pars plana vitrectomy with instillation of antibiotics is an option for management of acute-onset endophthalmitis. It helps in debulking the infection, clearing the visual axis to allow for visual rehabilitation and a serial funduscopic examination, collecting adequate vitreous specimens for culture to guide management, and allowing better distribution of intravitreal antibiotics.

Advancements in diagnostic technologies, such as real-time PCR (RT-PCR) and mass spectrometry, offer significant potential for enhancing the detection and identification of microorganisms in endophthalmitis, enabling more accurate and timely diagnosis.[10]
In 2018, Mishra D et al studied the utility of broad range 16 S rRNA PCR assay versus conventional methods and re-emphasised that the positivity from routine culture was much lower (conventional culture positivity = 8.7 %) as compared to automated culture (30.76 %) and PCR (65.13 %).[78] In 2022, Low et al demonstrated the utility of whole genome sequencing to detect pathogens and even bacteriophages in both culture-positive and culture-negative cases of endophthalmitis.[79]

There have been studies reporting the emergence of multidrug-resistant micro-organisms. Jindal A et al in 2013 and 2015 evaluated medical records of all patients with Gram-negative bacterial endophthalmitis resistant to both amikacin and ceftazidime between 2005 and 2010 at L. V. Prasad Eye Institute, a tertiary care ophthalmic Centre in South India.[80,81] Pseudomonas was the most common Gram-negative bacteria resistant to both amikacin and ceftazidime. The emergence of MDR bacteria causing endophthalmitis was addressed as a matter of concern in India. Globally, Schwartz S G et al in 2014 mentioned emergence of multidrug resistant organisms causing endophthalmitis.[82]

Post-cataract surgery endophthalmitis may be caused by break in OT sterility and cold chain of consumables. It may or may not be associated with post-operative endophthalmitis. In a study by Satpathy G et al, P. aeruginosa isolates obtained from the patients of post-cataract surgery endophthalmitis were phenotypically similar and genetically close to those obtained

from the corresponding phacoemulsification machine.[83] Thus the association needs to be evaluated in future studies.

Consensus Statement 2.8: Aqueous tap and PPV have equivalent value in establishing the diagnosis of endophthalmitis. (Consensus score: 30.77% [strongly agree: 0%; agree: 30.77%; neutral: 23.08%; disagree: 30.77%; strongly disagree 15.38%])

Consensus Statement 2.9: Performing pars plana vitrectomy and instillation of intravitreal antibiotics is the first line treatment option in cases of endophthalmitis. (Consensus score: 53.84%[strongly agree: 15.38%; agree: 38.46%; neutral: 7.69%; disagree: 38.46%; strongly disagree 0%])

Consensus Statement 2.10: Polymerase chain reaction (PCR) testing of vitreous may be useful if available. (Consensus score: 100% [strongly agree: 50%; agree: 50%; neutral: 0%; disagree: 0%; strongly disagree 0%])

Consensus Statement 2.11: There has been emergence of MDR (multi-drug resistant) micro-organism over time as causative agents for endophthalmitis.(Consensus score: 83.33% [strongly agree: 25%; agree: 58.33%; neutral: 8.33%; disagree: 0%; strongly disagree 0%])

Consensus Statement 2.12: The factors contributing to cluster endophthalmitis may differ from those associated with isolated cases. (Consensus score: 100%[strongly agree: 16.67%; agree: 83.33%; neutral: 0%; disagree: 0%; strongly disagree 0%])

Section 3: Management of Endophthalmitis

Antibiotics given oral or intravenous have poor penetration into the vitreous cavity. Therefore, intravitreal antibiotics are mainstay of treatment.[84]

The role of systemic antibiotics in treating postoperative endophthalmitis remains controversial. Systemic administration of amikacin and ceftazidime has shown no significant impact on final visual outcomes, likely due to their poor penetration across the blood-ocular barrier. In contrast, fluoroquinolones such as ciprofloxacin and moxifloxacin may have better intraocular penetration. Though intravenous drugs may achieve higher concentration in the blood stream, oral administration of these drugs has been preferred due to lower risk of systemic adverse effects.[85]

When managing severe bacterial postoperative endophthalmitis, intravitreal injection of unpreserved dexamethasone with broad-spectrum antibiotics can be considered. The first-line treatment typically involves an intravitreal vancomycin-ceftazidime combination. Other combinations include ceftazidime-tazobactam, ceftazidime-imipenem, and vancomycin-amikacin.[86,87]

The antibiotic combination covers both gram-positive and gram-negative bacteria. The parameters guiding the frequency of repeat administration of antibiotics are clinical response, half-life, drug clearance from the eye, and surgical status of the eye. The aim of repeat dosing should be to optimize the duration of drug exposure to concentrations above the minimum inhibitory concentration (MIC), rather than to aim for higher peak levels. Adequate and safe antibiotic levels can be better achieved by more frequent rather than higher dosages.[88]

Since intravitreal antibiotic levels drop rapidly within 24 to 48 hours following injection, a single injection may not be sufficient, particularly of vancomycin or ceftazidime based on culture results and clinical response. Drugs like amikacin are typically avoided if possible due to potential retinal toxicity. Repeat antibiotic selection is guided by culture results.

In cases of multidrug resistant microorganisms causing endophthalmitis, alternate antibiotic regimens like intravitreal piperacillin/tazobactam and imipenem have been reported to be safe and comparable to each other.[86,89–94]

The pharmacokinetics of various drugs have been studied and usually a drug combination which tends to stay in the vitreous cavity and covers both gram-positive and negative micro-organisms is chosen for injection. The large molecules like vancomycin are known to leave the eye predominantly by the passive diffusion across the vitreous to the anterior chamber and through Schlemm's canal. Smaller drug molecules like beta-lactams, clindamycin and fluoroquinolones are cleared posteriorly by active transport in the capillaries and the retinal pigment epithelium (RPE).[95]

The drugs eliminated through the anterior route have a faster clearance In an Inflamed eye.[96] For drugs mainly eliminated by the posterior route (beta-lactams, cephalosporins, and clindamycin), drug clearance is retarded in an inflamed eye due to compromise of the RPE pump or active transport. Thus, their half-life is extended.[88]

The microbiological profile of post-cataract surgery endophthalmitis has remained stable over the past few decades. In fact, it has not changed much from the Endophthalmitis Vitrectomy Study. The predominant etiological agents are gram-positive bacteria followed by gram-negative bacteria and fungi. Overall the most common causative species is coagulase negative Staphylococcus. Similar outcomes have been observed throughout different geographical zones.[56,77,97–99] However, there are few isolated reports identifying newer causative agents for post-surgical endophthalmitis.[50,52]

Consensus Statement 3.1: Intravenous antibiotics do not have an important role in management of acute-onset bacterial endophthalmitis. *(Consensus score: 76.92% [strongly agree: 38.46%; agree: 38.46%; neutral: 23.08%; disagree: 0%; strongly disagree 0%])*

Consensus Statement 3.2: There is no definite role of oral antibiotics in cases of acute-onset bacterial endophthalmitis. *(Consensus score: 100% [strongly agree: 15.38%; agree: 84.62%; neutral: 0%; disagree: 0%; strongly disagree 0%])*

Consensus Statement 3.3: The ideal intravitreal antibiotic regimen for management of acute bacterial endophthalmitis is a combination of drugs covering both gram-positive and gram-negative bacteria. *(Consensus score: 100% [strongly agree: 83.33%; agree: 16.67%; neutral: 0%; disagree: 0%; strongly disagree 0%])*

Consensus Statement 3.4: A repeat intravitreal antibiotic injection is not recommended in cases that show a favourable response to the initial injection. *(Consensus score: 75% [strongly agree: 16.67%; agree: 58.33%; neutral: 8.33%; disagree: 16.67%; strongly disagree 0%])*

Consensus Statement 3.5: The choice of antibiotics for intravitreal injection is based on the pharmacokinetics of the drugs. Injections usually do need to be repeated. *(Consensus score: 66.67% [strongly agree: 16.67%; agree: 50%; neutral: 25%; disagree: 8.33%; strongly disagree 0%])*

Consensus Statement 3.6: The microbiological profile of the most common etiological agents causing acute bacterial endophthalmitis has not changed over 2 decades. *(Consensus score:*

61.54% [strongly agree: 0%; agree: 61.54%; neutral: 30.77%; disagree: 7.69%; strongly disagree 0%])

The predictors for poor visual outcomes include old age, poor presenting visual acuity at presentation, gram-negative bacteria on culture and acute-onset endophthalmitis.[100] In a study by Ting et al, 66.7% cases of post-surgical endophthalmitis attained best corrected visual acuity better than 6/36.[10]

The Endophthalmitis Vitrectomy Study laid the basic principles for the management of endophthalmitis. It addressed major points like the role of initial visual acuity on the timing of PPV and the lack of benefit of systemic antibiotics. However, with advancements in surgical machines and techniques, early primary vitrectomy is often indicated in acute-onset endophthalmitis today. It decreases the infectious load at an earlier stage. Additionally, has been demonstrated to decrease the need for repeated interventions and shorten the treatmentperiod and recovery time for endophthalmitis.

