

Ophthalmic Essential Medication List for Canada

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Prepared by



Canadian Ophthalmological Society | Société canadienne d'ophtalmologie

EYE PHYSICIANS AND SURGEONS OF CANADA | MÉDECINS ET CHIRURGIENS OPHTALMOLOGISTES DU CANADA

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Introduction

Essential medicines are defined as drugs that are proven to be therapeutically effective, to have an acceptable safety, and to satisfy the health needs of the population.¹ The World Health Organization (WHO) developed its first model list of essential medicines in 1977.¹ In doing so, the WHO encouraged member states to consider the problems posed by drug unavailability and the benefits of a list focused on priority medications. The WHO noted that international differences prohibit the creation of a standard list for all nations. Yet, the WHO suggested its essential medication list (EML) could serve as a guideline for each country in “adopting a list of essential drugs, according to its own policy in the field of health.”¹ By 2017, 137 countries out of 194 WHO member states had a formal national EML (70.6%).² Canada does not have an EML.

The WHO convenes a committee to update its EML list every two years. It offers the following guidelines in deciding what should be considered when creating and maintain national EMLs:²

- Drugs selected via committees that have input from experts of clinical medicine, pharmacology, and pharmacy. Additionally, there should be insight from peripheral health workers.
- Drug selected based on the results of studies that prove benefit and safety.
- The international non-proprietary (generic) names used whenever possible.
- National quality control and medication oversight.
- The cost of treatment representing a major selection criterion.
- Decide the level of expertise required to prescribe selected medication.
- Consider the influence of local diseases or conditions.
- Select drugs that provide the highest benefit to risk ratio.
- When two or more drugs are therapeutically equivalent, give preference to higher levels of evidence, more favourable pharmacokinetic profiles, drugs that can be produced locally, or those with favourable stability / storage.
- Select single compounds, rather than fixed dose combinations, unless there is justification (synergistic therapeutic effect, cost savings, improved compliance) otherwise.
- Review the drug list regularly.

Canadian authors, citing cost savings and improved availability of drugs in other countries after the implementation of an EML, have made a case for an EML in Canada.³ Canada’s drug prices are the third highest among the Organisation for Economic Co-operation and Development (OECD) countries.⁴ This is 25% above the OECD median. In 2021, total drug purchases cost \$35.4 billion in Canada.⁵ This was a cost increase of 8.3% from the previous year, with costs projected to continue rising in the coming years. There is also a human cost to drug shortages. Drug shortages have negative health consequences.⁶ Drug shortages in ophthalmology have been shown to decrease the availability of sight saving treatments.⁷ The total cost of vision loss in Canada in 2019 was estimated to be \$32.9 billion.⁸ An EML can be a tool to help reduce drug



costs, increase availability of drugs and, most importantly to ophthalmology, save sight and prevent blindness.

On a global scale, the Canadian pharmaceutical market is small. Pharmaceutical sales in Canada are 2.1% of the global market.⁹ The COVID-19 pandemic highlighted supply chain risks. Health Canada added pandemics to its list of causes of drug shortages. Other causes of drug shortages include drug manufacturing issues, difficulty obtaining raw materials, a sudden increase in demand, discontinuation of a drug, a natural disaster.¹⁰ In summary, drug shortages are multifactorial, often resulting from an interplay between supply, demand, and regulatory issues (Fig 1).¹¹

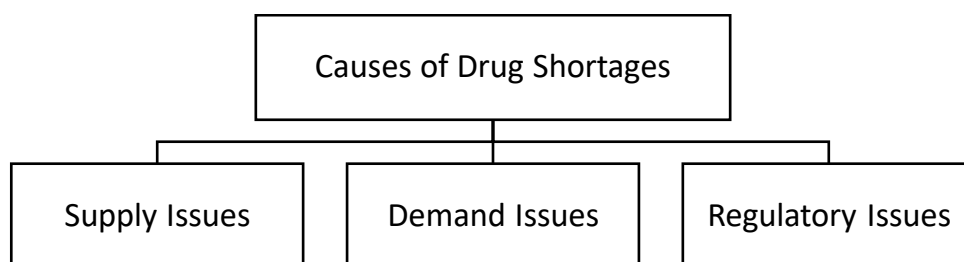


Figure 1. Causes of drug shortages. Adapted from Shukar S, Zahoor F, Hayat K, et al.¹¹

The Canadian ophthalmological drug supply has been experiencing difficulties since before the pandemic. Many ophthalmic medications are marketed in Canada by a single manufacturer. This factor has been associated with drug shortages.¹² Homatropine was lost from the Canadian market in 2016.¹³ Other than 1995-2003, where a second company entered the market, homatropine was marketed in Canada by a single company since 1951.¹⁴ In 2018, citing changes to quality testing standards in Canada, atropine eye drops were discontinued by the manufacturer.¹⁵ Discussions between providers, national organizations representing medical providers, manufacturers and Health Canada led to a discontinuation decision reversal later that year. Atropine then returned to the Canadian market. Verteporfin encountered a two-year shortage, between 2020 and 2022, due to disruptions in the manufacturing of the drug.¹⁶ Timolol has been encountering repeated shortages, with companies experiencing delays in shipping then others encountering backorders due to increased demand of the drug. Between October 2022 and April 2023, there were seven Tier 3 shortages of ophthalmic medications: three potent ophthalmic steroids, two intraocular miotics, physiologic balanced saline solution, and one cycloplegic eyedrop.¹⁷

Shortages vary in duration. Most drug shortages are temporary, but permanent shortages may occur when a drug is discontinued. Federal and provincial governments, supply chain players and health care providers work together to mitigate and/or minimize the impact of shortages when possible.¹¹

In 2019, the Advocacy Committee of the Canadian Ophthalmological Society (COS) created a draft EML for ophthalmology. In 2023, it was revised and updated into the current format. The



following report highlights the medications that the COS feels are important to provide optical medical and surgical eyecare for all Canadians. It follows the format of the WHO model lists of essential medications. The COS EML indicates when drugs may also be found on the most recent WHO model list of essential medications,¹⁸ what is indicated on the Health Canada product monograph for the drug, cites in what circumstances ophthalmologists may use the medication off label, and indicates where drugs may be considered therapeutic alternatives for one another.

This document can appear encyclopedic in its volume. Yet, it is not a list of all medications that ophthalmologists use. For example, it does not list essential diabetic medications that are needed to control blood sugars and thereby treat the cause of diabetic retinopathy. Nor does it list all the immunosuppressants that ophthalmologists apply in conjunction with their medical colleagues for the treatment of ocular and periocular inflammation. It also does not list all the medications that are used off-label, or all the off-label ways in which medications are used, by ophthalmologists to address eye disease.

At its core, this Canadian ophthalmic EML is a starting point for discussion. It gives the reader an opportunity to understand the medications that play a role in ophthalmic care. It catalogues priority medications that are foundations in quality eye care. But it is not a true EML; there is redundancy in therapeutic targets. The list would be further carved through expert consensus in the Canadian context.

Drug shortages can put vision and lives at risk. A pre-requisite in limiting harm is the creation of an essential medication list. There are other steps that must be taken in parallel. This includes creating frameworks to guide optimal medication selection, procurement practices, and utilization. And the success of an EML relies on its adoption. Health care systems and regulatory agencies must prioritize access to critical medications. The intention of this document is to provide a fundamental set of high priority ophthalmic medications currently used in Canada, which could be adapted into a future Canadian EML.



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Ophthalmic Essential Medication List for Canada

Symbol legend:

° Indicates agreement between this ophthalmic essential medication list and the World Health Organization's 22nd model list of essential medicines, published in 2021.

