

# Temporal trends in ophthalmic surgical demand in a universal healthcare system: an Ontario population-based study of over two decades

Tina Felfeli ,<sup>1,2,3</sup> Gener Austria,<sup>4</sup> Reeza Menalo,<sup>4</sup> Sherif R El-Defrawy,<sup>1,5</sup> Diana Vasiliu,<sup>4</sup> Claudia Zanchetta,<sup>4</sup> Beate Sander<sup>2,3,6</sup>

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<sup>1</sup>Ophthalmology and Vision Sciences, University of Toronto, Toronto, Ontario, Canada

<sup>2</sup>The Institute of Health Policy, Management and Evaluation (IHPE), University of Toronto, Toronto, Ontario, Canada

<sup>3</sup>Toronto Health Economics and Technology Assessment (THETA) Collaborative, University Health Network, Toronto, Ontario, Canada

<sup>4</sup>Access to Care Program, Health System Performance and Support Portfolio, Ontario Health, Toronto, Ontario, Canada

<sup>5</sup>Kensington Eye Institute, Kensington Health, Toronto, Ontario, Canada

<sup>6</sup>Public Health Ontario, Toronto, Ontario, Canada

## Correspondence to

Dr Tina Felfeli; tina.felfeli@mail.utoronto.ca

## INTRODUCTION

The global demand for eye health services is growing with increasing life expectancy and the ageing population.<sup>1</sup> The estimated prevalence and relative contribution of avoidable causes of blindness and vision impairment globally is 9600 cases per 100 000 people, with cataract and glaucoma as the leading global causes of blindness in those aged 50 years and older.<sup>1</sup> Cataract surgery and other vision saving surgeries are among the most cost-effective healthcare interventions currently available.<sup>2</sup> However, increasing case volume and backlogs in ophthalmic surgery will place unprecedented pressures on healthcare systems, particularly those with a limited ability to increase throughput.<sup>3</sup> Data regarding demand and supply of surgery

is required to inform surgical policies for optimal outcomes and equitable care.<sup>3</sup>

In many jurisdictions including the USA, there is a lack of population-based ophthalmic surgical data, and therefore, the unmet demand is unknown. The Canadian universal healthcare context is uniquely positioned to provide an overview of the demand for ophthalmic surgeries in a developed country. Herein, we report the trends in surgical volumes, wait times and characteristics of adult patients on the wait list in Ontario, the largest province in Canada's universal healthcare system.