The EVS did not discuss the use of steroids in these cases. Since most case of acute-onset endophthalmitis are due to bacterial infection, steroids may help in managing the intraocular inflammation. [100] In a recent retrospective long-term study, it was observed that current practise patterns are different from those employed by the EVS study.[101]

The prognosis of acute-onset endophthalmitis depends on the etiology and intervention method. Poor prognostic factors include delayed presentation beyond 6 days, virulent pathogens (*Pseudomonas* sp.), pre-existing retinal detachment, and corneal disease.[102] The management involves vitreous tap with injection of intravitreal antibiotics. Pars plana vitrectomy with intravitreal antibiotics is often preferred in eyes with poor vision or non-response to intravitreal antibiotics.

One-quarter to one-half of the routine dose of intravitreal antibiotics is preferred in cases of endophthalmitis with silicone oil in-situ to prevent retinal toxicity as the drug is confined to the limited aqueous-filled space surrounding the oil bubble and has a longer elimination time.[103]

Consensus Statement 3.7: In cases of post-cataract surgery endophthalmitis, <10% eyes have poor visual outcomes. *(Consensus score: 33.33% [strongly agree: 0%; agree: 33.33%; neutral: 16.67%; disagree: 41.67%; strongly disagree 8.33%])*

Consensus Statement 3.8: The management principles of the Endophthalmitis Vitrectomy Study are still valid. *(Consensus score: 41.67% [strongly agree: 0%; agree: 41.67%; neutral:33.33%; disagree: 25%; strongly disagree 0%])*

Consensus Statement 3.9: The final outcomes of post-surgical endophthalmitis are dependent on multiple factors. *(Consensus score: 100% [strongly agree: 61.54%; agree: 38.46%; neutral: 0%; disagree: 0%; strongly disagree 0%])*

Consensus Statement 3.10: Eyes with post-cataract surgery endophthalmitis in the presence of silicone oil tamponade require a lower dose of intravitreal antibiotics. *(Consensus score: 100%[strongly agree: 50%; agree: 50%; neutral: 0%; disagree: 0%; strongly disagree 0%])*

Result of Voting and Discussion

Table 1 provides a summary of the key consensus statements along with the corresponding voting results.

Section	Consensus Statement	C Score	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. Preventing Endophthalmitis							
1.1	Prophylactic measures are considered to reduce the rates of post-cataract surgery acute-onset bacterial endophthalmitis.	**100%**	84.62%	15.38%	0%	0%	0%
1.2	A short course of topical antibiotics is considered as a part of the pre-operative regimen in all cases undergoing cataract surgery.	23.07%	7.69%	15.38%	15.38%	46.15%	15.38%
1.3	Pre-operative application of betadine on the periocular skin and ocular surface offers enhanced protection against acute-onset post-cataract surgery endophthalmitis.	**100%**	84.62%	15.38%	0%	0%	0%
1.4	As part of pre-operative preparation, a single application of 5% betadine on the ocular surface for a minimum of 3 minutes is commonly utilized.	**100%**	46.15%	53.85%	0%	0%	0%
1.5	Combining pre-operative application of topical antibiotics and betadine decreases the risk of acute-onset post-surgical endophthalmitis.	23.07%	15.38%	7.69%	46.15%	23.08%	7.69%
1.6	Intracameral antibiotics (moxifloxacin or cefuroxime or vancomycin) can be considered at the end of cataract surgery.	**84.62%**	61.54%	23.08%	15.38%	0%	0%

1.7	Intracameral antibiotics can be considered in cases with a higher risk of post-surgical endophthalmitis.	**100%**	76.92%	23.08%	0%	0%	0%
1.8	Instillation of intracameral antibiotics can be considered in paediatric cataract surgery.	**84.62%**	23.08%	61.54%	15.38%	0%	0%
1.9	Intracameral moxifloxacin can be considered for possibly reducing the rates of post-cataract surgery endophthalmitis.	**84.61%**	38.46%	46.15%	15.38%	0%	0%
1.10	Intracameral antibiotics can be considered in cases undergoing immediate sequential bilateral cataract surgery.	**100%**	53.85%	46.15%	0%	0%	0%
1.11	Adverse reactions of intracameral moxifloxacin, cefuroxime and vancomycin are comparable.	30.77%	7.69%	23.08%	15.38%	46.15%	7.69%
1.12	The reported safe dose of intracameral moxifloxacin for instillation after cataract surgery is 150 µg/0.1 mL.	61.53%	15.38%	46.15%	7.69%	23.08%	7.69%
1.13	Hydration of the corneal incisions may not post any additional risk.	69.23%	7.69%	61.54%	23.08%	7.69%	0%
1.14	Optimum OT sterilization techniques play an important role in reducing rates of post-surgical endophthalmitis.	**100%**	76.92%	23.08%	0%	0%	0%
1.15	Pre-operative check list for reducing rates of bacterial endophthalmitis is necessary.	**76.92%**	38.46%	38.46%	7.69%	7.69%	7.69%
1.16	Trimming eyelashes is not recommended practice prior to cataract surgery.	**76.92%**	46.15%	30.77%	7.69%	0%	15.38%
1.17	Instead of trimming eyelashes, adequate draping eyelashes from surgical field is an acceptable practical practice.	**100%**	61.54%	38.46%	0%	0%	0%
1.18	A short course of pre- and post-operative (peri-operative) oral antibiotics is not proven benefical for high-risk cases such as one-eye patients (the other eye blind already) to prevent post-surgical endophthalmitis.	**92.31%**	23.08%	69.23%	7.69%	0%	0%
1.19	The use of topical antibiotics for 1 to 2 weeks after surgery is commonly utilized.	**76.92%**	15.38%	61.54%	15.38%	7.69%	0%
1.20	The rates of endophthalmitis are higher in extracapsular cataract extraction than phacoemulsification.	53.84%	7.69%	46.15%	30.77%	15.38%	0%
1.21	Diabetic patients with well controlled blood sugars are not at higher risk of post-surgical endophthalmitis.	53.84%	23.08%	30.77%	0%	46.15%	0%
1.22	Cluster endophthalmitis is a preventable entity.	**92.31%**	23.08%	69.23%	0%	7.69%	0%
1.23	The major limiting factor for usage of intracameral antibiotics is the cost factor in developing countries.	38.46%	0%	38.46%	46.15%	15.38%	0%
2. Diagnosing Endophthalmitis							
2.1	The most common symptom of acute-onset endophthalmitis is loss of visual acuity.	**92.31%**	30.77%	61.54%	7.69%	0%	0%
2.2	Both presumed and proven endophthalmitis should be managed similarly.	**100%**	53.85%	46.15%	0%	0%	0%
2.3	Culture positivity of vitreous biopsy is an important prognostic factor in post-surgical endophthalmitis.	**100%**	41.67%	58.33%	0%	0%	0%

2.4	The 1-week post-operative visit is important for diagnosing acute-onset bacterial endophthalmitis.	69.23%	30.77%	38.46%	15.38%	15.38%	0%
2.5	The clinical features and microbiology report of acute-onset endophthalmitis are important in management.	**100%**	53.85%	46.15%	0%	0%	0%
2.6	Post-operative endophthalmitis with keratitis is associated with worse clinical outcomes.	**100%**	38.46%	61.54%	0%	0%	0%
2.7	Toxic anterior shock syndrome (TASS) is clinically distinct from acute-onset endophthalmitis in most cases.	**76.92%**	30.77%	46.15%	15.38%	7.69%	0%
2.8	Aqueous tap and PPV have equivalent value in establishing the diagnosis of endophthalmitis.	30.77%	0%	30.77%	23.08%	30.77%	15.38%
2.9	Performing pars plana vitrectomy and instillation of intravitreal antibiotics is the first line treatment option in cases ofendophthalmitis.	53.84%	15.38%	38.46%	7.69%	38.46%	0%
2.10	Polymerase chain reaction (PCR) testing of vitreous may be useful if available.	**100%**	50%	50%	0%	0%	0%
2.11	There has been emergence of MDR (multi-drug resistant) micro-organism over time as causative agents for endophthalmitis.	**83.33%**	25%	58.33%	8.33%	0%	0%
2.12	The factors contributing to cluster endophthalmitis may differ from those associated with isolated cases.	**100%**	16.67%	83.33%	0%	0%	0%
3. Management of Endophthalmitis							
3.1	Intravenous antibiotics do not have an important role in management of acute-onset bacterial endophthalmitis.	**76.92%**	38.46%	38.46%	23.08%	0%	0%
3.2	There is no definite role of oral antibiotics in cases of acute-onset bacterial endophthalmitis.	**100%**	15.38%	84.62%	0%	0%	0%
3.3	The ideal intravitreal antibiotic regimen for management of acute bacterial endophthalmitis is a combination of drugs covering both gram-positive and gram-negative bacteria.	**100%**	83.33%	16.67%	0%	0%	0%
3.4	A repeat intravitreal antibiotic injection is not recommended in cases that show a favourable response to the initial injection.	**75%**	16.67%	58.33%	8.33%	16.67%	0%
3.5	The choice of antibiotics for intravitreal injection is based on the pharmacokinetics of the drugs. Injections usually do need to be repeated.	66.67%	16.67%	50%	25%	8.33%	0%
3.6	The microbiological profile of the most common etiological agents causing acute bacterial endophthalmitis has not changed over 2 decades.	61.54%	0%	61.54%	30.77%	7.69%	0%
3.7	In cases of post-cataract surgery endophthalmitis, <10% eyes have poor visual outcomes.	33.33%	0%	33.33%	16.67%	41.67%	8.33%
3.8	The management principles of the Endophthalmitis Vitrectomy Study are still valid.	41.67%	0%	41.67%	33.33%	25%	0%
3.9	The final outcomes of post-surgical endophthalmitis are dependent on multiple factors.	**100%**	61.54%	38.46%	0%	0%	0%

3.10	Eyes with post-cataract surgery endophthalmitis in the presence of silicone oil tamponaderequire a lower dose of intravitreal antibiotics.	**100%**	50%	50%	0%	0%	0%

Consensus Score (C Score) was defined as the value of the summation of the 'strongly agree', and 'agree' percentages; C Score ≥ 75% was considered 'consensus achieved' and C Score < 75% was 'consensus not reached'. Fifteen statements were 'consensus not achieved' (with unbold and underline).