× Indicates that the WHO recommends this medication as a therapeutic alternative, but not as an essential medication itself.

† Indicates that medications in this class could be considered therapeutic alternatives for one another. The presence of one would suffice in event of a shortage.

1. ANESTHETICS, PREOPERATIVE MEDICINE, AND MEDICAL GASES	
1.1. Injectable local anesthetics	
°†Bupivacaine	Injection: 0.25%, 0.5% (hydrochloride) in vial On label: Local or regional anesthesia
°†Lidocaine	Injection: 1%, 2% (hydrochloride) in vial Topical forms: 2% to 4% (hydrochloride) On label: Local or regional anesthesia
°Lidocaine + epinephrine (adrenaline)	Injection: 1%, 2% (hydrochloride or sulfate) + epinephrine 1:200,000 in vial On label: Local or regional anesthesia
2. ANTI-INFECTIVE MEDICINES	
2.1 Antibiotics	
2.1.1 Antibiotics: Access group	
Per WHO EML 2021: "Antibiotics that have activity against a wide range of commonly encountered susceptible pathogens while also showing lower resistance."	
°Amikacin	Injection: 250mg/mL (as sulfate) in 2mL vial On label: short-term treatment of serious infections due to susceptible strains of Pseudomonas species, Escherichia coli, Proteus species, Klebsiella - Enterobacter - Serratia species, Providencia species, Salmonella species, Citrobacter species and Staphylococcus aureus. Off label: Compounded into topical drops Historical note: Previously used for intravitreally for endophthalmitis. <i>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. 1995 Dec;113(12):1479-96</i>



	<p>Current note: Following reports of retinal toxicity when injected intravitreally, it has been abandoned for safer intravitreal antibiotics. <i>Jackson TL, Williamson TH. Amikacin retinal toxicity. Br J Ophthalmol. 1999 Oct;83(10):1199-200.</i></p>
°Amoxicillin + clavulanic acid	<p>Tablet: 250mg (as trihydrate) + 125mg (as potassium salt), 500mg (as trihydrate) + 125mg (as potassium salt), 875 mg (as trihydrate) + 125mg (as potassium salt)</p> <p>On label: Treatment of infections: Sinusitis when caused by β-lactamase producing strains of <i>H. influenzae</i> or <i>Moraxella</i> (<i>Branhamella</i>) <i>catarrhalis</i>. Skin and Soft Tissue Infections when caused by β-lactamase producing strains of <i>S. aureus</i></p>
°Cephalexin	<p>Powder for oral liquid: 125mg/5mL; 250mg/5mL (anhydrous) Solid oral dosage form: 250mg; 500mg (as monohydrate)</p> <p>On label: Treatment of bacterial infections of the respiratory tract, bones and joints, skin and soft tissue when the infection is caused by susceptible organisms</p>
°Cefazolin	<p>Powder for injection: 1g (as sodium salt) in vial</p> <p>On label: Treatment of bacterial infections of the respiratory tract, skin and soft tissues, bone and joints, septicemia. Perioperative (preoperative, intraoperative, and postoperative) prophylaxis during potentially contaminated surgery and in patients in whom infection would pose a serious risk.</p>
°Clindamycin	<p>Capsule: 150mg (as hydrochloride) Oral liquid: 75mg/5mL 9as palmitate)</p> <p>On Label: Treatment of bacterial infections from sensitive anaerobic bacteria; serious infections due to sensitive gram-positive aerobic organisms when the patient is intolerant of, or the organism is resistant to, other antibiotics; the treatment of <i>Pneumocystis jiroveci</i> pneumonia in patients with AIDS; prophylaxis against alpha-hemolytic (<i>viridans</i> group) streptococci before</p>



	dental, oral and upper respiratory tract surgery in patients with susceptible conditions.
°Doxycycline	<p>Solid oral dosage form: 50mg; 100mg (as hyclate) *Use in children <8 years only for life threatening infections when no alternative exists</p> <p>On label: Skin and soft tissue infections caused by susceptible strains. Off label: Meibomian Gland-Related Ocular Surface Disease (Level II evidence) <i>Wladis EJ, Bradley EA, Bilyk JR, Yen MT, Mawn LA. Oral Antibiotics for Meibomian Gland-Related Ocular Surface Disease: A Report by the American Academy of Ophthalmology. Ophthalmology. 2016 Mar;123(3):492-6</i></p> <p><i>Vernhardsdottir RR, Magno MS, Hynnekleiv L, Lagali N, Dartt DA, Vehof J, Jackson CJ, Utheim TP. Antibiotic treatment for dry eye disease related to meibomian gland dysfunction and blepharitis - A review. Ocul Surf. 2022 Oct;26:211-221</i></p>
°Metronidazole	<p>Injection: 500mg in 100mL vial Oral liquid: 200mg/5mL (as benzoate) Suppository: 500mg; 1g Tablet: 200mg to 500mg</p> <p>Off label: In the treatment of serious anaerobic infections including orbital cellulitis [used 50mg/kg/day divided each 6-8 hour in pediatrics or 500mg IV each 6-8 hour in adults in combination Ceftriaxone and Vancomycin] for patients allergic to penicillin but able to tolerate cephalosporins. <i>Stimes GT, Girotto JE. Applying Pharmacodynamics and Antimicrobial Stewardship to Pediatric Preseptal and Orbital Cellulitis. Paediatr Drugs. 2019 Dec;21(6):427-438.</i></p>
°Sulfamethoxazole + trimethoprim	<p>Injection: 80mg +16mg/mL in 5mL ampoule; 80mg + 16mg/mL in 10mL ampoule Oral liquid: 200mg + 40mg/5mL Tablet: 100mg + 20mg; 400mg + 80mg; 800mg + 160mg</p>



	<p>On label: In the treatment of bacterial infections from susceptible gram-positive and gram-negative organisms.</p> <p>Off label:</p> <p>-In the treatment of acute vision threatening toxoplasma retinochoiritis [used 800mg/160mg tablet twice daily with or without clindamycin and prednisone as an equivalent alternative to first line therapy of pyrimethamine, folinic acid, sulfadiazine and prednisone]</p> <p><i>Soheilian M, Sadoughi MM, Ghajarnia M, et al. Prospective randomized trial of trimethoprim/sulfamethoxazole versus pyrimethamine and sulfadiazine in the treatment of ocular toxoplasmosis. Ophthalmology. 2005;112(11):1876-1882</i></p> <p>-Chronic recurrent toxoplasma retinochoiroiditis [used 800mg/160mg tablet once each 3 days] (Level II evidence)</p> <p><i>Kim SJ, Scott IU, Brown GC, Brown MM, Ho AC, Ip MS, Recchia FM. Interventions for toxoplasma retinochoroiditis: a report by the American Academy of Ophthalmology. Ophthalmology. 2013 Feb;120(2):371-8</i></p>
<p align="center">2.1.2. Antibiotics: Watch group</p> <p align="center">Per WHO EML 2021: “Antibiotics that have higher resistance potential... These medicines should be prioritized a key targets of stewardship programs and monitoring”</p>	
°Azithromycin	<p>Capsule: 250mg; 500mg (anhydrous) Oral liquid: 200mg/5mL</p> <p>On label: In the treatment of mild to moderate bacterial infections caused by susceptible organisms including uncomplicated skin infections; sexually transmitted infections due to <i>Chlamydia trachomatis</i> or <i>Neisseria gonorrhoea</i></p>
°Ceftriaxone	Powder for injection: 250mg; 1g; 2g (as sodium) in vial