## METHODS

This is a population-based retrospective cohort study in Ontario, Canada, which

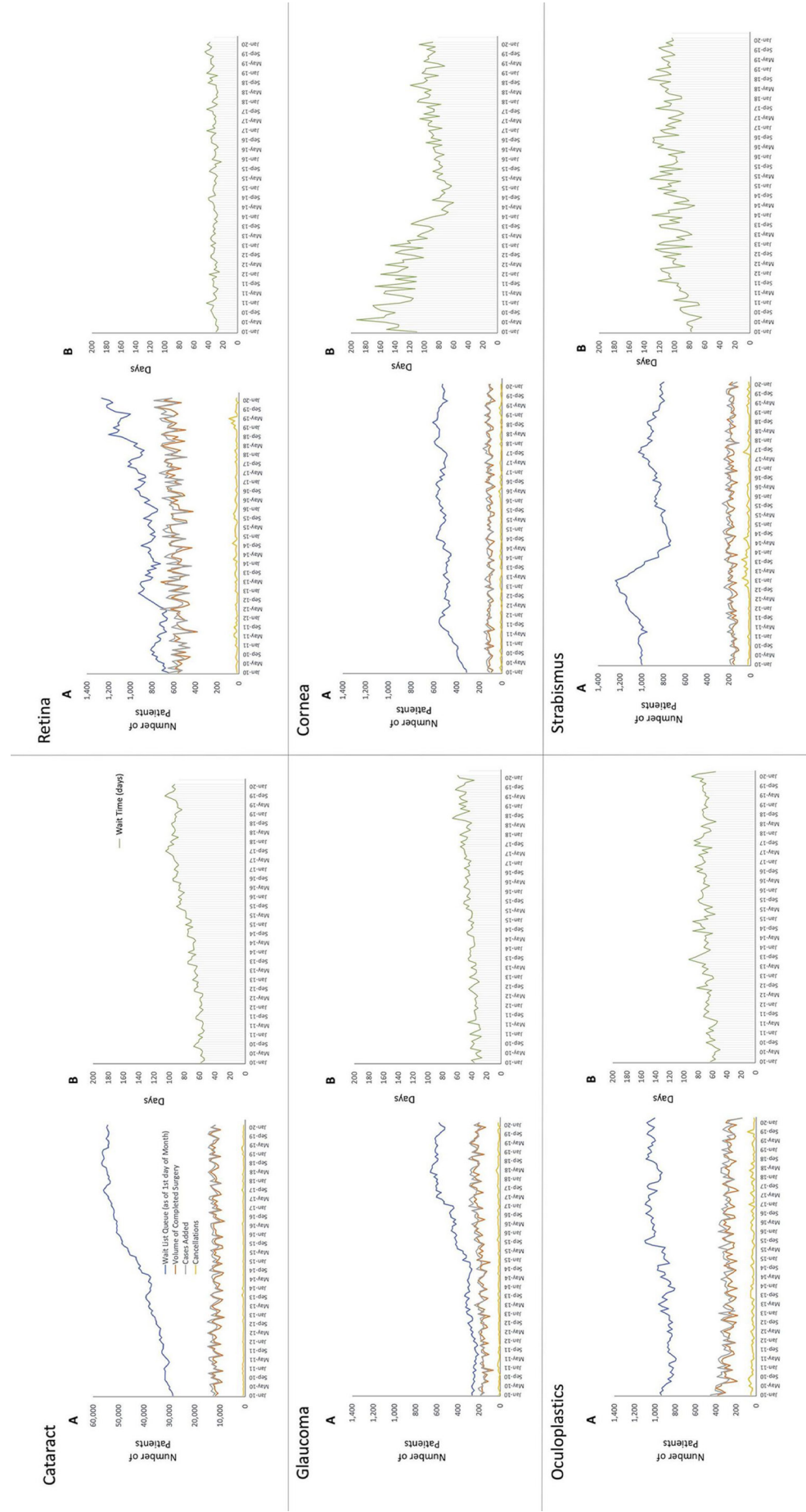
**Table 1** Summary of average monthly ophthalmology surgical (all specialties combined) waitlist data over the study period

Year	Cases added*	Cases cancelled*	Volume of completed surgery*	Wait list queue*†	Wait time, days—mean (SD)*
2010	13 843 (1528)	892 (107)	12 633 (1535)	33 715 (1232)	59 (58)
2011	13 951 (1544)	888 (155)	12 947 (1568)	34 999 (1048)	58 (63)
2012	13 988 (1632)	855 (148)	12 791 (1737)	37 671 (1041)	60 (62)
2013	13 476 (1558)	960 (170)	12 462 (1736)	41 380 (822)	67 (67)
2014	13 609 (1330)	863 (153)	12 283 (1601)	42 471 (2144)	69 (70)
2015	13 643 (1288)	830 (115)	12 170 (1491)	49 821 (2535)	77 (73)
2016	13 906 (1428)	922 (152)	12 746 (1580)	54 792 (765)	84 (83)
2017	13 987 (1458)	914 (174)	12 952 (1544)	57 985 (1307)	91 (94)
2018	14 427 (1303)	822 (195)	13 289 (1441)	59 075 (1269)	90 (94)
2019	14 411 (1488)	936 (274)	13 509 (1431)	58 708 (1073)	89 (96)
2020	14 108 (1392)‡	742 (80)‡	13 998 (893)‡	58 628 (225)‡	91 (95)

\*Monthly average between January and December.

†As of first day of Month.

‡Up to but not including March 2020.



**Figure 1** Monthly number of patients on the wait list, volume of completed surgery, cases added and cancellations (A) as well as mean monthly wait times in days (B), for subspecialty ophthalmic surgeries including cataract and combination cataract and other procedures, retina surgery (vitrectomy and other vitreoretinal surgery), glaucoma surgery (glaucoma filter/seton and other glaucoma surgeries), corneal surgery (corneal transplant and other cornea surgery), oculoplastics and adult strabismus surgery between January 2010 and February 2020. Note that the y-axis scale (in A) for cataract surgery is different than other subspecialty groups

followed the Strengthening the Reporting of Observational Studies in Epidemiology reporting guideline.