Post-cataract surgery endophthalmitis is a rare but potentially devastating complication that can lead to significant vision loss. This consensus manuscript represents a comprehensive synthesis of current scientific literature, enriched by the collective expertise of leading international specialists in the field. The primary objective was to establish evidence-based recommendations for the prevention, early diagnosis, and effective management of post-operative endophthalmitis to optimize patient outcomes.

The consensus development process was methodologically rigorous, incorporating an extensive review of existing literature alongside structured expert deliberation. A panel of 35 experts from the Academy of Asia-Pacific Professors of Ophthalmology (AAPPO), the Asia-Pacific Vitreo-retina Society (APVRS), and the Asia-Pacific Society of Ocular Inflammation and Infection (APSOII) participated in the voting process, providing their agreement on a series of consensus statements.

The outcomes of this collaborative effort is the formulation of standardized, practical guidelines aimed at assisting cataract surgeons in minimizing the incidence and improving the management of post-surgical endophthalmitis across diverse clinical settings. The consensus statements have been divided into those with high (>75%), borderline (50-74%) and poor (<50%) acceptance.

Highly Accepted Statements

Table 2 summarizes the statements which are highly accepted by the international panel of experts (>75%).

Section	Consensus Statement	C Score	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. Preventing Endophthalmitis							

1.1	Prophylactic measures are considered to reduce the rates of post-cataract surgery acute-onset bacterial endophthalmitis.	**100%**	84.62%	15.38%	0%	0%	0%
1.3	Pre-operative application of betadine on the periocular skin and ocular surface offers enhanced protection against acute-onset post-cataract surgery endophthalmitis.	**100%**	84.62%	15.38%	0%	0%	0%
1.4	As part of pre-operative preparation, a single application of 5% betadine on the ocular surface for a minimum of 3 minutes is commonly utilized.	**100%**	46.15%	53.85%	0%	0%	0%
1.6	Intracameral antibiotics (moxifloxacin or cefuroxime or vancomycin) can be considered at the end of cataract surgery.	**84.62%**	61.54%	23.08%	15.38%	0%	0%
1.7	Intracameral antibiotics can be considered in cases with a higher risk of post-surgical endophthalmitis.	**100%**	76.92%	23.08%	0%	0%	0%
1.8	Instillation of intracameral antibiotics can be considered in pediatric cataract surgery.	**84.62%**	23.08%	61.54%	15.38%	0%	0%
1.9	Intracameral moxifloxacin can be considered for possibly reducing the rates of post-cataract surgery endophthalmitis.	**84.61%**	38.46%	46.15%	15.38%	0%	0%
1.10	Intracameral antibiotics can be considered in cases undergoing immediate sequential bilateral cataract surgery.	**100%**	53.85%	46.15%	0%	0%	0%
1.14	Optimum OT sterilization techniques play an important role in reducing rates of post-surgical endophthalmitis.	**100%**	76.92%	23.08%	0%	0%	0%
1.15	Pre-operative check list for reducing rates of bacterial endophthalmitis is necessary.	**76.92%**	38.46%	38.46%	7.69%	7.69%	7.69%
1.16	Trimming eyelashes is not recommended practice prior to cataract surgery.	**76.92%**	46.15%	30.77%	7.69%	0%	15.38%
1.17	Instead of trimming eyelashes, adequate draping eyelashes from surgical field is an acceptable practical practice.	**100%**	61.54%	38.46%	0%	0%	0%
1.18	A short course of pre- and post-operative (peri-operative) oral antibiotics is not proven beneficial for high-risk cases such as one-eye patients (the other eye blind already) to prevent post-surgical endophthalmitis.	**92.31%**	23.08%	69.23%	7.69%	0%	0%
1.19	The use of topical antibiotics for 1 to 2 weeks after surgery is commonly utilized.	**76.92%**	15.38%	61.54%	15.38%	7.69%	0%
1.22	Cluster endophthalmitis is a preventable entity.	**92.31%**	23.08%	69.23%	0%	7.69%	0%
2. Diagnosing Endophthalmitis							
2.1	The most common symptom of acute-onset endophthalmitis is loss of visual acuity.	**92.31%**	30.77%	61.54%	7.69%	0%	0%
2.2	Both presumed and proven endophthalmitis should be managed similarly.	**100%**	53.85%	46.15%	0%	0%	0%
2.3	Culture positivity of vitreous biopsy is an important prognostic factor in post-surgical endophthalmitis.	**100%**	41.67%	58.33%	0%	0%	0%

2.5	The clinical features and microbiology report of acute-onset endophthalmitis are important in management.	**100%**	53.85%	46.15%	0%	0%	0%
2.6	Post-operative endophthalmitis with keratitis is associated with worse clinical outcomes.	**100%**	38.46%	61.54%	0%	0%	0%
2.7	Toxic anterior shock syndrome (TASS) is clinically distinct from acute-onset endophthalmitis in most cases.	**76.92%**	30.77%	46.15%	15.38%	7.69%	0%
2.10	Polymerase chain reaction (PCR) testing of vitreous may be useful if available.	**100%**	50%	50%	0%	0%	0%
2.11	There has been emergence of MDR (multi-drug resistant) micro-organism over time as causative agents for endophthalmitis.	**83.33%**	25%	58.33%	8.33%	0%	0%
2.12	The factors contributing to cluster endophthalmitis may differ from those associated with isolated cases.	**100%**	16.67%	83.33%	0%	0%	0%
3. Management of Endophthalmitis							
3.1	Intravenous antibiotics do not have an important role in management of acute-onset bacterial endophthalmitis.	**76.92%**	38.46%	38.46%	23.08%	0%	0%
3.2	There is no definite role of oral antibiotics in cases of acute-onset bacterial endophthalmitis.	**100%**	15.38%	84.62%	0%	0%	0%
3.3	The ideal intravitreal antibiotic regimen for management of acute bacterial endophthalmitis is a combination of drugs covering both gram-positive and gram-negative bacteria.	**100%**	83.33%	16.67%	0%	0%	0%
3.4	A repeat intravitreal antibiotic injection is not recommended in cases that show a favorable response to the initial injection.	**75%**	16.67%	58.33%	8.33%	16.67%	0%
3.9	The final outcomes of post-surgical endophthalmitis are dependent on multiple factors.	**100%**	61.54%	38.46%	0%	0%	0%
3.10	Eyes with post-cataract surgery endophthalmitis in the presence of silicone oil tamponade require a lower dose of intravitreal antibiotics.	**100%**	50%	50%	0%	0%	0%

Statements which had gained clear majority (>75%) were considered highly accepted consensus statements. The majority of experts agreed that prophylactic measures are essential to prevent post-cataract surgery bacterial endophthalmitis. There was strong agreement on the use of intracameral antibiotics in patients at higher risk of post-surgical endophthalmitis and in those undergoing immediate sequential bilateral cataract surgery. Intracameral antibiotic use was considered safe in paediatric age group. There was strong agreement on the use of intracameral antibiotics in patients at higher risk of post-surgical endophthalmitis and in those undergoing immediate sequential bilateral cataract surgery.

Oral antibiotics, whether administered pre- or post-operatively, were not considered to provide additional benefit, even in high-risk scenarios such as monocular cataract surgery.

Optimal operating theatre (OT) sterilization protocols were universally regarded as critical for minimizing the risk of infection. Implementation of a comprehensive pre-operative checklist was deemed essential for the prevention of bacterial contamination. Most experts believed that rather than trimming eyelashes, adequately draping them away from the surgical field was a safe and effective practice. A post-operative regimen of topical antibiotics for one to two weeks was considered sufficient for routine prophylaxis.

The practice of changing surgical gloves after each procedure and using a sterile gown for each patient has been found to be comparable in efficacy to disinfecting the same gloves between cases without patient gowning.[104]

Cluster endophthalmitis was viewed as a largely preventable complication, contingent on stringent infection control measures. Acute bacterial endophthalmitis typically presents with progressive visual loss, pain, redness, and lid swelling. Decrease in visual acuity was considered the most common presenting symptom as per experience of the experts.

