Age affects intraocular lens attributes preference in cataract surgery

Shu-Wen Chang1,2*, Wan-Lin Wu1

Abstract:
PURPOSE: The aim of this study is to analyze the effects of age on intraocular lens (IOL) attributes preference.
MATERIALS AND METHODS: We enrolled 4213 eyes that underwent smooth phacoemulsification and IOL implantation between January 2005 and June 2018. Patients were subdivided into six groups according to their ages, i.e., ≤40, 41–50, 51–60, 61–70, 71–80, and ≥ 81 years old. The difference in preference of IOL attributes regarding age, gender, and year of surgery was analyzed separately. The analyzed IOL attributes included asphericity, astigmatism-correction, presbyopia-correction, and blue-blocking function.
RESULTS: The patients averaged 68.3 ± 11.6 years old at the time of surgery. There was no significant difference in age between males and females. There were 1980 patients (47.0%) selected aspheric IOL, 822 patients (19.5%) selected multifocal (MF) IOL, 93 patients (2.2%) selected toric IOL, and 859 patients (20.4%) selected blue-blocking IOL. Adoption of aspheric and MF IOL increased significantly during the study (P < 0.001 for both attributes). There were more young patients selected aspheric and MF IOL (P < 0.001 for both), and the change in the trend of adoption over the years was also most significant in the young group (P < 0.001 for both). The proportion of patients that selected blue-blocking IOL decreased significantly after 2011 (P < 0.001). There was no gender preference in aspheric, MF, and toric IOL selection. However, there were more male patients selected blue-blocking IOL (P = 0.018).
CONCLUSION: The adoption of IOLs with emerging technologies increased significantly over the years. Younger adults tended to adopt advanced technology IOL more than the older ones.

Keywords: Age, functional intraocular lens, intraocular lens attributes, intraocular lens preference

Introduction
Cataract surgery is the most effective treatment for cataract blindness. Better vision after cataract surgery is associated with a reduced risk of subsequent dementia.[1,2] Achieving spectacle independence is one of the major goals in refractive lens surgery.[3–6] However, the cost of cataract surgery is a barrier to some individuals and a burden to the health-care system due to the aging population,[7] making full coverage of advanced technology intraocular lens (IOL) impossible. Nevertheless, there has been limited study regarding patients’ willingness-to-pay for spectacle independence.[6]

Together with the improvement in surgical techniques, IOLs designs have advanced tremendously and improved postoperative visual outcomes over the past three decades.[9] Although there was no significant difference in visual acuity, there was a significantly better contrast sensitivity in eyes implanted with aspheric IOL.[9,10] The correction of preoperative corneal astigmatism with a toric IOL also provides better visual outcomes than nontoric IOL for astigmatic patients[11] particularly for the 40.41% of subjects with...
corneal astigmatism ≥1.0 D. However, accurate measurements of the preexisting corneal astigmatism, accurate IOL power, and orientation estimation, and optimal IOL rotational stability to achieve a desired refractive outcome after toric IOL implantation are still in progress. 

Although multifocal (MF) IOLs were associated with certain degrees of halos and glare, systematic reviews of the clinical outcomes demonstrated that implantation of MF IOLs resulted in good visual outcomes and mean spectacle independence of 80.1%. There was no significant difference in clinical or patient-reported outcomes among different age groups from 45 to 65 years. MF toric IOLs were noninferior to MF nontoric IOLs in the uncorrected distance and near visual acuity.

Cost-benefit analysis using cataract patients’ willingness-to-pay for spectacle independence demonstrated that the net benefit of the MF IOL exceeded its acquisition cost and the net benefit of the conventional multifocal IOL, confirming its value to select cataract patients willing to pay a premium for spectacle independence. However, bilateral toric IOL implantation was not cost-effective, and copayment by patients is thus advocated. As patient’s willingness to pay depends on multiple determinants, including personal, financial, and cultural factors, the IOLs implanted reflect the results of the interaction between patients’ adoption attitude toward new technology and their willingness to pay for IOLs. Market data demonstrate the trend of IOL evolution without delineating the trend and change in patient demographics in whom the IOL implanted. Studies addressing the patients’ preference in IOL attributes are lacking. There is an age difference in the adoption of new and emerging technologies. Whether there is an age difference in the adoption of new technology IOL in real world practice is less well illustrated. The purpose of the study was to investigate the change in patients’ preference in IOL attributes over time.