	<p>On label: In the treatment of bacterial infections when caused by susceptible strains in the setting of bacterial septicemia, skin and skin structure infections, bone and joint infections, uncomplicated gonorrhoea.</p> <p>Off label:</p> <p>-Indicated by WHO as a first-choice systemic therapy for treatment in endophthalmitis. However, when available, other drugs such as meropenem, linezolid and moxifloxacin have better vitreous:serum penetration ratios. <i>Brockhaus L, Goldblum D, Eggenschwiler L, Zimmerli S, Marzolini C. Revisiting systemic treatment of bacterial endophthalmitis: a review of intravitreal penetration of systemic antibiotics. Clin Microbiol Infect. 2019 Nov;25(11):1364-1369.</i></p> <p>-Orbital cellulitis [used 75/kg/day each 24 hours in pediatrics or 1-2g each 12-24 hours in adults in combination Metronidazole and Vancomycin] for patients allergic to penicillin but able to tolerate cephalosporins. <i>Stimes GT, Girotto JE. Applying Pharmacodynamics and Antimicrobial Stewardship to Pediatric Preseptal and Orbital Cellulitis. Paediatr Drugs. 2019 Dec;21(6):427-438.</i></p>
°Piperacillin + tazobactam	<p>Powder for injection: 2g (as sodium) + 250mg (as sodium); 4g (as sodium) + 500mg (as sodium)</p> <p>On label: In the treatment of bacterial infections caused by susceptible strains in the setting of bacterial skin and skin structure infections.</p>
°Vancomycin	<p>Capsule: 125mg; 250mg (as hydrochloride)</p> <p>On label:</p> <p>-In the treatment of severe or life-threatening staphylococcal infections in patients who cannot receive or have failed to respond to penicillin, or cephalosporins, or who have infections with staphylococci resistant to other antibiotics including methicillin.</p> <p>-Orbital cellulitis [used 60mg/kg/day divided every 6-8 hours in pediatrics or 15mg/kg each 12-24 hours in adults with renal adjustment in combination with Ceftriaxone and Vancomycin]</p>



	<p>for patients allergic to penicillin but able to tolerate cephalosporins <i>Stimes GT, Giroto JE. Applying Pharmacodynamics and Antimicrobial Stewardship to Pediatric Preseptal and Orbital Cellulitis. Paediatr Drugs. 2019 Dec;21(6):427-438.</i></p> <p>Off label: Endophthalmitis [used as intravitreal injection (0.1mg/0.1cc) in combination with intravitreal Ceftazidime (2.25mg/0.1mL)] <i>Relhan N, Forster RK, Flynn HW Jr. Endophthalmitis: Then and Now. Am J Ophthalmol. 2018 Mar;187:xx-xxvii.</i></p>
<p>2.1.3. Antibiotics: Complementary list Per WHO EML 2021: “For priority diseases, for which specialized diagnostic or monitoring facilities, and/or specialist medical care, and/or specialist training are needed.”</p>	
°Ceftazidime	<p>Powder for injection: 250mg; 1g (as pentahydrate) in vial</p> <p>On label: In the treatment of bacterial infections caused by susceptible organisms in the setting of skin structure infections, bacteremia, and bone infections.</p> <p>Off Label: Endophthalmitis [used as intravitreal injection (2.25mg/0.1mL) in combination with intravitreal vancomycin (0.1mg/0.1cc)] <i>Relhan N, Forster RK, Flynn HW Jr. Endophthalmitis: Then and Now. Am J Ophthalmol. 2018 Mar;187:xx-xxvii.</i></p>
<p>2.2 Antifungal medicines</p>	
°Amphotericin B	<p>Powder for injection: 50mg (as sodium deoxycholate or liposomal complex) in vial</p> <p>On label: In the empirical therapy for presumed fungal infections in febrile, neutropenic patients. In the treatment of systemic or disseminated infections due to susceptible organisms in patients who are refractory to or intolerant to conventional therapy or in renally impaired patients.</p> <p>Off label: -Fungal keratitis (reconstituted into 0.15% eye drop)</p>



	<p><i>Sharma N, Bagga B, Singhal D, Nagpal R, Kate A, Saluja G, Maharana PK. Fungal keratitis: A review of clinical presentations, treatment strategies and outcomes. Ocul Surf. 2022 Apr;24:22-30.</i></p> <p>-Candida retinitis / uveitis / endophthalmitis <i>Essman TF, Flynn HW Jr, Smiddy WE, Brod RD, Murray TG, Davis JL, Rubsamen PE. Treatment outcomes in a 10-year study of endogenous fungal endophthalmitis. Ophthalmic Surg Lasers. 1997 Mar;28(3):185-94. [alternatives include voriconazole or caspofungin]</i></p> <p><i>Breit SM, Hariprasad SM, Mieler WF, Shah GK, Mills MD, Grand MG. Management of endogenous fungal endophthalmitis with voriconazole and caspofungin. Am J Ophthalmol. 2005 Jan;139(1):135-40.</i></p>
°Fluconazole	<p>Capsule: 50mg Injection: 2mg/mL in vial Oral liquid: 50mg/5mL</p> <p>Off label: Candida retinitis / uveitis / endophthalmitis [therapeutic alternatives include voriconazole or caspofungin] <i>Silva RA, Sridhar J, Miller D, Wykoff CC, Flynn HW Jr. Exogenous fungal endophthalmitis: an analysis of isolates and susceptibilities to antifungal agents over a 20-year period (1990-2010). Am J Ophthalmol. 2015 Feb;159(2):257-64.e1. doi: 10.1016/j.ajo.2014.10.027.</i></p>
°Itraconazole	<p>Capsule: 100mg Oral liquid: 10mg/mL</p> <p>Off label: Acanthamoeba keratitis [oral route. Alternatives include ketoconazole or voriconazole. Used in combination with polyhexamethylene biguanide or chlorhexidine eye drops] <i>Ishibashi Y, Matsumoto Y, Kabata T, Watanabe R, Hommura S, Yasuraoka K, Ishii K. Oral itraconazole and topical miconazole with debridement for Acanthamoeba keratitis. Am J Ophthalmol. 1990 Feb 15;109(2):121-6.</i></p>
°Voriconazole	<p>Tablet: 50mg; 200mg</p>



	<p>Powder for injection: 200mg in vial Powder for oral liquid: 40mg/mL</p> <p>On label: Treatment of candidemia in non-neutropenic patients.</p> <p>Off label:</p> <p>-Fungal keratitis [oral and topical reconstituted eyedrop route. Topical alternatives include natamycin.] <i>McDonald EM, Ram FS, Patel DV, McGhee CN. Effectiveness of Topical Antifungal Drugs in the Management of Fungal Keratitis: A Systematic Review and Meta-analysis of Randomized Controlled Trials. Asia Pac J Ophthalmol (Phila). 2014 Jan-Feb;3(1):41-7.</i></p> <p>-Acanthamoeba keratitis [topical and oral routes. Oral alternatives include itraconazole. Used in combination with polyhexamethylene biguanide or chlorhexidine eye drops] <i>Kaufman AR, Tu EY. Advances in the management of Acanthamoeba keratitis: A review of the literature and synthesized algorithmic approach. Ocul Surf. 2022 Jul;25:26-36.</i></p>
2.3 Antiviral medicines	
2.3.1 Antiherpes medicines	
<p>°+Acyclovir Therapeutic alternatives: °Valacyclovir, famciclovir</p>	<p>Oral liquid: 200mg/5mL Powder for injection: 250mg (as sodium salt) in vial Tablet: 200mg</p> <p>On label: Acute treatment of herpes zoster (shingles) and varicella (chickenpox)</p> <p>Off label:</p> <p>-Treatment of, and reducing risk of recurrent, herpes simplex virus keratitis <i>White ML, Chodosh J. Reviewed and endorsed by the Ocular Microbiology and Immunology group. Herpes Simplex virus Keratitis: A Treatment Guideline -2014. American Academy of Ophthalmology</i></p> <p>-Reducing the risk of recurrent HSV in patients having undergone recent corneal graft <i>Bhatt UK, Abdul Karim MN, Prydal JI, Maharajan SV, Fares U. Oral antivirals for preventing</i></p>