Both presumed and microbiologically confirmed cases of endophthalmitis should be managed using similar protocols, with emphasis on clinical presentation and laboratory findings. Culture positivity from vitreous biopsy remains an important prognostic indicator, influencing both therapeutic decisions and expected outcomes. A one-week post-operative follow-up is critical for the early detection of acute bacterial endophthalmitis. Endophthalmitis associated with keratitis typically results in worse clinical outcomes. Although toxic anterior segment syndrome (TASS) may mimic infectious endophthalmitis, it is usually distinguishable based on clinical presentation. When accessible, polymerase chain reaction (PCR) testing of vitreous samples is recommended for rapid and accurate microbial identification.

Majority of experts believed that the emergence of multi-drug resistant (MDR) organisms as causative agents has added complexity to the management of post-operative endophthalmitis. Notably, the etiological factors for cluster outbreaks often differ from those implicated in isolated cases, underscoring the need for tailored preventive and investigative approaches.

While the EVS included systemic therapy in the study, it found no benefit of systemic antibiotics in acute post-cataract bacterial endophthalmitis. Therefore, the current consensus suggests that systemic antibiotics may not be necessary in routine endophthalmitis

management. Moreover, cases showing clinical improvement after a single dose of intravitreal antibiotics may not require repeat administration. Selection of intravitreal antibiotics was primarily based on broad-spectrum coverage against both gram-positive and gram-negative organisms, rather than on pharmacokinetics. Over the past two decades, there has been a notable shift in the microbiological spectrum of causative organisms, further distancing current practice from EVS-era recommendations.

The prognosis was believed to be influenced by multiple factors, including patient age, initial visual acuity, microbial virulence, timing of vitrectomy, culture positivity, and underlying retinal or corneal pathology. In patients with prior vitreoretinal surgery and silicone oil in situ, the dose of intravitreal antibiotics should be reduced to one-quarter to one-half of the standard amount to minimize retinal toxicity.

Borderline Accepted Statements

Table 3 summarizes the statements which are borderline accepted by the international panel of experts (50-74%).

Section	Consensus Statement	C Score	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. Preventing Endophthalmitis							
1.12	The reported safe dose of intracameral moxifloxacin for instillation after cataract surgery is 150 µg/0.1 mL.	61.53%	15.38%	46.15%	7.69%	23.08%	7.69%
1.13	Hydration of the corneal incisions may not post any additional risk.	69.23%	7.69%	61.54%	23.08%	7.69%	0%
1.20	The rates of endophthalmitis are higher in extracapsular cataract extraction than phacoemulsification.	53.84%	7.69%	46.15%	30.77%	15.38%	0%
1.21	Diabetic patients with well controlled blood sugars are not at higher risk of post-surgical endophthalmitis.	53.84%	23.08%	30.77%	0%	46.15%	0%
2. Diagnosing Endophthalmitis							
2.4	The 1-week post-operative visit is important for diagnosing acute-onset bacterial endophthalmitis.	69.23%	30.77%	38.46%	15.38%	15.38%	0%
2.9	Performing pars plana vitrectomy and instillation of intravitreal antibiotics is the first	53.84%	15.38%	38.46%	7.69%	38.46%	0%

	line treatment option in cases of endophthalmitis.						
3. Management of Endophthalmitis							
3.5	The choice of antibiotics for intravitreal injection is based on the pharmacokinetics of the drugs. Injections usually do need to be repeated.	66.67%	16.67%	50%	25%	8.33%	0%
3.6	The microbiological profile of the most common etiological agents causing acute bacterial endophthalmitis has not changed over 2 decades.	61.54%	0%	61.54%	30.77%	7.69%	0%

Few statements had more than 50% response score but still could not achieve clear majority. These topics remain subjects of ongoing debate and may require prospective studies to establish definitive clinical outcomes.

The dosage of intracameral moxifloxacin, 150 µg/0.1 mL, was found to be acceptable to most experts but not majority of them. This suggests that a proportion of surgeons prefer higher dosage of moxifloxacin for prophylaxis of post-cataract surgery endophthalmitis. The hydration of corneal incisions with moxifloxacin was not considered a preferable technique. Some experts believe this may be due to a potential risk of endothelial toxicity. The consensus was also divided on whether well-controlled diabetic patients face a similar risk of endophthalmitis compared to non-diabetic patients. It remains uncertain whether patients with short-term glycaemic control but poor long-term blood sugar management are at increased risk of post-cataract surgery endophthalmitis. Among cataract surgical techniques, extracapsular cataract extraction (ECCE) was expected to be associated with a higher incidence of post-operative endophthalmitis compared to phacoemulsification. ECCE involves a larger incision and more sutures; however, despite decades of advancements in cataract surgery techniques, the consensus on its relative drawbacks remains unclear.

While the majority of experts considered the first postoperative week follow-up to be important, this view was not universally shared. In cases of early endophthalmitis, vitreous biopsy and intravitreal antibiotic administration were not always deemed necessary as first-line management, especially in milder presentations. The selection of antibiotics was primarily based on microbial coverage rather than pharmacokinetic properties. Many experts believed that the microbiological profile of organisms causing post-surgical endophthalmitis

has remained largely unchanged over the past two decades; however, strong consensus was lacking due to emerging etiological agents and varying patterns of antibiotic susceptibility.

Poorly Accepted Statements

Table 4 summarizes the statements which are poorly accepted by the international panel of experts (<50%).

Section	Consensus Statement	C Score	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. Preventing Endophthalmitis							
1.2	A short course of topical antibiotics is considered as a part of the pre-operative regimen in all cases undergoing cataract surgery.	23.07%	7.69%	15.38%	15.38%	46.15%	15.38%
1.5	Combining pre-operative application of topical antibiotics and betadine decreases the risk of acute-onset post-surgical endophthalmitis.	23.07%	15.38%	7.69%	46.15%	23.08%	7.69%
1.11	Adverse reactions of intracameral moxifloxacin, cefuroxime and vancomycin are comparable.	30.77%	7.69%	23.08%	15.38%	46.15%	7.69%
1.23	The major limiting factor for usage of intracameral antibiotics is the cost factor in developing countries.	38.46%	0%	38.46%	46.15%	15.38%	0%
2. Diagnosing Endophthalmitis							
2.8	Aqueous tap and PPV have equivalent value in establishing the diagnosis of endophthalmitis.	30.77%	0%	30.77%	23.08%	30.77%	15.38%
3. Management of Endophthalmitis							
3.7	In cases of post-cataract surgery endophthalmitis, <10% eyes have poor visual outcomes.	33.33%	0%	33.33%	16.67%	41.67%	8.33%
3.8	The management principles of the Endophthalmitis Vitrectomy Study are still valid.	41.67%	0%	41.67%	33.33%	25%	0%

The statements with consensus score <50% were considered poorly accepted, suggesting the uncertainty or controversy on the topic among experts. Although these topics lacked sufficient evidence to support formal recommendations, they revealed a general ambivalence among experts.

The use of pre-operative antibiotics is not a standard or widely accepted prophylactic measure for cataract surgery among the practicing ophthalmologists. It was not believed to offer additional advantage for preventing post-operative endophthalmitis. There was no uniform consensus on whether the combined use of topical antibiotics and povidone-iodine offered additional protection. Specific strategies such as a single pre-operative application of 5% povidone-iodine on the periocular skin and ocular surface for at least three minutes, along with a short course of pre-operative topical antibiotics, were not considered sufficiently effective in significantly reducing the incidence of post-operative endophthalmitis.

There was variability in expert opinion regarding the adverse effects of commonly used intracameral antibiotics such as moxifloxacin, cefuroxime, and vancomycin, suggesting that these agents are not interchangeable in terms of safety profiles. Intracameral antibiotics though offer significant advantage, moxifloxacin was considered safer and preferable over cefuroxime and vancomycin.

The major reason for non-usage of intracameral antibiotics is debatable with majority experts casting a neutral reply. There was no clear agreement on the limiting factors for the use of intracameral antibiotics in developing countries; however, high cost was not considered a primary barrier. Other factors, such as errors in dilution, breaches in sterility, logistical constraints and lack of suitable commercially available preparations were identified as more likely contributors to non-usage of reconstituted antibiotics.

Aqueous tap and PPV have no diagnostic role in endophthalmitis. The expert panel also stressed that in the modern era, the management principles of Endophthalmitis vitrectomy study do not stand valid. The concept of early vitrectomy with advances in vitrectomy system and newer antibiotics and usage of steroids has revolutionized the old age principles. These observations suggest that the traditional guidelines outlined in the Endophthalmitis Vitrectomy Study (EVS) may no longer be fully applicable in contemporary practice. The Chinese expert consensus on endophthalmitis proposes a classification system that stratifies the condition into stages based on the severity of anterior chamber inflammation, the presence or absence of hypopyon, and the degree of vitreous opacification. Management is implemented in a stepwise approach, incorporating subconjunctival and systemic antibiotic therapy, intravitreal antimicrobial agents, and adjunctive treatments. In cases exhibiting rapid progression, frequent clinical monitoring is essential, and therapeutic strategies are dynamically adjusted according to the disease stage.[105]

Despite best management practices, the visual outcomes in post-operative endophthalmitis remain suboptimal, with more than 10% of affected eyes experiencing poor outcomes.