Methods

This study was conducted by a retrospective chart review. Our research adhered to the tenets of the Declaration of Helsinki and the protocol was approved by the Institutional Review Board (IRB) of Far Eastern Memorial Hospital (IRB reference number: 108116-E). The patient consent is waived by IRB. There were 4213 eyes of 4213 patients enrolled. Patients underwent smooth phacoemulsification and IOL implantation through a 2.75-mm or a 2.2-mm incision with three-step superior limbal incision by a single surgeon (SWC) from January 2005 to June 2018. Patients with pterygium, corneal diseases, surgery with complications or other prior eye surgeries were excluded. There were no eyes of clear lens exchange. The cost of a spheric, nontoric, monofocal IOL was covered by the patients themselves or private health insurance. When both eyes of one patient underwent surgery in our hospital, the data of the first eye were included for analysis to avoid confounding effects.

Intraocular lens selection

At the clinic, the patients and their families selected the IOL to be implanted after thorough explanation of phacoemulsification procedure and the attributes of each IOL. The explained attributes included asphericity, astigmatism-correction, presbyopia-correction, and blue-blocking. The scientific evidence of each attribute was briefed to the patient and family at the time of consultation. The IOLs inserted and their attributes coded for analysis are summarized in Table 1. Every attribute was coded independently for each IOL, for example, an aspheric MF toric IOL will be coded in the aspheric, presbyopia-correction, and astigmatism-correction category during analysis. The cost of each IOL was also explained at the time of consultation.

Surgical procedures

All surgeries were performed by one experienced surgeon (SWC). Briefly, topical anesthesia was applied with 0.05% proparacaine hydrochloride (ALCAINE, Alcon Laboratories Inc.). With the surgeon sitting superior to the patient, incisions were made at the 12 o’clock position with paracentesis at the 2 o’clock position. A three-step incision was made 0.5 mm posterior to the limbus using a 2.2-mm or 2.75-mm clear corneal knife. A continuous curvilinear capsulorhexis measuring approximately 5.0–5.5 mm in diameter was created after the anterior chamber was inflated with viscoelastic (DuoVisc, Alcon Laboratories Inc.). Nuclei were chopped after hydrodissection, and nuclear fragments were removed by phacoemulsification. In-the-bag implantation of the IOL was completed, and the viscoelastic was then completely removed. Incisions were sealed by standardized stromal hydration at the end of surgery. Only cases with no intraoperative complications were included.

Data analysis

Patients were subdivided into six groups according to their ages, i.e., ≤40, 41–50, 51–60, 61–70, 71–80, and ≥81 years old. The difference in preference of IOL attributes regarding age, gender, year of surgery was analyzed separately. Differences in age between genders and among the years at the time of surgery were examined using independent t-tests and one-way analysis of variance (ANOVA) separately. Distribution of selected IOL attributes between gender and among different age groups was examined using the Pearson
Chi-square test. For all tests, a $P = 0.05$ or less was considered statistically significant. Significant main effects in ANOVA were followed up with the least significant difference post hoc comparisons. All statistical analyses were performed using SPSS for Windows software (version 17.0, SPSS, Inc., Chicago, IL, USA).

**Results**

In contrast to the regular spheric IOL, there were 1980 patients (47.0%) selected aspheric IOL, 822 patients (19.5%) selected MF IOL, 93 patients (2.2%) selected toric IOL, and 859 patients (20.4%) selected blue-blocking IOL.

**Gender**

The 4213 patients averaged 68.3 ± 11.6 years old. There was no significant difference in age between males and females (68.8 ± 10.9 for 2443 females and 67.7 ± 12.3 for 1770 males respectively, $P = 0.405$) at the time of surgery. There were no significant gender differences in the selection of aspheric, presbyopia correction, astigmatism correction IOLs, except there were more male selected blue blockers containing IOL ($P = 0.018$).