	<i>recurrent herpes simplex keratitis in people with corneal grafts. Cochrane Database Syst Rev. 2016 Nov 30;11(11):CD007824.</i>
†Valacyclovir × Alternative to acyclovir	Tablet: 500mg, 1000mg On label: Treatment of herpes zoster (shingles), treatment of cold sores. Off label: Treatment of, and reducing risk of recurrent, herpes simplex virus keratitis. <i>White ML, Chodosh J. Reviewed and endorsed by the Ocular Microbiology and Immunology group. Herpes Simplex virus Keratitis: A Treatment Guideline -2014. American Academy of Ophthalmology</i>
2.3.2 Antivirals for treatment of CMV retinitis	
°†Valganciclovir	Tablet: 450mg On label: CMV retinitis in AIDS
†Ganciclovir	Powder: 500mg/vial On label: CMV retinitis in AIDS
†Foscarnet sodium	Solution: 24mg/mL On label: CMV retinitis in AIDS
2.4. Antiprotozoal medicines	
2.4.1 Antitoxoplasmosis medicines	
°Pyrimethamine	Tablet: 25mg On label: Treatment of toxoplasmosis when used conjointly with a sulfonamide given synergism exists in this combination. *Note: Not available in Canada for humans
2.5. Antileprosy medicine	
°Dapsone	Tablet: 100mg Off label: Treatment of ocular findings of mild to modest mucous membrane pemphigoid in patients who are not glucose-6-phosphate dehydrogenase (G6PD) deficient. <i>Kirtschig G, Murrell D, Wojnarowska F, Khumalo N. Interventions for mucous membrane pemphigoid and epidermolysis bullosa acquisita. Cochrane Database Syst Rev. 2003;2003(1):CD004056.</i>
3. IMMUNOMODULATORS AND ANTINEOPLASTICS	
3.1 Immunomodulators for non-malignant disease	



<p>°Adalimumab *Including quality-assured biosimilars</p> <p>Therapeutic alternatives: °Infliximab (<i>Norcia LF, Kiappe OP, Jorge EC. Biological Therapy in Noninfectious Pediatric Uveitis: A Systematic Review. Clin Ophthalmol. 2021 Sep 7;15:3765-3776</i>) °Golimumab (as per WHO 2021)</p>	<p>Injection: 40mg/0.8mL; 40mg/0.4mL</p> <p>On label: Treatment of non-infectious adult and pediatric uveitis with inadequate response to corticosteroids, as corticosteroid sparing treatment in corticosteroid-dependent patients, or when conventional therapy is inappropriate. <i>Jaffe GJ, Dick AD, Brézin AP, Nguyen QD, Thorne JE, Kestelyn P, Barisani-Asenbauer T, Franco P, Heiligenhaus A, Scales D, Chu DS, Camez A, Kwatra NV, Song AP, Kron M, Tari S, Suhler EB. Adalimumab in Patients with Active Noninfectious Uveitis. N Engl J Med. 2016 Sep 8;375(10):932-43.</i></p>
<p>°Azathioprine</p>	<p>Powder for injection: 100mg (as sodium salt) in vial Tablet (scored): 50mg</p> <p>Off label: Non-biologic treatment of non-infectious uveitis and periocular inflammation with inadequate response to corticosteroids, as corticosteroid sparing treatment in corticosteroid-dependent patients, or when conventional therapy is inappropriate. <i>Edwards Mayhew RG, Li T, McCann P, Leslie L, Strong Caldwell A, Palestine AG. Non-biologic, steroid-sparing therapies for non-infectious intermediate, posterior, and panuveitis in adults. Cochrane Database Syst Rev. 2022;10(10):CD014831. Published 2022 Oct 31</i></p>
<p>Golimumab × Alternative to adalimumab</p>	<p>Subcutaneous injection: 50mg/0.5mL; 100mg/1.0mL Intravenous infusion: 50mg/4.0mL</p> <p>Off label: Non-infectious intraocular inflammation that is recalcitrant to other treatment. <i>Jin Y, Lu S, Lin Y, Mou X. The efficacy and safety of TNF inhibitor (golimumab) as salvage treatment in patients with refractory noninfectious uveitis. Inflammopharmacology. 2022 Aug;30(4):1363-1368</i></p>
3.2 Antineoplastics and supportive medicines	
3.2.1 Cytotoxic medicines	
<p>°Methotrexate</p>	<p>Powder for injection: 50mg in vial Tablet: 2.5mg (as sodium salt)</p>



	<p>Off label:</p> <p>-Non-biologic treatment of non-infectious uveitis with inadequate response to corticosteroids, as corticosteroid sparing treatment in corticosteroid-dependent patients, or when conventional therapy is inappropriate. <i>Edwards Mayhew RG, Li T, McCann P, Leslie L, Strong Caldwell A, Palestine AG. Non-biologic, steroid-sparing therapies for non-infectious intermediate, posterior, and panuveitis in adults. Cochrane Database Syst Rev. 2022;10(10):CD014831. Published 2022 Oct 31</i></p> <p>-Non-biologic treatment of non-infectious periocular inflammation with inadequate response to corticosteroids, as corticosteroid sparing treatment in corticosteroid-dependent patients, or when conventional therapy is inappropriate. <i>Smith JR, Rosenbaum JT. A role for methotrexate in the management of non-infectious orbital inflammatory disease. Br J Ophthalmol. 2001 Oct;85(10):1220-4.</i></p> <p>-Intravitreal injection for intraocular tumors, proliferative vitreoretinopathy, uveitis, and epithelial downgrowth. <i>Hasan N, Chawla R, Shaikh N, Kandasamy S, Azad SV, Sundar MD. A comprehensive review of intravitreal immunosuppressants and biologicals used in ophthalmology. Ther Adv Ophthalmol. 2022 May 18;14:25158414221097418</i> <i>Abdi F, Mohammadi SS, Falavarjani KG. Intravitreal Methotrexate. J Ophthalmic Vis Res. 2021 Oct 25;16(4):657-669.</i></p>
3.2.2 Targeted therapies	
°Rituximab	<p>Injection (intravenous): 100mg/10mL in 10mL vial; 500mg/50mL in 50mL vial</p> <p>On label: Treatment of Non-Hodgkin's lymphoma, chronic lymphocytic leukemia, granulomatosis with polyangiitis, microscopic polyangiitis</p> <p>Off label:</p> <p>- Non-biologic treatment of non-infectious uveitis with inadequate response to corticosteroids, as corticosteroid sparing</p>