There are certain limitations of this study. It being a consensus article is based on expert opinions and existing literature, which means it does not include new experimental or large-scale clinical trials to validate the recommendations. This limits the ability to definitively confirm the efficacy of some proposed strategies. On the other hand, it provides a more practical working guideline. Additionally, there may be geographical bias. While the expert panel was international, certain recommendations may be more applicable in regions with access to advanced technology and resources. The applicability of these guidelines in resource limited settings may be challenging, especially for practices with limited access to intracameral antibiotics or advanced imaging technologies. This consensus also highlights certain points which have low acceptance or majority, further exposing areas of controversy and potential research to provide clearer guidelines.

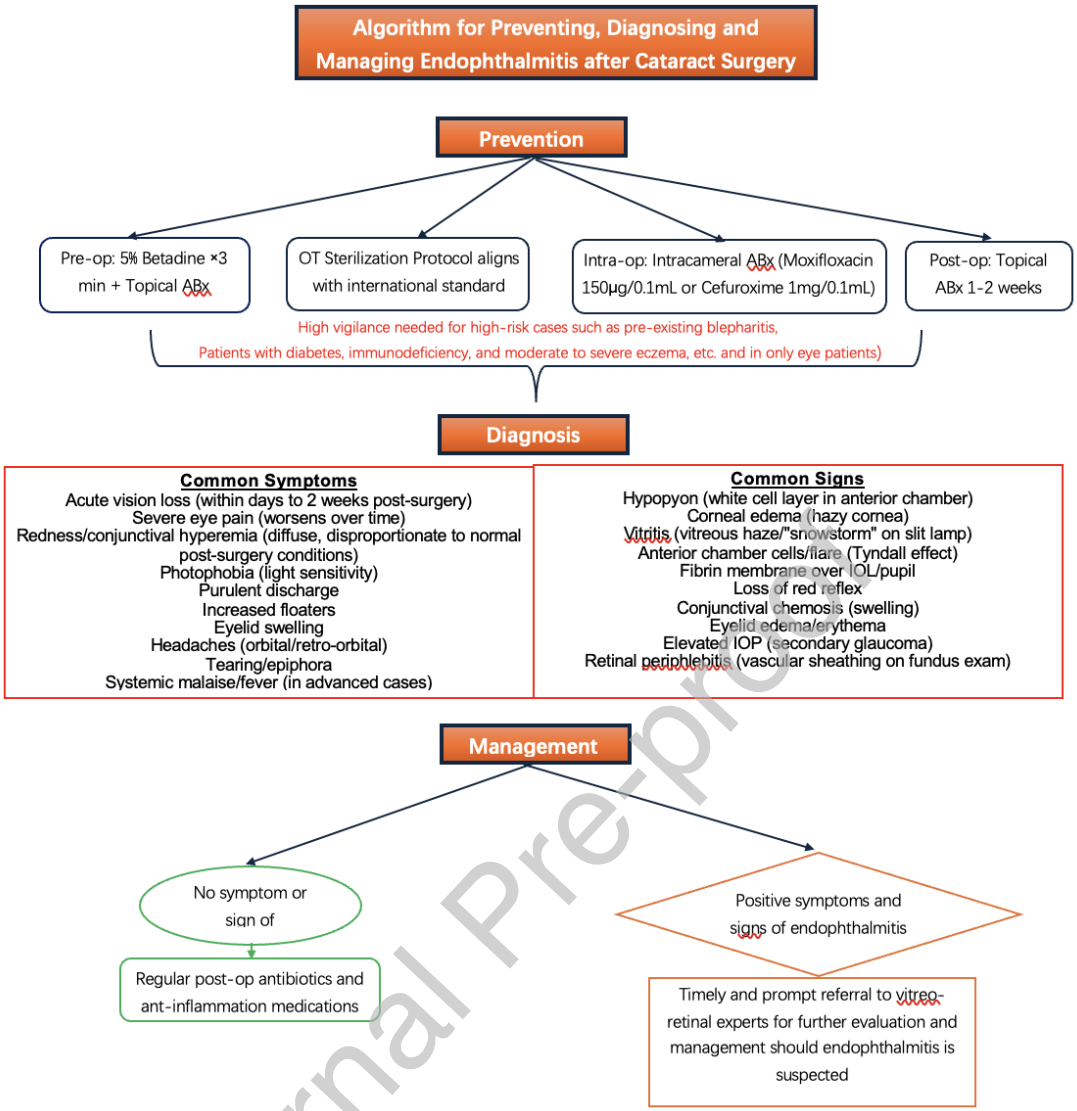

Figure 1. Management algorithm for endophthalmitis after cataract surgery.

Conclusion

Acute-onset endophthalmitis after cataract surgery is a serious and uncommon complication. A consensus statement on the prevention, diagnosis, and management of post-surgical endophthalmitis is crucial to harmonize clinical practices, enhance patient safety, and uphold the standards of cataract surgery worldwide. The formulation of such statements should be a priority for professional ophthalmic organizations, promoting collaboration among experts to address this vision-threatening complication comprehensively. The development of a consensus statement is not merely a procedural formality, but a vital step toward improving patient care. By standardizing these guidelines, it enables early and accurate diagnosis while

optimizing the final outcomes. Furthermore, it helps to identify and bridge existing knowledge gaps and updates outdated frameworks, such as those outlined in the Endophthalmitis Vitrectomy Study (EVS), which may no longer fully align with current practices. As cataract surgery continues to evolve with advancements in surgical techniques and technology, the establishment of updated, evidence-based consensus guidelines will be instrumental in ensuring safer procedures and improved visual outcomes for patients globally.

References

1. Gunalda J, Williams D, Koyfman A, Long B. High risk and low prevalence diseases: Endophthalmitis. *Am J Emerg Med*. 2023;71:144-149. doi:10.1016/j.ajem.2023.06.029

2. Low L, Shah V, Norridge CFE, Donachie PHJ, Buchan JC. Royal College of Ophthalmologists' National Ophthalmology Database, Report 10: Risk Factors for Post–Cataract Surgery Endophthalmitis. *Ophthalmology*. 2023;130(11):1228-1230. doi:10.1016/j.ophtha.2023.07.021

3. Zhu Y, Chen X, Chen P, Wu J, Hua H, Yao K. The occurrence rate of acute-onset postoperative endophthalmitis after cataract surgery in Chinese small- and medium-scale departments of ophthalmology. *Sci Rep*. 2017;7(1):40776. doi:10.1038/srep40776

4. Miller KM, Oetting TA, Tweeten JP, et al. Cataract in the Adult Eye Preferred Practice Pattern®. *Ophthalmology*. 2022;129(1):P1-P126. doi:10.1016/j.ophtha.2021.10.006

5. Zafar A, Shaheen F, Afzal T, Ahmad S, Amjad M. Role of Prophylactic Oral Antibiotics in the Prevention of Post-cataract Surgery Acute Infective Endophthalmitis. Cureus. Published online July 29, 2023. doi:10.7759/cureus.42662

6. Ruamviboonsuk P, Ng DSC, Chaikitmongkol V, et al. Consensus and guidelines on diagnosis and management of polypoidal choroidal vasculopathy (PCV) from the Asia-Pacific Vitreo-retina Society (APVRS). Asia Pac J Ophthalmol. 2025;14:100144.

7. the Preoperative Disinfection Study Group, Inoue Y, Usui M, Ohashi Y, Shiota H, Yamazaki T. Preoperative disinfection of the conjunctival sac with antibiotics and iodine compounds: A prospective randomized multicenter study. *Jpn J Ophthalmol*. 2008;52(3):151-161. doi:10.1007/s10384-008-0517-y

8. Wu PC, Li M, Chang SJ, et al. Risk of Endophthalmitis After Cataract Surgery Using Different Protocols for Povidone– Iodine Preoperative Disinfection. *J Ocul Pharmacol Ther*. 2006;22(1):54-61. doi:10.1089/jop.2006.22.54

9. Ferguson AW. Comparison of 5% povidone-iodine solution against 1% povidone-iodine solution in preoperative cataract surgery antisepsis: a prospective randomised double blind study. *Br J Ophthalmol*. 2003;87(2):163-167. doi:10.1136/bjo.87.2.163

10. Ting MYL, Pocobelli G, Butu DM, Mandal N, Nicholson L, Khan SR. Incidence and outcomes of post-operative endophthalmitis following elective phacoemulsification cataract surgery, between 2015 and 2022. *Eye*. 2024;38(18):3429-3433. doi:10.1038/s41433-024-03281-0

11. Rees AC, Saleki M. Effect of a topical antibiotic and povidone-iodine vs povidone-iodine alone on conjunctival flora:systematic review and meta-analysis. *J Cataract Refract Surg*. 2025;51(5):427-435. doi:10.1097/j.jcrs.0000000000001626

12. Eslami J, Rezaei R, Jamali H, Sedaghat A, Nowroozzadeh MH. Effect of topical povidone–iodine 10% plus levofloxacin 0.5% 1 hour before cataract surgery in eliminating

perioperative conjunctival flora: randomized clinical trial. *J Cataract Refract Surg*. 2021;47(3):340-344. doi:10.1097/j.jcrs.0000000000000436

13. Halachimi-Eyal O, Lang Y, Keness Y, Miron D. Preoperative topical moxifloxacin 0.5% and povidone–iodine 5.0% versus povidone–iodine 5.0% alone to reduce bacterial colonization in the conjunctival sac. *J Cataract Refract Surg*. 2009;35(12):2109-2114. doi:10.1016/j.jcrs.2009.06.038