**Aspheric**

There was a significant increase in aspheric IOL adoption during the study period ($P < 0.001$) [Figure 1a]. A greater proportion of younger patients selected aspheric IOL ($P < 0.001$) [Figure 1b], and the increase in adoption over the years was also most significant in the young group ($P < 0.001$) [Figure 1c]. The adoption rate of aspheric IOLs increased 91% in patients younger than 40 years of age (i.e., 48.0% in years 2005-2009 vs. 93.3% in years 2015–2018). In contrast, the adoption increased 13% in patients older than 81 years of age (i.e., 33.7% in the years 2005–2009 vs. 38.2% in years 2015–2018).

**Presbyopia correction intraocular lens**

There was a significant increase in MF IOL adoption during the study period ($P < 0.001$) [Figure 2a]. The younger patients were more prone to select MF IOL ($P < 0.001$) [Figure 2b], and the change in the trend of adoption over the years was also most significant in the young group ($P < 0.001$) [Figure 2c]. The proportion of presbyopia-correcting IOLs adoption remained 52.0%–60% in patients younger than 40 years of age (i.e., 48.0% in years 2005-2009 vs. 56.9% in years 2015–2018). In contrast, the adoption rate was low in patients older than 81 years and increased 22% (i.e., 7.4% in the years 2005–2009 vs. 9.1% in years 2015–2018).

**Toric**

There was an increase in toric IOL adoption after its introduction to the country in 2012 ($P < 0.001$) [Figure 3a].

---

**Table 1: Summary of inserted intraocular lens attributes**

| Company                | IOL models | Aspheric | Astigmatism correction | Presbyopia correction | Blue-blocking |
|------------------------|------------|----------|------------------------|-----------------------|--------------|
| Alcon                  | MA60MA     | 0        | 0                      | 0                     | 0            |
| Alcon                  | SA60AT     | 0        | 0                      | 0                     | 0            |
| Alcon                  | AcrySof Natural | 0   | 0                      | 0                     | 1            |
| Bausch and Lomb        | enVista MX60 | 1       | 0                      | 0                     | 0            |
| Abbott Medical Optics  | TECNIS® ZCB00 | 1   | 0                      | 0                     | 0            |
| Rayner                 | C-FLEX®    | 1        | 0                      | 0                     | 0            |
| Rayner                 | Superflex® | 1        | 0                      | 0                     | 0            |
| Alcon                  | AcrySof® IQ | 1        | 0                      | 0                     | 1            |
| PhysIOL                | MicroPure 123 | 1     | 0                      | 0                     | 1            |
| Abbott Medical Optics  | TECNIS® ZMB | 1   | 0                      | 1                     | 0            |
| Abbott Medical Optics  | TECNIS® Symfony® | 1  | 0                      | 1                     | 0            |
| Alcon/Policlin B.V.    | LS-313     | 1        | 0                      | 1                     | 0            |
| Alcon                  | AcrySof® ReSTOR® | 0  | 0                      | 1                     | 1            |
| Alcon                  | AcrySof® IQ ReSTOR® | 1  | 0                      | 1                     | 0            |
| PhysIOL                | POD®       | 1        | 0                      | 1                     | 1            |
| Abbott Medical Optics  | TECNIS® ZMT | 1   | 1                      | 1                     | 0            |
| Alcon                  | AcrySof® IQ ReSTOR Multifocal Toric | 1 | 1 | 1 | 0 |
| PhysIOL                | POD-FT     | 1        | 1                      | 1                     | 1            |

1: With the indicated attribute, 0: Without the indicated attribute. IOL=Intraocular lens

---

Taiwan J Ophthalmol - Volume 11, Issue 3, July-September 2021
The younger patients were more prone to select toric IOL ($P < 0.001$) [Figure 3b], and the change in trend of adoption over the years was also most significant in the young group ($P < 0.001$) [Figure 3c]. The toric IOLs adoption rate increased 122% in patients younger than 40 years of age (i.e., 15.0% in years 2010–2014 vs. 33.3% in years 2015–2018). In contrast, the adoption of toric IOLs remained low in patients older than 81 years (i.e., 1.0% in the years 2010–2014 vs. 1.8% in years 2015–2018).