	<p>treatment in corticosteroid-dependent patients, or when conventional therapy is inappropriate. <i>Angeles-Han ST, Lo MS, Henderson LA, Lerman MA, Abramson L, Cooper AM, Parsa MF, Zemel LS, Ronis T, Beukelman T, Cox E, Sen HN, Holland GN, Brunner HI, Lasky A, Rabinovich CE; Juvenile Idiopathic Arthritis Disease-Specific and Uveitis Subcommittee of the Childhood Arthritis Rheumatology and Research Alliance. Childhood Arthritis and Rheumatology Research Alliance Consensus Treatment Plans for Juvenile Idiopathic Arthritis-Associated and Idiopathic Chronic Anterior Uveitis. Arthritis Care Res (Hoboken). 2019 Apr;71(4):482-491</i></p> <p>-Treatment of non-infectious periocular inflammation with inadequate response to corticosteroids, as corticosteroid sparing treatment in corticosteroid-dependent patients, or when conventional therapy is inappropriate. <i>Ng CC, Sy A, Cunningham ET Jr. Rituximab for treatment of non-infectious and non-malignant orbital inflammatory disease. J Ophthalmic Inflamm Infect. 2021 Aug 27;11(1):24.</i></p>
4. CARDIOVASCULAR MEDICINES	
4.1 Thrombolytic medicines	
°+Alteplase	<p>Powder for injection: 10mg; 20mg; 50mg in vial</p> <p>Off label: Moderate evidence in the treatment of acute non-arteritic central retinal artery occlusion. <i>Mac Grory B, Schrag M, Biousse V, Furie KL, Gerhard-Herman M, Lavin PJ, Sobrin L, Tjoumakaris SI, Weyand CM, Yaghi S; American Heart Association Stroke Council; Council on Arteriosclerosis, Thrombosis and Vascular Biology; Council on Hypertension; and Council on Peripheral Vascular Disease. Management of Central Retinal Artery Occlusion: A Scientific Statement From the American Heart Association. Stroke. 2021 Jun;52(6):e282-e294.</i></p>
°+Streptokinase	<p>Powder for injection: 1.5 million IU in vial</p> <p>Off label: Moderate evidence in the treatment of acute non-arteritic central retinal artery occlusion.</p>



	<p>Mac Grory B, Schrag M, Biousse V, Furie KL, Gerhard-Herman M, Lavin PJ, Sobrin L, Tjoumakaris SI, Weyand CM, Yaghi S; American Heart Association Stroke Council; Council on Arteriosclerosis, Thrombosis and Vascular Biology; Council on Hypertension; and Council on Peripheral Vascular Disease. Management of Central Retinal Artery Occlusion: A Scientific Statement From the American Heart Association. <i>Stroke</i>. 2021 Jun;52(6):e282-e294.</p>
5. ANTI-INFLAMMATORY MEDICINES	
5.1 Systemic steroids	
°Dexamethasone	<p>Injection: 4mg/mL (as disodium phosphate salt) in 1mL ampoule Oral liquid: 2mg/5mL Tablet 2mg; 4mg</p> <p>On label: Sympathetic ophthalmia, temporal arteritis, uveitis, and ocular inflammatory conditions unresponsive to topical corticosteroids.</p>
°Methylprednisolone	<p>Injection: 40mg/mL (as sodium succinate) 1 mL single-dose vial and 5mL multi-dose vials; 80mg/mL (as sodium succinate) in 1mL single dose vial</p> <p>Off label:</p> <ul style="list-style-type: none"> -Active thyroid eye disease <i>Bartalena L, Kahaly GJ, Baldeschi L, et al. The 2021 European Group on Graves' orbitopathy (EUGOGO) clinical practice guidelines for the medical management of Graves' orbitopathy. Eur J Endocrinol. 2021;185(4):G43-G67.</i> -Optic neuritis <i>Beck RW, Cleary PA, Anderson MM Jr, et al. A randomized, controlled trial of corticosteroids in the treatment of acute optic neuritis. The Optic Neuritis Study Group. N Engl J Med. 1992;326(9):581-588.</i>
Prednisone × Alternative to prednisolone	<p>Tablet: 5mg, 50mg</p> <p>On label: Rheumatic disorders; Psoriatic arthritis; giant cell arteritis; dermatologic disease; allergic states; respiratory disease including sarcoidosis; ophthalmic diseases including allergic conjunctivitis, keratitis, allergic corneal marginal</p>



	ulcers, herpes zoster ophthalmicus, iritis and iridocyclitis, chorioretinitis, anterior segment inflammation, diffuse posterior uveitis and choroiditis, optic neuritis, sympathetic ophthalmia.
5.2 Topical (dermatologic) anti-inflammatories	
°Hydrocortisone	Cream or ointment: 0.5%, 1%, 2.5% (acetate) On label: Topical therapy of corticosteroid responsive dermatoses for a maximum duration of 4 weeks, where an anti-inflammatory and antipruritic activity is required in the topical management of these conditions.
°Tacrolimus	Cream: 0.03%, 0.1% On label: 0.03% and 0.1% for adults and only 0.03% for children aged 2 to 15 years is indicated as a second-line therapy for short and long-term intermittent treatment of moderate to severe atopic dermatitis in non-immunocompromised patients, in whom the use of conventional therapies are deemed inadvisable because of potential risks, or who are not adequately responsive to or intolerant of conventional therapies
6. ANTIMETABOLITE	
°Fluorouracil	Ointment: 5% On label: Topical treatment of premalignant keratoses and superficial basal cell carcinoma. Off label: Compounded (http://www.bccancer.bc.ca/drug-database-site/Drug%20Index/Fluorouracil_monograph.pdf) eye drops for the treatment of: -Topical medial treatment of ocular surface squamous neoplasia (therapeutic alternative: interferon alfa-2b, MMC) <i>Venkateswaran N, Mercado C, Galor A, Karp CL. Comparison of Topical 5-Fluorouracil and Interferon Alfa-2b as Primary Treatment Modalities for Ocular Surface Squamous Neoplasia. Am J Ophthalmol. 2019 Mar;199:216-222.</i> -Surgical adjunct in glaucoma trabeculectomy surgery (therapeutic alternative: MMC)



	<p><i>Lin ZJ, Li Y, Cheng JW, Lu XH. Intraoperative mitomycin C versus intraoperative 5-fluorouracil for trabeculectomy: a systematic review and meta-analysis. J Ocul Pharmacol Ther. 2012 Apr;28(2):166-73.</i></p> <p>-Adjunct to bleb needling after glaucoma surgical procedures (therapeutic alternative: MMC) <i>Halili A, Kessel L, Subhi Y, Bach-Holm D. Needling after trabeculectomy - does augmentation by anti-metabolites provide better outcomes and is Mitomycin C better than 5-Fluorouracil? A systematic review with network meta-analyses. Acta Ophthalmol. 2020 Nov;98(7):643-653.</i></p> <p>-Surgical adjunct in pterygium surgery <i>Lee BWH, Sidhu AS, Francis IC, Coroneo MT. 5-Fluorouracil in primary, impending recurrent and recurrent pterygium: Systematic review of the efficacy and safety of a surgical adjuvant and intralesional antimetabolite. Ocul Surf. 2022 Oct;26:128-141.</i></p> <p>-Management of hypertrophic scars <i>Choi C, Mukovozov I, Jazdarehee A, Rai R, Sachdeva M, Shunmugam M, Zaslavsky K, Byun S, Barankin B. Management of hypertrophic scars in adults: A systematic review and meta-analysis. Australas J Dermatol. 2022 May;63(2):172-189.</i> <i>Bui AD, Grob SR, Tao JP. 5-Fluorouracil Management of Oculofacial Scars: A Systematic Literature Review. Ophthalmic Plast Reconstr Surg. 2020 May/Jun;36(3):222-230.</i></p>
Imiquimod	<p>Ointment: 5%</p> <p>On label: Topical treatment of clinically typical, nonhyperkeratotic, nonhypertrophic actinic keratosis on face or balding scalp; topical treatment of biopsy-confirmed, primary superficial basal cell carcinoma on trunk, neck or extremities excluding hands and feet</p>
Mitomycin	<p>Vial: 20mg per vial</p> <p>Off label:</p> <p>-Topical medical treatment, alone or in conjunction with surgery, of ocular surface squamous neoplasia (therapeutic alternatives with fewer side effects: interferon alfa, 5-FU)</p>