14. Ikuno Y, Sawa M, Tsujikawa M, Gomi F, Maeda N, Nishida K. Effectiveness of 1.25 % povidone–iodine combined with topical levofloxacin against conjunctival flora in intravitreal injection. *Jpn J Ophthalmol*. 2012;56(5):497-501. doi:10.1007/s10384-012-0160-5

15. Miño De Kaspar H, Kreutzer TC, Aguirre-Romo I, et al. A Prospective Randomized Study to Determine the Efficacy of Preoperative Topical Levofloxacin in Reducing Conjunctival Bacterial Flora. *Am J Ophthalmol*. 2008;145(1):136-142.e2. doi:10.1016/j.ajo.2007.08.031

16. Ta CN, Singh K, Egbert PR, De Kaspar HM. Prospective comparative evaluation of povidone–iodine (10% for 5 minutes versus 5% for 1 minute) as prophylaxis for ophthalmic surgery. *J Cataract Refract Surg*. 2008;34(1):171-172. doi:10.1016/j.jcrs.2007.08.035

17. Moss JM, Sanislo SR, Ta CN. A Prospective Randomized Evaluation of Topical Gatifloxacin on Conjunctival Flora in Patients Undergoing Intravitreal Injections. *Ophthalmology*. 2009;116(8):1498-1501. doi:10.1016/j.ophtha.2009.02.024

18. Priya G, Sahu Y, Aggarwal R. Impact of topical moxifloxacin prophylaxis and povidone iodine on conjunctival bacterial flora in patients receiving intravitreal injections in a tertiary healthcare center in India. *J Fam Med Prim Care*. 2022;11(7):3856-3861. doi:10.4103/jfmpc.jfmpc_928_21

19. Sreedhar SS, Rajalakshmi AR, Nagarajan S, Easow JM, Rajendran P. Comparison of preoperative prophylaxis with povidone–iodine (5%) and moxifloxacin (0.5%) versus povidone–iodine (5%) alone: a prospective study from India. *Int Ophthalmol*. 2024;44(1):48. doi:10.1007/s10792-024-03025-9

20. Haripriya A, Chang DF, Ravindran RD. Endophthalmitis reduction with intracameral moxifloxacin in eyes with and without surgical complications: Results from 2 million consecutive cataract surgeries. *J Cataract Refract Surg*. 2019;45(9):1226-1233. doi:10.1016/j.jcrs.2019.04.018

21. Barry P, Seal DV, Gettinby G, Lees F, Peterson M, Revie CW. ESCRS study of prophylaxis of postoperative endophthalmitis after cataract surgery: Preliminary report of principal results from a European multicenter study. *J Cataract Refract Surg*. 2006;32(3):407-410. doi:10.1016/j.jcrs.2006.02.021

22. Mehta S, Armstrong BK, Kim SJ, et al. LONG-TERM POTENCY, STERILITY, AND STABILITY OF VANCOMYCIN, CEFTAZIDIME, AND MOXIFLOXACIN FOR TREATMENT OF BACTERIAL

ENDOPHTHALMITIS. *Retina*. 2011;31(7):1316-1322. doi:10.1097/IAE.0b013e31820039af

23. Kato A, Horita N, Namkoong H, et al. Prophylactic antibiotics for postcataract surgery endophthalmitis: a systematic review and network meta-analysis of 6.8 million eyes. *Sci Rep*. 2022;12(1):17416. doi:10.1038/s41598-022-21423-w

24. Garg P, Roy A, Sharma S. Endophthalmitis after cataract surgery: epidemiology, risk factors, and evidence on protection. *Curr Opin Ophthalmol*. 2017;28(1):67-72. doi:10.1097/ICU.0000000000000326

25. Anderson J, Young S, Cockerham G, Chomsky A, Parr NJ. *Evidence Brief: Intracameral Moxifloxacin for Prevention of Endophthalmitis After Cataract Surgery*. Department of Veterans Affairs (US); 2022. Accessed May 31, 2025. http://www.ncbi.nlm.nih.gov/books/NBK581595/

26. Verma L, Agarwal A, Dave VP, et al. All India Ophthalmological Society (AIOS) Task Force guidelines to prevent intraocular infections and cluster outbreaks after cataract surgery. *Indian J Ophthalmol*. 2022;70(2):362-368. doi:10.4103/ijo.IJO_94_22

27. Melega MV, Alves M, Lira RPC, et al. Safety and efficacy of intracameral moxifloxacin for prevention of post-cataract endophthalmitis: Randomized controlled clinical trial. *J Cataract Refract Surg*. 2019;45(3):343-350. doi:10.1016/j.jcrs.2018.10.044

28. Friling E, Johansson B, Lundström M, Montan P. Postoperative Endophthalmitis in Immediate Sequential Bilateral Cataract Surgery. *Ophthalmology*. 2022;129(1):26-34. doi:10.1016/j.ophtha.2021.07.007

29. Spekreijse LS, Nuijts RMMA. An update on immediate sequential bilateral cataract surgery. *Curr Opin Ophthalmol*. 2023;34(1):21-26. doi:10.1097/ICU.0000000000000907

30. Grzybowski A, Brona P, Zeman L, Stewart MW. Commonly used intracameral antibiotics for endophthalmitis prophylaxis: A literature review. *Surv Ophthalmol*. 2021;66(1):98-108. doi:10.1016/j.survophthal.2020.04.006

31. Garcia O'Farrill N, Abi Karam M, Villegas VM, Flynn HW, Grzybowski A, Schwartz SG. New Approaches to Overcoming Antimicrobial Resistance in Endophthalmitis. *Pharmaceuticals*. 2024;17(3):321. doi:10.3390/ph17030321

32. Moisseiev E, Levinger E. Anaphylactic reaction following intracameral cefuroxime injection during cataract surgery. *J Cataract Refract Surg*. 2013;39(9):1432-1434. doi:10.1016/j.jcrs.2013.06.008

33. Delyfer MN, Rougier MB, Leoni S, et al. Ocular toxicity after intracameral injection of very high doses of cefuroxime during cataract surgery. *J Cataract Refract Surg*. 2011;37(2):271-278. doi:10.1016/j.jcrs.2010.08.047

34. Ullman MA, Midgley KJ, Kim J, Ullman S. Anaphylactic reaction secondary to topical preoperative moxifloxacin. *J Cataract Refract Surg*. 2016;42(12):1836-1837. doi:10.1016/j.jcrs.2016.11.004

35. Murphy CC, Nicholson S, Quah SA, Batterbury M, Neal T, Kaye SB. Pharmacokinetics of vancomycin following intracameral bolus injection in patients undergoing phacoemulsification cataract surgery. *Br J Ophthalmol*. 2007;91(10):1350-1353. doi:10.1136/bjo.2006.112060

36. Nicholson LB, Kim BT, Jardón J, et al. Severe Bilateral Ischemic Retinal Vasculitis Following Cataract Surgery. *Ophthalmic Surg Lasers Imaging Retina*. 2014;45(4):338-342. doi:10.3928/23258160-20140605-01

37. Hospital Infection Control Practices Advisory Committee (HICPAC). Recommendations for Preventing the Spread of Vancomycin Resistance. *Infect Control Hosp Epidemiol*. 1995;16(2):105-113. doi:10.1086/647066

38. Forster RK. The Endophthalmitis Vitrectomy Study. *Arch Ophthalmol*. 1995;113(12):1555. doi:10.1001/archopht.1995.01100120085015

39. Witkin AJ, Chang DF, Jumper JM, et al. Vancomycin-Associated Hemorrhagic Occlusive Retinal Vasculitis. *Ophthalmology*. 2017;124(5):583-595. doi:10.1016/j.ophtha.2016.11.042

40. Arshinoff SA, Modabber M. Dose and administration of intracameral moxifloxacin for prophylaxis of postoperative endophthalmitis. *J Cataract Refract Surg*. 2016;42(12):1730-1741. doi:10.1016/j.jcrs.2016.10.017

41. Drago L. Topical Antibiotic Therapy in the Ocular Environment: The Benefits of Using Moxifloxacin Eyedrops. *Microorganisms*. 2024;12(4):649. doi:10.3390/microorganisms12040649

42. Bowen RC, Zhou AX, Bondalapati S, et al. Comparative analysis of the safety and efficacy of intracameral cefuroxime, moxifloxacin and vancomycin at the end of cataract surgery: a meta-analysis. *Br J Ophthalmol*. 2018;102(9):1268-1276. doi:10.1136/bjophthalmol-2017-311051

43. Shorstein NH, Gardner S. Injection volume and intracameral moxifloxacin dose. *J Cataract Refract Surg*. 2019;45(10):1498-1502. doi:10.1016/j.jcrs.2019.04.020

44. Asencio MA, Huertas M, Carranza R, Tenias JM, Celis J, Gonzalez-Del Valle F. A case-control study of post-operative endophthalmitis diagnosed at a Spanish hospital over a 13-year-period. *Epidemiol Infect*. 2015;143(1):178-183. doi:10.1017/S095026881400034X

45. Waltz K. Intraocular Gentamicin Toxicity. *Arch Ophthalmol*. 1991;109(7):911. doi:10.1001/archopht.1991.01080070021002

46. McDonald HR, Schatz H, Allen AW, et al. Retinal Toxicity Secondary to intraocular Gentamicin Injection. *Ophthalmology*. 1986;93(7):871-877. doi:10.1016/S0161-6420(86)33648-0

47. Perry LD, Skaggs C. Preoperative topical antibiotics and lash trimming in cataract surgery. *Ophthalmic Surg*. 1977;8(5):44-48.