**Blue blocking intraocular lens**

There was a significant decrease in blue-blocking IOL adoption during the study period ($P < 0.001$) [Figure 4a]. The younger patients were more prone to select blue-blocking IOL ($P < 0.001$) [Figure 4b]. However, the decreasing trend of adoption over the years was also most significant in the young group ($P < 0.001$) [Figure 4c]. The proportion of patients that selected blue-blocking IOL decreased significantly after 2011 ($P < 0.001$). The blue-blocking IOLs adoption decreased by 67% in patients younger than 40 years of age (60.0% in years 2005–2009 vs. 20.0% in years 2015–2018). Similarly, the blue-blocking IOLs implanted in patients >81 years old was 30.4% in the years 2005–2009 and was 0% in years 2015–2018.

**Discussion**

Our 4213 patients averaged 68.3 ± 11.6 years old, which is younger than the national data of 73.5 ± 0.015 years in France\(^{[23]}\) and the 73 ± 11 years in Olmsted County, Minnesota, USA\(^{[24]}\). This could result from the higher myopic rate in our country, as cataract is more prevalent in myopic eyes\(^{[25, 26]}\). With more favorable clinical outcomes including better visual and/or life quality after implantation of aspheric,\(^{[10]}\) toric, and MF IOL\(^{[4, 5]}\) we demonstrated a trend of more adoption of aspheric, toric, and MF IOL in younger patients. Our results confirmed that older adults are less likely to adopt new and emerging technologies\(^{[22]}\) and less willing to pay for the IOL\(^{[27]}\).

We demonstrated that younger patients were more prone to adopt MF IOLs, and the trend increased over the years. As 100% of patients will have presbyopia if no
presbyopia-correcting IOL is implanted, there was around 60% of younger patients adopted presbyopia-correcting IOL, with the youngest adopted fastest. The proportion of presbyopia-correcting IOLs adoption remained high (52.0%–60%) in patients younger than 40 years of age since its launch while patients 41–50 years old adopted at a slightly slower rate, i.e., 44.0% in years 2005–2009 increased to 56.9% in the years 2015–2018. In contrast, the adoption rate remained <10% in the elderly group throughout the study period. The young to old ratio in adoption was 6.3 folds. Although the halos/glare and variable neural adaptation to multifocality in some patients had been the major reasons of reluctance in the adoption of MF IOLs, the young generation were more prone to adopt the new technology IOL. A systematic review of the clinical outcomes demonstrating that implantation of MF IOLs resulted in good visual outcomes and increased spectacle independence also encouraged their adoption. Preoperative explanation of night glare/halo did not hinder their motivation to achieve spectacle independence. As reading glasses is a protective factor against cognitive deterioration associated with visual deprivation in old age, whether the MF IOL associated near work independently could potentially benefit the retardation of dementia development awaits further elucidation.

Although 40.41% of subjects undergoing cataract surgery have corneal astigmatism ≥ 1.0 D, there was an overall 3%–5% patients selected toric IOLs in our series. The adoption rate was 33.3% in patients younger than 40 years of age in years 2015–2018, indicating that most patients, i.e., 83% of whom with significant corneal astigmatism, had already adopted this new technology IOL in this group. In contrast, the adoption of toric IOLs remained low, i.e., 4.5% of whom with significant corneal astigmatism and the change was slow (0% in years 2010–2014 vs. 1.8% in years 2015–2018) in patients older than 81 years. This might represent the less willing to pay for the IOL with advanced age when there is less necessity and more risky to embrace new technology are likely the deciding factors in choosing MF IOLs. Preoperative explanation of night glare/halo did not hinder their motivation to achieve spectacle independence. As reading glasses is a protective factor against cognitive deterioration associated with visual deprivation in old age, whether the MF IOL associated near work independently could potentially benefit the retardation of dementia development awaits further elucidation.