	<p><i>Kozma K, Dömötör ZR, Csutak A, Szabó L, Hegyi P, Erőss B, Helyes Z, Molnár Z, Dembrovsky F, Szalai E. Topical pharmacotherapy for ocular surface squamous neoplasia: systematic review and meta-analysis. Sci Rep. 2022 Aug 20;12(1):14221.</i></p> <p>-Prevention of corneal haze in photorefractive keratectomy</p> <p><i>Chang YM, Liang CM, Weng TH, Chien KH, Lee CH. Mitomycin C for the prevention of corneal haze in photorefractive keratectomy: a meta-analysis and trial sequential analysis. Acta Ophthalmol. 2021 Sep;99(6):652-662.</i></p> <p>-Surgical adjunct in dacryocystorhinotomy</p> <p><i>Phelps PO, Abariga SA, Cowling BJ, Selva D, Marcet MM. Antimetabolites as an adjunct to dacryocystorhinostomy for nasolacrimal duct obstruction. Cochrane Database Syst Rev. 2020 Apr 7;4(4):CD012309.</i></p> <p>-Surgical adjunct in glaucoma trabeculectomy surgery (therapeutic alternative: 5-FU)</p> <p><i>Lin ZJ, Li Y, Cheng JW, Lu XH. Intraoperative mitomycin C versus intraoperative 5-fluorouracil for trabeculectomy: a systematic review and meta-analysis. J Ocul Pharmacol Ther. 2012 Apr;28(2):166-73.</i></p> <p>-Adjunct to bleb needling after glaucoma surgical procedures (therapeutic alternative: 5-FU)</p> <p><i>Halili A, Kessel L, Subhi Y, Bach-Holm D. Needling after trabeculectomy - does augmentation by anti-metabolites provide better outcomes and is Mitomycin C better than 5-Fluoruracil? A systematic review with network meta-analyses. Acta Ophthalmol. 2020 Nov;98(7):643-653.</i></p> <p>-Surgical adjunct in pterygium surgery</p> <p><i>Fonseca EC, Rocha EM, Arruda GV. Comparison among adjuvant treatments for primary pterygium: a network meta-analysis. Br J Ophthalmol. 2018 Jun;102(6):748-756</i></p>
<p>°Interferon alfa-2b</p> <p>‡Not marketed in Canada. Global supply was discontinued for business reasons by Merck in 2021.</p>	<p>Vial or prefilled syringe: 80 micrograms, 100 micrograms (peginterferon alfa-2b)</p> <p>Off label:</p>



	<p>-Topical medical treatment, alone or in conjunction with surgery, of ocular surface squamous neoplasia (therapeutic alternatives with fewer side effects: interferon alfa, 5-FU) <i>Kozma K, Dömötör ZR, Csutak A, Szabó L, Hegyi P, Erőss B, Helyes Z, Molnár Z, Dembrovszky F, Szalai E. Topical pharmacotherapy for ocular surface squamous neoplasia: systematic review and meta-analysis. Sci Rep. 2022 Aug 20;12(1):14221.</i></p> <p>-Surgical adjunct in treatment of primary acquired melanosis or conjunctival melanoma <i>Cid-Bertomeu P, Huerva V. Use of interferon alpha 2b to manage conjunctival primary acquired melanosis and conjunctival melanoma. Surv Ophthalmol. 2022 Sep-Oct;67(5):1391-1404.</i></p>
7. DIAGNOSTIC AGENTS	
7.1 Ophthalmic surface agents	
°Fluorescein	<p>Eye drop: 2% Strips: 1mg</p> <p>On label: Ophthalmic disclosing agent</p>
7.2 Ophthalmic angiography media	
Fluorescein	<p>Solution: 10% (50mg/mL)</p> <p>On label: Diagnostic fluorescein angiography, angioscopy of the fundus and of the iris vasculature</p>
Indocyanine green	<p>Powder: 25mg (lyophilized)</p> <p>On label: Ophthalmic angiography</p>
8. ANTISEPTICS AND DISINFECTANTS	
8.1 Antiseptics	
°Chlorhexidine	<p>Solution: 5%</p> <p>On label: Surgical hand scrub, healthcare personnel handwash, skin wound and general skin cleansing.</p> <p>Off label:</p> <p>-Compounded (0.02-0.2%) for topical treatment of acanthamoeba keratitis <i>Seal D. Treatment of Acanthamoeba keratitis. Expert Rev Anti Infect Ther. 2003 Aug;1(2):205-8. doi: 10.1586/14787210.1.2.205</i></p> <p>-Substitute for povidone-iodine in cleaning ocular surface <i>Kanclerz P, Myers WG. Potential substitutes for</i></p>



	<i>povidone-iodine in ocular surgery. Eye (Lond). 2021 Oct;35(10):2657-2659.</i>	
°Povidone iodine	Solution: 10% (equivalent to 1% available iodine) On label: Preoperative skin parathion of the operative site, disinfection of wounds, skin, genital or oropharyngeal mucosa, anti-infective prophylaxis during hospital and office procedures. Off label: Topical ocular cleaning prior to intraocular manipulation <i>Speaker MG, Menikoff JA. Prophylaxis of endophthalmitis with topical povidone-iodine. Ophthalmology. 1991 Dec;98(12):1769-75.</i>	
8.2 Disinfectants		
°Alcohol based hand rub	Solution: containing ethanol 80% volume/volume Solution: Containing isopropyl alcohol 75% volume/volume On label: Antiseptic skin cleanser	
9. MUSCLE RELAXANTS (PERIPHERALLY-ACTING) AND CHOLINESTERASE INHIBITORS		
°Pyridostigmine	Injection: 1mg in 1mL ampoule Tablet: 60mg, 180mg (bromide) On label: Symptomatic treatment of myasthenia gravis	
Botulinum toxin	OnabotulinumtoxinA On label: Blepharospasm; Strabismus	
10. OPHTHALMOLOGICAL PREPARATIONS		
10.1 Anti-infective agents		
10.1.1 Anti-bacterial topical agents		
Class: Low potency gram-negative antibacterial	Polymyxin B	Eye drops: 10 000 units/mL
	On label: In the treatment of bacterial infections of the ocular surface when caused by susceptible strains.	
Class: °High potency gram-negative antibacterial	°Ciprofloxacin	Eye drop: 0.3% Ointment: 0.3%
	On label: In the treatment of bacterial corneal ulcers and conjunctivitis when caused by susceptible strains.	
	°Tobramycin Therapeutic alternative (ophthalmic forms not	Eye drops: 0.3% Ointment: 0.1%, 0.3%



	currently available in Canada): °Gentamycin	
	On label: In the treatment of external infections of the eye and its adnexa when caused by susceptible strains.	
Class: °High potency broad spectrum antibacterial	†Besifloxacin	Eyedrop: 0.6%
	On label: In the treatment of bacterial conjunctivitis when caused by susceptible strains.	
	†Gatifloxacin	Eyedrop: 0.3%
	On label: In the treatment of bacterial conjunctivitis when caused by susceptible strains.	
	†Moxifloxacin	Eyedrop: 0.5%
On label: In the treatment of bacterial conjunctivitis when caused by susceptible strains.		
°Erythromycin Therapeutic alternatives (ophthalmic forms not currently available in Canada): °Azithromycin, clarithromycin	Ointment: 0.5%	
		On label: For the treatment of superficial ocular infections involving the conjunctiva and/or cornea caused by susceptible organisms; For prophylaxis of ophthalmic neonatorum due to <i>N. gonorrhoeae</i> or <i>C. trachomatis</i> .
10.1.2 Anti-fungal topical agents		
°Natamycin	Eyedrop: 0.5%	
ϕNot marketed in Canada.	On label: Treatment of fungal blepharitis, conjunctivitis, and keratitis -Considered 1 st line therapy for fungal keratitis <i>Sharma N, Bagga B, Singhal D, Nagpal R, Kate A, Saluja G, Maharana PK. Fungal keratitis: A review of clinical presentations, treatment strategies and outcomes. Ocul Surf. 2022 Apr;24:22-30.</i>	
°Voriconazole	Reconstituted into eyedrop: 1% (marketed in 200mg vials)	
	Off label: Reconstituted (1%) for treatment of fungal blepharitis, conjunctivitis, and keratitis. Considered first line therapy for rare causes of fungal keratitis. <i>Sharma N, Bagga B, Singhal D, Nagpal R, Kate A, Saluja G, Maharana PK. Fungal keratitis: A review of clinical presentations, treatment</i>	