48. Niyadurupola N, Astbury N. Postoperative endophthalmitis. *Community Eye Health*. 2015;28(90):32-33.

49. Passaro ML, Posarelli M, Avolio FC, et al. Evaluating the efficacy of postoperative topical antibiotics in cataract surgery: A systematic review and meta-analysis. *Acta Ophthalmol (Copenh)*. Published online February 28, 2025:aos.17469. doi:10.1111/aos.17469

50. Friling E, Lundström M, Stenevi U, Montan P. Six-year incidence of endophthalmitis after cataract surgery: Swedish national study. *J Cataract Refract Surg*. 2013;39(1):15-21. doi:10.1016/j.jcrs.2012.10.037

51. Titiyal JS, Kaur M. Role of intracameral antibiotics in endophthalmitis prophylaxis following-cataract surgery. *Indian J Ophthalmol*. 2020;68(5):688-691. doi:10.4103/ijo.IJO_195_20

52. Lundström M, Friling E, Montan P. Risk factors for endophthalmitis after cataract surgery: Predictors for causative organisms and visual outcomes. *J Cataract Refract Surg*. 2015;41(11):2410-2416. doi:10.1016/j.jcrs.2015.05.027

53. Hahn P, Yashkin AP, Sloan FA. Effect of Prior Anti–VEGF Injections on the Risk of Retained Lens Fragments and Endophthalmitis after Cataract Surgery in the Elderly. *Ophthalmology*. 2016;123(2):309-315. doi:10.1016/j.ophtha.2015.06.040

54. Weston K, Nicholson R, Bunce C, Yang YF. An 8-year retrospective study of cataract surgery and postoperative endophthalmitis: injectable intraocular lenses may reduce the incidence of postoperative endophthalmitis. *Br J Ophthalmol*. 2015;99(10):1377-1380. doi:10.1136/bjophthalmol-2014-306372

55. Sun J, Guo Z, Li H, Yang B, Wu X. Acute Infectious Endophthalmitis After Cataract Surgery: Epidemiological Characteristics, Risk Factors and Incidence Trends, 2008–2019. *Infect Drug Resist*. 2021;Volume 14:1231-1238. doi:10.2147/IDR.S304675

56. Althiabi S, Aljbreen AJ, Alshutily A, Althwiny FA. Postoperative Endophthalmitis After Cataract Surgery: An Update. *Cureus*. Published online February 8, 2022. doi:10.7759/cureus.22003

57. Jensen MK, Fiscella RG, Moshirfar M, Mooney B. Third- and fourth-generation fluoroquinolones: Retrospective comparison of endophthalmitis after cataract surgery performed over 10 years. *J Cataract Refract Surg*. 2008;34(9):1460-1467. doi:10.1016/j.jcrs.2008.05.045

58. Taban M. Acute Endophthalmitis Following Cataract Surgery: A Systematic Review of the Literature. *Arch Ophthalmol*. 2005;123(5):613. doi:10.1001/archopht.123.5.613

59. Schwartz SG, Flynn Jr HW, Das T, Mieler WF. Ocular Infection: Endophthalmitis. In: Nguyen QD, Rodrigues EB, Farah ME, Mieler WF, Do DV, eds. *Developments in Ophthalmology*. Vol 55. S. Karger AG; 2016:176-188. doi:10.1159/000431195

60. Phillips WB, Tasman WS. Postoperative Endophthalmitis in Association with Diabetes Mellitus. *Ophthalmology*. 1994;101(3):508-518. doi:10.1016/S0161-6420(13)31268-8

61. Gondhale H, Jaichandran V, Jambulingam M, et al. Distribution and risk factors of postoperative endophthalmitis in people with diabetes. *Indian J Ophthalmol*. 2021;69(11):3329-3334. doi:10.4103/ijo.IJO_1485_21

62. Wong TY. Risk factors of acute endophthalmitis after cataract extraction: a case-control study in Asian eyes. *Br J Ophthalmol*. 2004;88(1):29-31. doi:10.1136/bjo.88.1.29

63. Desai S, Bhagat P, Parmar D. Recommendations for an expert team investigating a case of cluster endophthalmitis. *Indian J Ophthalmol*. 2018;66(8):1074. doi:10.4103/ijo.IJO_804_17

64. Zaluski S, Clayman HM, Karsenti G, et al. Pseudomonas aeruginosa endophthalmitis caused by contamination of the internal fluid pathways of a phacoemulsifier. *J Cataract Refract Surg*. 1999;25(4):540-545. doi:10.1016/S0886-3350(99)80052-2

65. Swaddiwudhipong W, Tangkitchot T, Silarug N. An outbreak of Pseudomonas aeruginosa postoperative endophthalmitis caused by contaminated intraocular irrigating solution. *Trans R Soc Trop Med Hyg*. 1995;89(3):288. doi:10.1016/0035-9203(95)90545-6

66. García-Sáenz MC, Arias-Puente A, Rodríguez-Caravaca G, Bañuelos JB. Effectiveness of intracameral cefuroxime in preventing endophthalmitis after cataract surgery: Ten-year comparative study. *J Cataract Refract Surg*. 2010;36(2):203-207. doi:10.1016/j.jcrs.2009.08.023

67. Results of the Endophthalmitis Vitrectomy Study. A randomized trial of immediate vitrectomy and of intravenous antibiotics for the treatment of postoperative bacterial endophthalmitis. Endophthalmitis Vitrectomy Study Group. *Arch Ophthalmol Chic Ill 1960*. 1995;113(12):1479-1496.

68. Prophylaxis of postoperative endophthalmitis following cataract surgery: Results of the ESCRS multicenter study and identification of risk factors. *J Cataract Refract Surg*. 2007;33(6):978-988. doi:10.1016/j.jcrs.2007.02.032

69. Mollan SP, Gao A, Lockwood A, Durrani OM, Butler L. Postcataract endophthalmitis: Incidence and microbial isolates in a United Kingdom region from 1996 through 2004. *J Cataract Refract Surg*. 2007;33(2):265-268. doi:10.1016/j.jcrs.2006.10.022

70. Satpathy G, Nayak N, Wadhwani M, et al. Clinicomicrobiological profile of endophthalmitis: A 10 year experience in a Tertiary Care Center in North India. *Indian J Pathol Microbiol*. 2017;60(2):214. doi:10.4103/IJPM.IJPM_794_15

71. Cioana M, Naidu S, Far PM, Yeung SC, You Y, Yan P. POSTINTRAVITREAL INJECTION AND POSTCATARACT EXTRACTION ENDOPHTHALMITIS VISUAL OUTCOMES BY ORGANISM: A SYSTEMATIC REVIEW AND META-ANALYSIS. *Retina*. 2024;44(9):1608-1618. doi:10.1097/IAE.0000000000004143

72. Results of the Endophthalmitis Vitrectomy Study. A randomized trial of immediate vitrectomy and of intravenous antibiotics for the treatment of postoperative bacterial endophthalmitis. Endophthalmitis Vitrectomy Study Group. *Arch Ophthalmol Chic Ill 1960*. 1995;113(12):1479-1496.

73. Senthamizh, Ms T, Aravind, Ms H, Singh, Ms TP. Factors associated with postoperative visual outcome in acute endophthalmitis after cataract surgery—a cross-sectional, analytical study. *Digit J Ophthalmol*. 2022;28(1):1-6. doi:10.5693/djo.01.2021.08.001

74. Cutler Peck CM, Brubaker J, Clouser S, Danford C, Edelhauser HE, Mamalis N. Toxic anterior segment syndrome: Common causes. *J Cataract Refract Surg*. 2010;36(7):1073-1080. doi:10.1016/j.jcrs.2010.01.030

75. Schwartz S, Vaziri K, Kishor K, Flynn, Jr. HW. Endophthalmitis: state of the art. *Clin Ophthalmol*. Published online January 2015:95. doi:10.2147/OPTH.S76406

76. Sandvig KU, Dannevig L. Postoperative endophthalmitis: Establishment and results of a national registry. *J Cataract Refract Surg*. 2003;29(7):1273-1280. doi:10.1016/S0886-3350(02)02048-5

77. Duan F, Wu K, Liao J, et al. Causative Microorganisms of Infectious Endophthalmitis: A 5-Year Retrospective Study. *J Ophthalmol*. 2016;2016:1-7. doi:10.1155/2016/6764192

78. Mishra D, Satpathy G, Chawla R, Venkatesh P, Ahmed NH, Panda SK. Utility of broad-range 16S rRNA PCR assay versus conventional methods for laboratory diagnosis of bacterial endophthalmitis in a tertiary care hospital. *Br J Ophthalmol*. 2019;103(1):152-156. doi:10.1136/bjophthalmol-2018-312877

79. Low L, Nakamichi K, Akileswaran L, Lee CS, Lee AY, Moussa G, Murray PI, Wallace GR, VanGelder RN, Rauz S; West Midlands Collaborative Ophthalmology Network for ClinicalEffectiveness & Research by Trainees (WM CONCERT). Deep Metagenomic Sequencing forEndophthalmitis Pathogen Detection Using a Nanopore Platform. Am J Ophthalmol. 2022;242:243-251.