Figure 3: The trend in overall toric intraocular lens adoption in different year of operation (a) and patient age group (b). The change in each individual age group over time is most significant in the younger adult group (c)

Figure 4: The trend in overall blue-blocking intraocular lens adoption in different year of operation (a) and patient age group (b). The change in each individual age group over time is most significant in the younger adult group (c)
The discrepancy in the ratio of adopting presbyopia-correcting and astigmatism correcting IOL could have resulted from the fact that most of our elderly patients were not wearing glasses for astigmatism correction preoperatively, while the majority of them did wear presbyopia glasses. It was thus much easier for them to understand and choose presbyopia-correcting IOLs than astigmatism correcting IOLs. In contrast, younger patients were relatively myopic and used to wear myopic/astigmatism glasses. They could understand the idea of astigmatism correction easily and thus are more prone to adopt astigmatism-correcting IOL when indicated. This was evidenced by the 122% increase in adoption rate in patients younger than 40 years of age from 2010 to 2018. However, it is noteworthy that although toric IOL could provide better visual outcomes than nontoric IOL for astigmatic patients, suboptimal visual satisfaction due to rotational stability of the IOL and residual astigmatism remained the limiting factors during the preoperative consultation for toric IOL. Accurate measurements of the preexisting corneal astigmatism are essential in order to achieve the desired refractive outcome after toric IOL implantation. Nevertheless, most commonly used biometers do not allow more than 43.75%−53% of eyes to yield an absolute error in astigmatism magnitude lower than 0.5 D. It is possible that the adoption rate of toric IOL would further increase when better refraction outcomes could be assured with the improvement in both biometry and IOL manufacturing technologies.

We demonstrated a decreased trend of blue-blocking IOL adoption. This is compatible with the lack of scientific evidence on clinically meaningful, favorable difference in short-term best-corrected visual acuity and contrast sensitivity with blue-blocking IOLs as well as in the association between progression of age-related macular degeneration and use of blue-blocking. In contrast, its potential in inducing mood changes in aging could have contributed to the decreased adoption rate.

The strength of this study is that we included a large number of patients living in the same areas, which reduced the confounding effects of socioeconomic effects. They were operated by a single surgeon, i.e., the attributes of IOLs were explained to all patients in the same manner to nullify the bias of the surgeon’s recommendation. The limitation of this study is that we included patients from the same area of a single surgeon, which makes the results less representative of a phenomenon of the country. The study cannot illustrate the direct relationship between the level of patient education and IOL selection as the education level was not recorded at the time of surgery and thus not possible to analyze. Furthermore, as our patients selected their IOLs based both on their understanding of the functions and cost of each attribute, the IOLs implanted could, therefore, be affected by patients’ socioeconomic status and their private insurance coverage. Nevertheless, by minimizing the confounding effect from the surgeon’s preference and the variation of the socioeconomic status of the patients, our results could thus reflect the alteration of a society’s perception and acceptance of the change in IOL technology in the real-world practice.

A person will assess all possible advantages and disadvantages (monetary or nonmonetary) of an intervention or product and derive a monetary figure that represents their measure of value for the product in question. Our national health insurance reimburses the majority of costs associated with the implantation of conventional multifocal IOLs for the treatment of cataracts. However, astigmatism and presbyopia correction are not considered medically necessary. Cataract patients opt to pay the additional premium associated with astigmatism- and presbyopia-correcting IOL implantation. The out-of-pocket expense for astigmatism- and presbyopia-correcting MF IOL are USD $1500 and $2000 per eye, respectively. In a cost-benefit analysis in the united states, 80% of all patients were willing to pay at least USD $5 per day to be spectacle independent. Postoperative spectacle independence was achieved in 80% in the MF intraocular lense (MF-IOL) group and 8% in the conventional monofocal-IOL group. The net benefit of the MF-IOL thus actually exceeded its acquisition cost. Although we did not conduct the willing-to-pay questionnaire in this study, the results of our out-of-pocket payment system indirectly reflected the trend of change in willing-to-pay for spectacle independency in the different age group over the study.

Conclusion

Our results are compatible with the global trend of increasing the adoption of IOL with emerging technology. We further demonstrated that younger patients tended more to adopt advanced technology IOLs than the elderly. This implies that if sufficient information is provided and the expected outcomes explained preoperatively, postoperative halo and glare is an acceptable trade-off with spectacle independence. This encourages future development of IOL attributes toward the need of the younger generation. Since this retrospective study spans 14 years, in which IOL technology has significantly changed, our results regarding the trend in patients’ need and adaptation of vision correction are informative and would facilitate preoperative consultation.