	<i>strategies and outcomes. Ocul Surf. 2022 Apr;24:22-30.</i>	
10.1.3 Anti-viral topical agents		
†Gancyclovir ‡Not marketed in Canada	Eyedrop: 0.15%	
	On label: Herpes simplex keratitis	
†Trifluridine ‡Not marketed in Canada	Eyedrop: 0.1%	
	On label: Herpes simplex keratitis	
10.2 Topical steroidal anti-inflammatory agents		
Low potency	†Fluorometholone	Eyedrop: 0.1%
	On label: steroid-responsive inflammation of the palpebral and bulbar conjunctiva, cornea, and anterior segment of the globe	
	†Loteprednol etabonate	Eyedrop: 0.2%, 0.5%
	On label (0.2%): short-term relief of the signs and symptoms of seasonal allergic conjunctivitis. On label (0.5%): treatment of post-operative inflammation following cataract surgery	
	†Prednisolone acetate	Eyedrop: 0.12% (discontinued)
High potency	†Dexamethasone	Eyedrop: 0.1%
	On label: Steroid responsive inflammatory conditions of the palpebral and bulbar conjunctiva, cornea, and anterior segment of the globe, such as allergic conjunctivitis, acne rosacea, superficial punctate keratitis, iritis, cyclitis, and selected infective conjunctivitis when the inherent hazard of steroid use is acceptable to obtain an advisable diminution in edema and inflammation; Corneal injury from chemical, radiation or thermal burns, or penetration of foreign bodies	
	†Difluprednate	Eyedrop: 0.05%
	On label: treatment of inflammation and pain associated with post-operative inflammation following cataract surgery; treatment of endogenous anterior uveitis.	
	†Fluoromethalone	Eyedrop: 0.25% (discontinued)
	†Prednisolone acetate	Eyedrop: 0.1%
	On label: steroid-responsive inflammation of the palpebral and bulbar conjunctiva, cornea, and anterior segment of the globe.	



	°†Prednisolone sodium phosphate	Eyedrop: 0.5% minims
	On label: non-infectious inflammatory allergic conditions: allergic, non-purulent catarrhal, and vernal conjunctivitis; acute iritis; catarrhal corneal ulcer, cornea injuries; non-purulent blepharitis; nonspecific superficial keratitis; non-purulent phlyctenular kerato-conjunctivitis.	
10.3 Topical non-steroidal anti-inflammatory agents		
Cyclosporine	Eyedrop: 0.03%, 0.1%	
	On label: The treatment of severe vernal keratoconjunctivitis in children from 4 years of age through adolescence; the treatment of moderate to moderately severe aqueous deficient dry eye disease.	
10.4 Local anesthetics		
°†Tetracaine	Eye drop: 0.5%, 0.1%	
	On label: procedures requiring a rapid and short-acting topical ophthalmic anesthetic.	
†Proparacaine	Eye drop: 0.5%	
	On label: Topical anesthesia for ophthalmic procedures such as measurement of intraocular pressure (tonometry), removal of foreign bodies and sutures from cornea, conjunctive scraping in diagnosis and gonioscopic examination; prior to surgical operations such as cataract extraction	
10.5 Antiglaucoma medicines		
Class: Alpha Agonist	Brimonidine tartrate	Eye drop: 0.15%, 0.2%
	On label: Control of intraocular pressure in patients with chronic open-angle glaucoma or ocular hypertension.	
	Apraclonidine	Eye drop: 0.5%, 1%
	On label: (0.5%) For adjunctive use in lowering intraocular pressure; (1%) Control or prevention of postsurgical elevations in intraocular pressure that occur in patients after anterior segment laser ophthalmic surgery including argon laser trabeculoplasty, argon laser iridotomy and neodymium:yttrium aluminum garnet (Nd:YAG) laser posterior capsulotomy Off label: In the diagnosis of Horner syndrome: -In adults (1%).	



	<p><i>Morales J, Brown SM, Abdul-Rahim AS, Crosson CE. Ocular effects of apraclonidine in Horner syndrome. Arch Ophthalmol. 2000;118(7):951-954.</i></p> <p>-In children (0.5%) when combined with three minutes of punctal occlusion.</p> <p><i>Chen PL, Chen JT, Lu DW, Chen YC, Hsiao CH. Comparing efficacies of 0.5% apraclonidine with 4% cocaine in the diagnosis of horner syndrome in pediatric patients. J Ocul Pharmacol Ther. 2006;22(3):182-187.</i></p>	
Class: Beta blocker	°Timolol	Eyedrop 0.25%, 0.5%
	On label: Reduction of elevated intraocular pressure.	
	Betaxolol	Eyedrop: 0.25%
	On label: For lowering of intraocular pressure in the treatment of ocular hypertension or chronic open angle glaucoma	
Class: Carbonic anhydrase inhibitor	°Acetazolamide	Tablet: 250mg
	On label: Glaucoma (chronic, simple, and secondary types).	
	†Brinzolamide	Eyedrop: 1%
	On label: ocular hypertension or open-angle glaucoma.	
	†Dorzolamide	Eyedrop: 2%
	On label: Ocular hypertension, open-angle glaucoma	
	†Methazolamide	Tablet: 50mg
On label: chronic simple (open angle) glaucoma, secondary glaucoma and preoperatively in acute angle closure glaucoma, where delay of surgery is desired in order to lower intraocular pressure.		
Class: Prostaglandin analog	†Bimatoprost	Eyedrop: 0.01%, 0.03%
	On label: open angle glaucoma or ocular hypertension.	
	°†Latanoprost	Eyedrop: 50mcg/mL
	On label: Open-angle glaucoma, ocular hypertension, chronic angle-closure glaucoma after peripheral iridotomy or laser iridoplasty.	
	†Latanoprostene	Eyedrop: 0.024%
On label: Open-angle glaucoma or ocular hypertension.		