80. Jindal A, Pathengay A, Khera M, et al. Combined ceftazidime and amikacin resistance among Gram-negative isolates in acute-onset postoperative endophthalmitis: prevalence, antimicrobial susceptibilities, and visual acuity outcome. *J Ophthalmic Inflamm Infect*. 2013;3(1):62. doi:10.1186/1869-5760-3-62

81. Jindal A, Pathengay A, Jalali S, et al. Microbiologic spectrum and susceptibility of isolates in delayed post-cataract surgery endophthalmitis. *Clin Ophthalmol Auckl NZ*. 2015;9:1077-1079. doi:10.2147/OPTH.S82852

82. Schwartz SG, Flynn Jr HW. Update on the prevention and treatment of endophthalmitis. *Expert Rev Ophthalmol*. 2014;9(5):425-430. doi:10.1586/17469899.2014.951331

83. Satpathy G, Patnayak D, Titiyal JS, et al. Post-operative endophthalmitis: Antibiogram & genetic relatedness between Pseudomonas aeruginosa isolates from patients & phacoemulsifiers. *Indian J Med Res*. 2010;131:571-577.

84. Das T, Joseph J, Simunovic MP, et al. Consensus and controversies in the science of endophthalmitis management: Basic research and clinical perspectives. *Prog Retin Eye Res*. 2023;97:101218. doi:10.1016/j.preteyeres.2023.101218

85. Lundström M, Barry P, Henry Y, Rosen P, Stenevi U. Evidence-based guidelines for cataract surgery: Guidelines based on data in the European Registry of Quality Outcomes for Cataract and Refractive Surgery database. *J Cataract Refract Surg*. 2012;38(6):1086-1093. doi:10.1016/j.jcrs.2012.03.006

86. Bari A, Chawla R, Mishra D, et al. Real-life comparison of three intravitreal antibiotic drug regimens in endophthalmitis. *Indian J Ophthalmol*. 2022;70(5):1696-1700. doi:10.4103/ijo.IJO_2640_21

87. Dave VP, Pathengay A, Nishant K, et al. Clinical presentations, risk factors and outcomes of ceftazidime-resistant Gram-negative endophthalmitis. *Clin Experiment Ophthalmol*. 2017;45(3):254-260. doi:10.1111/ceo.12833

88. Pearson AP, Hainsworth DP, Ashton P. CLEARANCE AND DISTRIBUTION OF CIPROFLOXACIN AFTER INTRAVITREAL INJECTION: *RETINA*. 1993;13(4):326-330. doi:10.1097/00006982-199313040-00010

89. Pathengay A, Mathai A, Shah GY, Ambatipudi S. Intravitreal piperacillin/tazobactam in the management of multidrug-resistant Pseudomonas aeruginosa endophthalmitis. *J Cataract Refract Surg*. 2010;36(12):2210-2211. doi:10.1016/j.jcrs.2010.09.013

90. Pop-Vicas AE, D'Agata EMC. The Rising Influx of Multidrug-Resistant Gram-Negative Bacilli into a Tertiary Care Hospital. *Clin Infect Dis*. 2005;40(12):1792-1798. doi:10.1086/430314

91. Anand AR, Therese KL, Madhavan HN. Spectrum of aetiological agents of postoperative endophthalmitis and antibiotic susceptibility of bacterial isolates. *Indian J Ophthalmol*. 2000;48(2):123-128.

92. Singh T, Pathengay A, Das T, Sharma S. Enterobacter endophthalmitis: Treatment with intravitreal tazobactam- piperacillin. *Indian J Ophthalmol*. 2007;55(6):482. doi:10.4103/0301-4738.36495

93. Özkiriş A, Evereklioglu C, Kontaş O, Öztürk Öner A, Erkiliç K. Determination of Nontoxic Concentrations of Piperacillin/Tazobactam for Intravitreal Application. *Ophthalmic Res*. 2004;36(3):139-144. doi:10.1159/000077326

94. Özkiris A, Evereklioglu C, Esel D, Akgün H, Göktas S, Erkiliç K. The Efficacy of Piperacillin/Tazobactam in Experimental Pseudomonas aeruginosa Endophthalmitis: A Histopathological and Microbiological Evaluation. *Curr Eye Res*. 2005;30(1):13-19. doi:10.1080/02713680490894180

95. Radhika M, Mithal K, Bawdekar A, et al. Pharmacokinetics of intravitreal antibiotics in endophthalmitis. *J Ophthalmic Inflamm Infect*. 2014;4(1):22. doi:10.1186/s12348-014-0022-z

96. Barza M, Kane A, Baum J. Pharmacokinetics of intravitreal carbenicillin, cefazolin, and gentamicin in rhesus monkeys. *Invest Ophthalmol Vis Sci*. 1983;24(12):1602-1606.

97. Teh BL, Ong AY, Mehta A, et al. Long term analysis of microbiological isolates and antibiotic susceptibilities in acute-onset postoperative endophthalmitis: a UK multicentre study. *Eye*. 2025;39(8):1470-1475. doi:10.1038/s41433-025-03673-w

98. Melo GB, Bispo PJM, Yu MCZ, Pignatari ACC, Höfling-Lima AL. Microbial profile and antibiotic susceptibility of culture-positive bacterial endophthalmitis. *Eye*. 2011;25(3):382-388. doi:10.1038/eye.2010.236

99. Ambiya V, Das T, Sharma S, et al. Comparison of clinico-microbiological profile and treatment outcome of in-house and referred post cataract surgery endophthalmitis in a tertiary care center in South India. *J Ophthalmic Inflamm Infect*. 2016;6(1):45. doi:10.1186/s12348-016-0113-0

100. Jeong SH, Cho HJ, Kim HS, et al. Acute endophthalmitis after cataract surgery: 164 consecutive cases treated at a referral center in South Korea. *Eye*. 2017;31(10):1456-1462. doi:10.1038/eye.2017.85

101. Tomaiuolo M, Deaner J, VanderBeek BL, et al. Do Treatment Patterns for Endophthalmitis after Cataract Surgery Follow the Endophthalmitis Vitrectomy Study Recommendations? *Ophthalmol Retina*. 2024;8(11):1035-1043. doi:10.1016/j.oret.2024.07.014

102. Das T, Kunimoto DY, Sharma S, et al. Relationship between clinical presentation and visual outcome in postoperative and posttraumatic endophthalmitis in south central India. *Indian J Ophthalmol*. 2005;53(1):5-16. doi:10.4103/0301-4738.15298

103. Hegazy HM, Kivilcim M, Peyman GA, et al. Evaluation of toxicity of intravitreal ceftazidime, vancomycin, and ganciclovir in a silicone oil-filled eye. *Retina Phila Pa*. 1999;19(6):553-557. doi:10.1097/00006982-199911000-00013

104. Haripriya A, Ravindran RD, Robin AL, Shukla AG, Chang DF. Changing operating room practices: the effect on postoperative endophthalmitis rates following cataract surgery. *Br J Ophthalmol*. 2023;107(6):780-785. doi:10.1136/bjophthalmol-2021-320506

105. Chinese Vitreo-Retina Society of Chinese Medical Association, Chinese Cataract and Refractive Surgery Society, China Ocular Trauma Society, Glaucoma Group of Ophthalmology Branch of Chinese Medical Association. [Chinese expert consensus on the diagnosis and management of infectious endophthalmitis after ophthalmic surgery (2022)]. *Zhonghua Yan Ke Za Zhi Chin J Ophthalmol*. 2022;58(7):487-499. doi:10.3760/cma.j.cn112142-20220301-00088

Table of Contents Statement

Post-cataract surgery endophthalmitis is a serious but largely preventable clinical entity. Its prevention, diagnosis and management have considerable variability in clinical practices. A panel of 35 international experts from 13 countries/regions was formed to establish consensus. This paper is the product of a systematic review of current literature, informed by the panel's collective experience and expertise. It aims to establish standardized guidelines to improve cataract surgery outcomes by minimizing the risk of post-operative endophthalmitis.

Funding

Ms. May Lam Research and Education Fund of The Primasia International Eye Research Institute (PIERI) of The Chinese University of Hong Kong (Shenzhen); Shun Hing Education and Charity Fund; Bright Future Charitable Foundation Postgraduate Education Fund; Daniel & Co Scholarship

Declaration of competing interests:

Andrzej Grzybowski: (Consultant/Contractor): Thea, Polpharma, Viatris, Santen, InView, Eyerising, Essilor, Beijing Zhipu Sunshine Health Management Co., Alcon; (Financial Support): Alcon, Bausch&Lomb, Zeiss, Teleon, J&J, CooperVision, Hoya, Essilor, Thea, Polpharma, Viatris; (Recipient): Thea, Polpharma, Viatris, Santen, InView, Eyerising, Essilor, Beijing Zhipu Sunshine Health Management Co., Alcon