Financial support and sponsorship
Nil.
Conflicts of interest
The authors declare that there are no conflicts of interest of this paper.

References
1. Yu WK, Chen YT, Wang SJ, Kuo SC, Shia BC, Liu CJ. Cataract surgery is associated with a reduced risk of dementia: A nationwide population-based cohort study. Eur J Neurol 2015;22:1370-7, e79-80.

2. Ishii K, Kabata T, Oshika T. The impact of cataract surgery on cognitive impairment and depressive mental status in elderly patients. Am J Ophthalmol 2008;146:404-9.

3. Rosen E, Alió JL, Dick HB, Dell S, Slade S. Efficacy and safety of multifocal intraocular lenses following cataract and refractive lens exchange: Metaanalysis of peer-reviewed publications. J Cataract Refract Surg 2016;42:310-28.

4. de Vries NE, Nuijts RM. Multifocal intraocular lenses in cataract surgery: Literature review of benefits and side effects. J Cataract Refract Surg 2013;39:268-78.

5. Calladine D, Evans JR, Shah S, Leyland M. Multifocal versus monofocal intraocular lenses after cataract extraction. Cochrane Database Syst Rev 2012;9:CD003169.

6. de Silva SR, Evans JR, Kirkthi V, Ziaei M, Leyland M. Multifocal versus monofocal intraocular lenses after cataract extraction. Cochrane Database Syst Rev 2016;12:CD003169.

7. Song P, Wang H, Theodoratou E, Chan KY, Rudan I. The national and subnational prevalence of cataract and cataract blindness in China: A systematic review and meta-analysis. J Glob Health 2018;8:010064.

8. Maxwell WA, Waycaster CR, D’Souza AO, Meissner BL, Hileman K. A United States cost-benefit comparison of an apodized, diffractive, presbyopia-correcting, multifocal intraocular lens and a conventional monofocal lens. J Cataract Refract Surg 2008;34:1855-61.

9. Crnej A, Buehl W, Greslechner R, Hirnschall N, Findl O. Effect of an aspheric intraocular lens on the ocular wave-front adjusted for pupil size and capsulorhexis size. Acta Ophthalmol 2014;92:e353-7.

10. Chen Y, Wang X, Zhou CD, Wu Q. Evaluation of visual quality of spherical and aspherical intraocular lenses by optical quality analysis system. Int J Ophthalmol 2017;10:914-8.

11. Kessel L, Andresen J, Tendal B, Erngaard D, Flesner P, Hjortdal J. Toric intraocular lenses in the correction of astigmatism during cataract surgery: A systematic review and meta-analysis. Ophthalmology 2016;123:275-86.

12. Khan MJ, Muhtasib M. Prevalence of corneal astigmatism in patients having routine cataract surgery at a teaching hospital in the United Kingdom. J Cataract Refract Surg 2011;37:1751-5.

13. Potvin R, Kramer BA, Hardten DR, Berdahl JP. Factors associated with residual astigmatism after toric intraocular lens implantation reported in an online toric intraocular lens back-calculator. J Refract Surg 2018;34:366-71.

14. Chamberlain PD, de Oca IM, Shah R, Wang L, Weikert MP, Khandelwal SS, et al. Preoperative prediction of the optimal toric intraocular lens alignment meridian. J Refract Surg 2018;34:515-20.

15. Park DY, Lim DH, Hwang S, Hyun J, Chung TY. Comparison of astigmatism prediction error taken with the pentacam measurements, Baylor nomogram, and Barrett formula for toric intraocular lens implantation. BMC Ophthalmol 2017;17:156.

16. Berdahl JP, Hardten DR, Kramer BA, Potvin R. The effect of lens sphere and cylinder power on residual astigmatism and its resolution after toric intraocular lens implantation. J Refract Surg 2017;33:157-62.