Data for the period of January 2010 to February 2020 were obtained from the provincial Wait Times Information System (WTIS) from Ontario Health, which comprehensively captures any surgical wait list data on the Ontario adult population of 14.8 million. Ontario Health is authorised to collect population-level data for the purpose of monitoring allocation of resources and delivery of services. The WTIS captures wait time data in near real time<sup>4</sup> on wait list queues for non-emergency ophthalmic surgical procedures (subspecialty surgeries including vitreoretinal, glaucoma, cornea, cataract, oculoplastics and adult strabismus surgery),<sup>5</sup> the number of new cases added to the wait list, the number of completed surgeries performed, as well as patient demographics (age and sex). Additionally, the WTIS captures the wait time in days (mean and SD) for patients on the wait list.

All results are reported descriptively with means, medians and margins of error (SD and IQR). For determining trends over time, per cent change calculations were used. Statistical analysis was performed using SAS Enterprise Guide V.7.15 (SAS Institute).

## RESULTS

Over the study period of 2010–2020, a total of 1 699 087 adult cases were added to the list for non-emergency ophthalmic surgery. This is equivalent to approximately 13 927 (SD 1429) cases added to the ophthalmic surgical weight list per month (or 94 cases/month/100 000 people). Among patients who underwent surgery, females represented 56% of all cases. The median age of all patients was 73 (IQR: 65–79) years in 2010 and 72 (IQR: 66–78) years in 2021. The youngest patient group on the waitlist was awaiting surgery for adult strabismus (median age: 45; IQR: 30–62 in 2020).

The number of patients awaiting ophthalmic surgery for all subspecialties between 2010 to 2020 grew by 74% (33 715 (SD 1,232) vs 58 628 (SD 225)). The mean number of cases added per month between 2010 and 2020 increased by approximately 265 cases from 13 843 (SD 1528) to 14 108 (SD 1392). Between 2010 and 2020, a total of 1 561 376 ophthalmic surgeries were completed, with an average of 12 798 (SD 1,558) cases performed per month over the study period. The mean monthly number of patients added to the wait list for surgery exceeded the number of surgeries being completed each month by 1129 (SD 660) additional cases. Accordingly, the wait time for patients on the wait list increased from 59 (SD 58) days to 91 (SD 95) days over the study period (table 1). With the increasing volume of completed surgery in 2018 and onwards, the wait list queue was noted to stabilise in more recent years.

With regard to each of the subspecialties, in 2020, cataract had the highest monthly number of patients on the waitlist (54 427 (SD 234) patients), followed by vitreoretinal surgery (12 777 (SD 52), figure 1A). Among all

subspecialties, the mean wait time in 2020 was highest for adult strabismus surgery at 102 (SD 112) days. The largest increase in wait time between 2010 and 2020 was noted for cataract surgery at 48.7% (figure 1B). During the study period, there were on average 886 (SD 169) cancellations per month for patients awaiting ophthalmic surgery.

## DISCUSSION

The findings from this population-based study suggest that there is an unmet demand for ophthalmic surgeries in the Ontario, Canada population over the past decade. The growing waitlist may be in part attributed to the gap between cases added and surgeries performed each month since 2010, which has started to stabilise in more recent years with the increasing number of completed surgeries. We have previously reported that there are approximately 478 ophthalmologists in Ontario as of 2018.<sup>6,7</sup> This suggests that there is one ophthalmologist for every 123 patients on the wait list. There was also a relatively high number of cancellations in the publicly funded ophthalmic surgery wait list, which suggests that the unmet demand for eye care may be even higher than reported here. Given the similarity in demographic characteristics of Canada and the USA and other developed nations, analogous increases in demand are anticipated in other jurisdictions. Implementation of strategies for addressing the unmet demand for subspecialty surgeries may help the burden of avoidable blindness.

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**Patient consent for publication** Not applicable.

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## ORCID iD

Tina Felfeli <http://orcid.org/0000-0002-0927-3086>

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