	†Travoprost	Eyedrop: 0.003%, 0.004%
	On label: Open-angle glaucoma or ocular hypertension.	
10.6 Miotics		
°Pilocarpine	Eyedrop: 2%	
	On label: Reduction of intraocular pressure.	
10.7 Mydriatics		
°Atropine	Eye drops: 1%	
Note: Differences with other cycloplegics include, but are not limited to, different onset of action (6-24 hours) and duration of cycloplegia (10-15 days). °Tropicamide and *Cyclopentolate are inadequate therapeutic alternatives given the use in amblyopia management and control of myopia progression.	On label: Cycloplegia and mydriasis for uveitis and refraction. Off label (not substitutable for other mydriatics): -Amblyopia management <i>Li T, Qureshi R, Taylor K. Conventional occlusion versus pharmacologic penalization for amblyopia. Cochrane Database Syst Rev. 2019;8(8):CD006460. Published 2019 Aug 28</i> -Control of myopia progression <i>Lawrenson JG, Shah R, Huntjens B, Downie LE, Virgili G, Dhakal R, Verkicharla PK, Li D, Mavi S, Kernohan A, Li T, Walline JJ. Interventions for myopia control in children: a living systematic review and network meta-analysis. Cochrane Database Syst Rev. 2023 Feb 16;2(2):CD014758</i>	
Cyclopentolate × Alternative to atropine	Eye drop: 1%	
Note: Differences with other cycloplegics include, but are not limited to, different onset of action (20-30 minutes) and duration of cycloplegia (4-10 hours). °Atropine and °Tropicamide are inadequate therapeutic alternatives given use in pediatric cycloplegic refractions and retinopathy of prematurity examinations.	On label: Cycloplegia and mydriasis. The American Academy of Ophthalmology Pediatric Eye Evaluations Preferred Practice Pattern recommends the (off-label) use of cyclopentolate as first line for cycloplegic refractions. The dosage recommended is: <ul style="list-style-type: none"> • ≤ 6 months of age: Cyclopentolate 0.2% + Phenylephrine 1% • > 6 months of age: Cyclopentolate 1% ± Phenylephrine 2.5% ± Tropicamide 1.0% <i>Wallace DK, Morse CL, Melia M, et al. Pediatric Eye Evaluations Preferred Practice Pattern®: I. Vision Screening in the Primary Care and Community Setting; II. Comprehensive Ophthalmic Examination. Ophthalmology. 2018;125(1):P184-P227.</i>	
°Tropicamide	Eye drops: 0.5%	



<p>Note: Differences with other cycloplegics include, but are not limited to, different onset of action (20-30 minutes) and duration of cycloplegia (4-10 hours). °Atropine and *Cyclopentolate are inadequate therapeutic alternatives given use in adult dilated exams.</p>	<p>On label: Cycloplegia and mydriasis for refraction. Hofmeister EM, Kaupp SE, Schallhorn SC. Comparison of tropicamide and cyclopentolate for cycloplegic refractions in myopic adult refractive surgery patients. <i>J Cataract Refract Surg.</i> 2005;31(4):694-700.</p>
<p>10.8 Anti-vascular endothelial growth factor (VEGF) preparations</p>	
<p>†Ranibizumab</p>	<p>Injection: 10mg/mL On label: Intravitreal injection in preterm infants for the treatment of retinopathy of prematurity. Intravitreal injection in adults for the treatment of neovascular age related macular degeneration or visual impairment from diabetic macular edema, macular edema secondary to retinal vein occlusion, visual impairment due to choroidal neovascularization secondary to pathologic myopia, and other causes of vision loss from choroidal neovascularization.</p>
<p>°†Bevacizumab *Including quality-assured biosimilars</p>	<p>Injection: 25mg/mL Off label: As alternative intravitreal treatment for ranibizumab. <i>CATT Research Group, Martin DF, Maguire MG, et al. Ranibizumab and bevacizumab for neovascular age-related macular degeneration. N Engl J Med.</i> 2011;364(20):1897-1908.</p>
<p>10.9 Photosensitizer for photodynamic therapy</p>	
<p>Verteporfin</p>	<p>Vial: 15mg/vial On label: As part of photodynamic therapy for the treatment of predominantly classic subfoveal choroidal neovascularization in patients with age-related macular degeneration (AMD), pathologic myopia, presumed ocular histoplasmosis. Off label: For vascular chorioretinal conditions including choroidal neovascularization from non-classic AMD, non-AMD choroidal neovascularization, choroidal hemangioma, central serous chorioretinopathy, polypoidal choroidal vasculopathy, and peripapillary choroidal neovascularization.</p>



	<i>Newman DK. Photodynamic therapy: current role in the treatment of chorioretinal conditions. Eye (Lond). 2016;30(2):202-210.</i>
11. INTRAOPERATIVE MEDICINES	
11.1 Intraocular miotics	
†Acetylcholine Chloride (Miochol E)	Vial: 20mg/2mL On label: Miosis of the iris in after delivery of the lens in cataract surgery, in penetrating keratoplasty, iridectomy, and other anterior segment surgery where rapid miosis may be required.
†Charbachol (Miostat) × Alternative to pilocarpine	Solution: 0.01% On label: obtaining miosis during surgery; reduction of the intensity of intraocular pressure elevation in the first 24 hours after cataract surgery
11.2 Physiologic Irrigating Solution	
Physiologic irrigating solution	Contents: Vary On label: Extraocular and intraocular irrigating solution during ocular surgical procedure involving perfusion of the eye.
11.3 Ophthalmic Viscosurgical Device (OVDs) Note: There are OVDs, including visco-adaptive and combined agents or dual viscoelastic systems, that fall into classes outside the <i>cohesive</i> and <i>dispersive</i> categories as listed below. However, access to these two classes is essential in providing safe anterior segment eye surgery. (Arshinoff SA, Jafari M. New classification of ophthalmic viscosurgical devices - 2005. J Cataract Refract Surg. 2005 Nov;31(11):2167-71)	
Class: Cohesive Note: Cohesive OVDs are more solid, providing maintenance of space and pressure. Cohesive and dispersive OVDs are inadequate therapeutic alternatives for each other given their different properties.	Contents: Varying amounts of hyaluronic acid and/or chondroitin sulfate On label: Protection of intraocular tissues during anterior segment surgery.
Class: Dispersive Note: Dispersive OVDs are more liquid, which acts as a protective coating to sensitive structures. Dispersive and cohesive OVDs are inadequate	Contents: Varying amounts of hyaluronic acid and/or chondroitin sulfate On label: Protection of intraocular tissues during anterior segment surgery.



therapeutic alternatives for each other given their different properties.	
11.4 Intraocular tissue stain	
Brilliant Blue G	Intravitreal: 0.25mg/mL
	On label: Aid in ophthalmic surgery by selectively staining the internal limiting membrane
Trypan Blue	Vial: 0.05%
	On label: Aid in ophthalmic surgery by staining the anterior capsule of the lens.



Closing Remarks

This document highlights drugs that are utilized every day by Canadian ophthalmologists. A future essential medication list (EML) for ophthalmic drugs would be more concise. But how do we define essential? Would it be limited to the most prescribed drugs? Or should drugs that are easier to produce domestically be prioritized? Is it acceptable that the list address 90% of circumstances, or should the drugs included be able to address all medical situations? What if drugs needed to be stockpiled? Should medications with longer shelf-lives find themselves at the top of the list when therapeutic alternatives are considered? This document is meant to assist in the conversation. Yet, if only considering medications used solely by eye care providers, it can be said with certainty that a 'crash cart' of ophthalmic medications would include:

- A high potency broad spectrum antibiotic eye drop
- Erythromycin ointment for the treatment of neonatal conjunctivitis
- Topical beta-blockers for the treatment of glaucoma
- Oral acetazolamide for the treatment of glaucoma
- A high potency steroid eye drop
- A topical anesthetic eye drop
- Atropine

This abbreviated list of ophthalmic medications would not address all needs. But it includes low cost, highly effective, widely used, and easy to stockpile medications. In the event of a public health emergency or a provincial critical drug stockpiling reserve, it would allow the treatment of many blinding eye diseases.

The Canadian Ophthalmological Society (COS) strives towards the provision of optimal medical and surgical eyecare for all Canadians. We hope to help all Canadians see the right provider, for the right treatment, at the right time.