17. Kramer BA, Berdahl JP, Hardten DR, Potvin R. Residual astigmatism after toric intraocular lens implantation: Analysis of data from an online toric intraocular lens back-calculator. J Cataract Refract Surg 2016;42:1595-601.

18. Akella SS, Juthani VV. Extended depth of focus intraocular lenses for presbyopia. Curr Opin Ophthalmol 2018;29:318-22.

19. Schallhorn SC, Schallhorn JM, Peloussouka M, Venter JA, Hettinger KA, Hannan SJ, et al. Refractive lens exchange in younger and older presbyopes: Comparison of complication rates, 3 months clinical and patient-reported outcomes. Clin Ophthalmol 2017;11:1569-81.

20. Lehmann R, Modi S, Fisher B, Michna M, Snyder M. Bilateral implantation of +3.0 D multifocal toric intraocular lenses: Results of a US food and drug administration clinical trial. Clin Ophthalmol 2017;11:1321-31.

21. Simons RW, Visser N, van den Biggelaar FJ, Nuijts RM, Webers CA, Bauer NJ, et al. Trial-based cost-effectiveness analysis of toric versus monofocal intraocular lenses in cataract patients with bilateral corneal astigmatism in the Netherlands. J Cataract Refract Surg 2019;45:146-52.

22. Berkowsky RW, Sharit J, Czaja SJ. Factors predicting decisions about technology adoption among older adults. Innov Aging 2018;2:iogy002.

23. Daen V, Le Pape A, Heve D, Carriere I, Villain M. Incidence and characteristics of cataract surgery in France from 2009 to 2012: A National Population Study. Ophthalmologica 2015;212:1633-8.

24. Collogly HE, Hodge DO, St Sauver JL, Erie JC. Increasing incidence of cataract surgery: Population-based study. J Cataract Refract Surg 2013;39:1383-9.

25. Pan CW, Cheng CY, Saw SM, Wang JJ, Wong TY. Myopia and age-related cataract: A systematic review and meta-analysis. Am J Ophthalmol 2013;156:1021-30.

26. Lee YY, Lo CT, Sheu SJ, Lin JG. What factors are associated with myopia in young adults? A survey study in Taiwan Military Enlists. Invest Ophthalmol Vis Sci 2013;54:1026-33.

27. Ko F, Frick KD, Tzu J, He M, Condgon N. Willingness to pay for potential enhancements to a low-cost cataract surgical package in rural southern China. Acta Ophthalmol 2012;90:e54-60.

28. Spierer O, Fischer N, Barak A, Belkin M. Correlation between vision and cognitive function in the elderly: A cross-sectional study. Medicine (Baltimore) 2016;95:e2423.

29. Savini G, Naeser K, Schiano-Lomoriello D, Ducoli P. Optimized keratometry and total corneal astigmatism for toric intraocular lens calculation. J Cataract Refract Surg 2017;43:1140-8.

30. Vounotrypis E, Haralanova V, Muth DR, Wertheimer C, Shajari M, Wolf A, et al. Accuracy of SS-OCT biometry compared with partial coherence interferometry biometry for combined phacovitrectomy with internal limiting membrane peeling. J Cataract Refract Surg 2019;45:48-53.

31. Downie LE, Busija L, Keller PR. Blue-light filtering intraocular lenses (IOLs) for protecting macular health. Cochrane Database Syst Rev 2018;5:CD011977.

32. Liu R, Gao C, Chen H, Li Y, Jin Y, Qin H. Analysis of Th17-associated cytokines and clinical correlations in patients with dry eye disease. F1000Res 2017;12:e0173301.

33. Qian CX, Young LH. The impact of cataract surgery on AMD development and progression. Semin Ophthalmol 2014;29:301-11.

34. Lai E, Levine B, Ciralsky J. Ultraviolet-blocking intraocular lenses: Fact or fiction. Curr Opin Ophthalmol 2014;25:35-9.

35. Zambrowski O, Tavernier E, Souied EH, Desmidt T, Le Gouge A, Bellicaud D, et al. Sleep and mood changes in advanced age after blue-blocking (yellow) intra ocular lens (IOLs) implantation during cataract surgical treatment: A randomized controlled trial. Aging Ment Health 2018;22:1351-6.